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Metaphors of Mobile Communications

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My parents have been my inspiration. I humbly dedicate this work to them.

Technology alone is not enough — it's technology married with liberal arts, married with the humanities, that yields us the result that makes our heart sing.

Steve Jobs

Metafore mobilnih komunikacija

Apstrakt

Mobilne komunikacije su polje informacione i komunikacione tehnologije koje karakteriše brzi razvoj i u kome se istraživanjem u analitičkim okvirima kognitivne lingvistike, zasnovanom na uzorku od 1005 odrednica, otkriva izrazito prisustvo metafore, metonimije, analogije i pojmovnog objedinjavanja. Analiza uzorka reči i izraza iz oblasti mobilnih medija, mobilnih operativnih sistema, dizajna korisničkih interfejsa, terminologije mobilnih mreža, kao i slenga i tekstizama koje upotrebljavaju korisnici mobilnih naprava ukazuje da pomenuti kognitivni mehanizmi imaju ključnu ulogu u olakšavanju interakcije između ljudi i širokog spektra mobilnih uređaja sa računarskim sposobnostima, od prenosivih računara i ličnih digitalnih asistenata (PDA), do mobilnih telefona, tableta i sprava koje se nose na telu. Ti mehanizmi predstavljaju temelj razumevanja i nalaze se u osnovi principa funkcionisanja grafičkih korisničkih interfejsa i direktne manipulacije u računarskim okruženjima. Takođe je analiziran i poseban uzorak od 660 emotikona i emođija koji pokazuju potencijal za proširenje značenja, imajući u vidu značaj piktograma za tekstualnu komunikaciju u vidu SMS poruka i razmenu tekstualnih sadržaja na društvenim mrežama kojima se redovno pristupa putem mobilnih uređaja.

Osnovna namera istraživanja je formulisanje metafora kojima se pojmovno predstavljaju mobilne komunikacije. To, kao prvo, podrazumeva praćenje transformacije grafičkog korisničkog interfejsa i metafore radnog stola, razvijenih radi zadovoljavanja potreba okruženja personalnih računara, odnosno, njihovog prilagođavanja okruženju koje odlikuje mobilne uređaje. Drugim rečima, analizirani su znaci dekonstrukcije *WIMP (Windows, Menus, Icons and Pointers)* paradigme, sačinjene od prozora, ikona, menija i pokazivača, izazvane promenama na nivou hardvera i softvera, a pre svega uvođenjem novih načina interakcije i identifikovane su nove metafore, uključujući i one koje se odnose na upravljanje uz pomoć pokreta uz upotrebu više prstiju. Pojava multimedijalne interakcije je prepoznata kao jasan dokaz evolucije direktne manipulacije ka većoj utelovljenosti, što se, pak, posmatra kao dokaz validnosti teze o utelovljenosti saznanja. Osim ove osnovne promene paradigme koja definiše mobilne uređaje sa računarskim sposobnostima, ilustrovani su i drugi trendovi često pominjani u našem uzorku, sa ciljem da se definišu metafore i druge pojmovne strukture povezane sa njima. Tu spada široko rasprostranjena antropomorfizacija, koja počinje pripisivanjem osnovnih odlika živog bića uređajima, što se vidi u nazivima raznih njihovih karakteristika, što kulminira sve većim prisustvom pametnih ličnih asistenata, čiji konverzacijski interfejsi kombinuju prepoznavanje glasa i obradu prirodnih jezika. Uticaj mašina na ljude je povezana tema, pošto je uticaj obostran, širi se i uključuje, sa jedne strane, narušavanje zdravlja izazvano preteranom upotrebom tehnologije, a sa druge, strategije osmišljene da se ljudi učine pametnijima, gotovo nadljudima, upotrebom pametnih sprava, od pametnih naočara, pametne odeće i pametnih domova, pa sve do iskustava koje nude proširena i virtuelna realnost sa druge strane. Svima njima se upravlja putem pametnih telefona i tableta, što im daje centralno mesto u našim životima, obeleženim interakcijom sa digitalnom sferom i značajnim prisustvom ekrana. Pošto su obdareni utelovljenim saznanjem i žive i rade u svom okruženju i društvu, ljudima je svojstveno da upotrebljavaju pojmove iz svog neposrednog okruženja, kao i iz prirode i kulture kao ciljne domene metafora da bi pronikli u misterije i čuda minijaturizacije i apstraktnog, nevidljivog polja prenosa, čuvanja i obima podataka koje deluje skoro kao da funkcioniše uz pomoć čarolije. Uticaj mobilnih tehnologija na društvo i ekonomiju je još jedna značajna tema, u čijem fokusu su transformacija radnog mesta i sve veći ekonomski značaj mobilnih aplikacija. U okviru ove teme je takođe bilo reči o digitalizaciji plaćanja i digitalnom kriminalu. Osim toga, oblici slenga koji se javljaju u SMS porukama i na Twitter-u su analizirani kao primeri prilagođavanja jezika ograničenjima koja nameće komunikacioni medij – kratkoći SMS poruka i poruka na Twitter-u u savremenoj asinhronoj računarski posredovanoj

komunikaciji. Pošto u njima dominiraju skraćivanja i slivenice, primerima tog oblika jezičkog izražavanja je svojstvena metonimija.

Mreže pojmovnog objedinjavanja nadilaze jednosmerno mapiranje značenja, tipično za metaforu i predstavljaju metodu analize koja pokazuje da se pojmovi iz oblasti interakcije čovek - računar zasnivaju na kompleksnijim strukturama. Shodno tome se ispostavlja da je metafora radnog stola u celosti rezultat pojmovnog objedinjavanja, što je slučaj i sa njenim delovima poput fascikli, kao i sa pojmom direktne manipulacije kada se uz pomoć miša ili prstiju upravlja predmetima prikazanim na ekranu, na primer prevlačenjem i spuštanjem (*dragging and dropping*). Sve ove karakteristike koje postoje samo u kontekstu interakcije se ne nalaze ni u jednom od ulaznih prostora mreže. One su, dakle, plod novonastale strukture. I ne samo to, pokazuje se da je uticaj procesa pojmovnog objedinjavanja, koji se ponavlja, sveobuhvatan. Naime, ukazano je da su novi vidovi interakcije (putem pokreta na ekranima osetljivim na dodir) i modifikovanje elemenata interfejsa da bi se prilagodili mobilnom okruženju (fascikle u mobilnim uređajima) proistekli iz ponovnog pojmovnog objedinjavanja koje je rezultat nadgradnje postojećih znanja korisnika interfejsa o računarima, sa ciljem da se interakcija učini još lakšom. Pošto su i same deo interfejsa i sa njima se može postupati na nove načine, ikone se takođe smatraju produktom pojmovnog objedinjavanja, koji je razvio nove odlike, karakteristične za mobilne uređaje. Njihov vizuelni sadržaj i njegova metonimijska priroda su takođe ilustrovani, a objašnjena je i raznorodnost ikona. Pojmovno objedinjavanje je mehanizam kojim se objašnjava i hibridna priroda tekstualne komunikacije u kojoj se koriste piktogrami.

Kao kôd sa svojstvima sličnim jeziku, ali ni blizu jeziku u punom smislu reči, emođiji zaslužuju posebnu pažnju, posto je njihova pojava posledica razvoja mobilnih tehnologija. Kao i emotikoni koji su im prethodili, emođiji imaju komunikativnu funkciju nadomeštanja elemenata neverbalne komunikacije odsutnih iz pisane komunikacije koju ne prate promene u intonaciji, izrazima lica ili gestikulaciji prisutne u toku govora. U situaciji u kojoj i govor tela u potpunosti nedostaje, emođi sa određenim izrazom lica ukazuje na raspoloženje učesnika u tekstualnoj komunikaciji. Analizom dekontekstualizovanih glifova je potvrđena njihova primarna uloga − izražavanje emocija i davanje, opšte uzev, pozitivnog tona komunikaciji, a razmotrena je i njihova izuzetna raznovrsnost i činjenica da objedinjuju emocije, gestikulaciju i slike, kao i poreklo piktograma i kulturne reference koje su u njima sadržane. Ishod svega toga je otkrivanje niza, često povezanih metonimija, metafora i analogija. Napravljen je i pokušaj poređenja sa drugim sistemima pisanja, a data je ilustracija izleta glifova u svet književnosti i to u formi sažetog pregleda različitih projekata prevođenja, pretvaranja književnih dela u nizove emođija.

Takođe je dat i kratak osvrt na mogućnosti za buduća istraživanja u oblasti mobilnih komunikacija i ukazano je na sve izraženiji trend da uređaji sa računarskim sposobnostima, od stonih i prenosivih računara, do mobilnih telefona nestaju iz vidokruga, a u izgledu je da će nova komunikaciona okruženja, ispunjena senzorima, biti izvor novih korisničkih iskustava. Uloga mobilnosti i mobilnih medija će zasigurno biti sve značajnija u budućnosti, a oblikovaće je novi talas inovacija koji će otvoriti nove mogućnosti za komunikaciju i postaviti nove izazove na polju njihove analize.

Ključne reči: metafora, metonimija, analogija, pojmovno objedinjavanje, mobilne komunikacije, mobilni uređaji, interakcija čovek - računar, društvene promene, emotikoni, emođiji.

Naučne oblasti: lingvistika, kognitivna lingvistika, semantika.

Metaphors of Mobile Communications

Abstract

Mobile communications are a fast-developing field of information and communication technology whose exploration within the analytical framework of cognitive linguistics, based on a sample of 1005 entries, reveals the pervasive presence of metaphor, metonymy analogy and conceptual integration. The analysis of the sample consisting of words and phrases related to mobile media, mobile operating systems and interface design, the terminology of mobile networking, as well as the slang and textisms employed by mobile gadget users shows that the above cognitive mechanisms play a key role in facilitating interaction between people and a wide range of mobile computing devices from laptops and PDAs to mobile phones, tablets and wearables. They are the cornerstones of comprehension that are behind the principles of functioning of graphical user interfaces and direct manipulation in computing environments. A separate sample, featuring a selection of 660 emoticons and emoji, exhibiting the potential for semantic expansion was also analyzed, in view of the significance of pictograms for text-based communication in the form of text messages or exchanges on social media sites regularly accessed via mobile devices.

The primary intention of the exploration was to establish the metaphors conceptualizing mobile communications. That meant, first and foremost, tracing the transformation of the graphical user interface and the desktop metaphor, developed to suit the requirements of the PC environment, namely its adaptation to the mobile setting. In other words, the evidence of the deconstruction of the WIMP (Windows, Icons, Menus and Pointers) paradigm, occurring as a result of hardware and software changes and, above all, the introduction of new interaction modalities was examined and new metaphors, including those arising from the use of multitouch gestures formulated. The move towards multimodal interaction has been recognized as a clear proof of the evolution of direct manipulation towards greater embodiment, which has, in turn, been perceived as a demonstration of the validity of the embodied cognition thesis fundamental to cognitive linguistics. Beyond this essential paradigm shift that defines modern mobile computing, other trends identified as recurrent in the field of mobile communications, on the basis of the data in our sample were also illustrated with the aim of pinpointing the related metaphors and other conceptual structures. These include widespread anthropomorphism, whose impact begins by attributing simple animateness to gadgets, as exemplified by the names of their various features and culminates in the current surge of intelligent personal assistants, where conversational interfaces combine voice recognition and natural language processing. The effects of machines on people is a related theme, since the influence cuts both ways and spreads to include, on the one hand conditions, caused by the overuse of technology and strategies devised to make humans smarter, almost superhuman, through the use of smart gadgets from smartglasses, smart garments and smart homes to augmented and virtual reality experiences on the other, all controlled by smartphones and tablets that have become hubs of our lives, marked by the interaction with the realm of the digital and the significant presence of screens. Endowed with embodied cognition and functioning in an environment and a society, humans tend to employ concepts from their immediate surroundings, the natural world and culture as targets of metaphors to fathom the mysteries and miracles of miniaturization and the abstract, invisible, near magical domain of data transfer, storage and size. The influence of mobile technologies on the society and the economy is another major topic that centres around the transformation of the workplace and the increasing impact of the app economy, touching upon digital payments and crime. Moreover, texting and Twitter slang, i.e. textisms and Twitterspeak have been analysed as examples of language adapting to the limitations of the communication medium − shortness

of text messaging and Twitter messages in modern asynchronous computer-mediated communication. Dominated by shortenings and blends, they are inherently metonymic.

Conceptual integration networks transcend unidirectional metaphorical mappings and provide an analytical tool that demonstrates that human-computer interaction concepts rely on more elaborate structures. Thus, the entire desktop metaphor turns out to be the outcome of blending and the same applies to its elements like folders, as well as direct manipulation by using the mouse or fingers to handle on-screen objects, e.g. *dragging and dropping*. All these features, unique to the context of interaction are not found in any of the input spaces. Rather, they are emergent structures in their respective blends. Furthermore, the process of blending and reblending has been found to exert an overarching influence. Namely, new modes of interaction (touchscreen gestures) and modifications of interface elements to suit the mobile setting (folders in mobile devices) have been shown to represent instances of reblending that build on users' existing knowledge of computing to facilitate interaction further. Being parts of the interface manipulable in new ways, icons are also regarded as blends that developed new features specific to mobile devices. Their visual content and its metonymic nature were also illustrated and diversity explained. Conceptual integration is also able to account for the hybrid nature of text-based communication involving the use of pictograms.

A code with language-like properties, nowhere near a full-blown language, emoji deserve special attention, having emerged as a result of the development of mobile technologies. Like their predecessors, emoticons, emoji perform the communicative function of providing non-verbal cues missing in written communication, which is not accompanied by the changes in intonation, facial expressions or gestures as we speak. In a situation where body language is also entirely absent, an emoji showing a particular facial expression provides an indication as to the state of mind of the participants in text-based exchanges. While the exploration of the semantic range of decontextualized glyphs has confirmed their principal, emotive role, setting a generally positive tone to communication, their exceptional diversity, fusing emotions, gestures and pictures was also taken into account, along with their roots and cultural references, all of which led to discovering a number of often interconnected metonymies, metaphors and analogies. A comparison with other writing systems was also attempted and an illustration of the glyphs' forays into the world of literature was provided, in the form of a concise overview of different projects translating i.e. rendering literary texts into sequences of emoji.

Future prospects for research into the area of mobile communications are also briefly discussed, highlighting the growing trend of computing devices, from desktops and laptops to mobile phones disappearing from view, as sensor-filled communication environments hold the promise of new user experiences. The role of mobility and mobile media is bound to increase in the future, shaped by the next wave of innovation, which will provide new communication possibilities and analytical challenges.

Key words: metaphor, metonymy, analogy, conceptual integration, mobile communications, mobile devices, human-computer interaction, social change, emoji, cognitive linguistics.

Scientific fields: linguistics, cognitive linguistics, semantics.

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Bitografija autora

Electronic appendices on CD-ROM

I INTRODUCTION. **Communication and cognition – metaphor as a mediator**

1.1 I wandered lonely as a cloud. **The changing landscape**. One of the most famous verses of the Wordsworth canon offers a comparison that hides a contradiction in terms which reveals itself to the people living here and now, two hundred years after the poem saw the light of day, surrounded by constantly expanding amounts of digital data. Personal or available in the public domain, ephemeral or worthy of being preserved for future generations, information is increasingly stored in the cloud which is becoming a crowded space. The cloud is never ever lonely and it goes wherever we may wander. The object of the early19[th] century poetic simile has morphed into one of the omnipresent metaphors of contemporary communication. It is such metaphors that will be in the focus of the present attempt to explore and describe the inner workings of the intricate relationship between people and their portable communication devices, as reflected primarily in language and the terms that have entered the vernacular or expanded their meaning with the rise of the mainly handheld gadgets.

 The humanity is on the cusp of the fourth industrial revolution, the latest in a series of fundamental shifts brought about by the development of new technologies. While the original industrial revolution was driven by the discovery of the steam engine and the application of the power of steam, electricity and information and communication technology sparked the two subsequent big changes that marked worldwide development in the 20th century. At the beginning of the third millennium, the horizons are widening, as the latest revolution builds on the already harnessed computing power and takes technological advancement further, creating a combined and sustained impact on the digital, physical and biological spheres. Its effects on individuals and the nature of the economy and societies are likely to be unprecedented, as humans begin to transcend the confines of biology (cf. Schwab, 2016, Kurzweil, 2005). Digital mobile technology is currently at the forefront of these three life-changing trends. The World Wide Web has been in use for over 25 years now, having changed the face of communication in the process. This year marks a decade since the historic launch of the iPhone, the mobile phone that ushered the era of dominance of mobile devices and the social web, sending lonely web surfers sitting in front of desktop computers to the annals of history. In view of these milestones, it seems that this is the right moment to gauge the extent of the impact of mobile media on our

perception of the world and the language that we use to communicate and describe the transformative change shaping modern communication-enhancing technologies.

1.2 Measuring the might of the mobile wave. The tipping points. The mobile wave has hit disrupting everything in its wake. The shift it has caused is tectonic, affecting both the existing technologies and the people who use them. The following statistics provide a vivid illustration of the scale of the changes happening across the board, in the digital and physical domains.
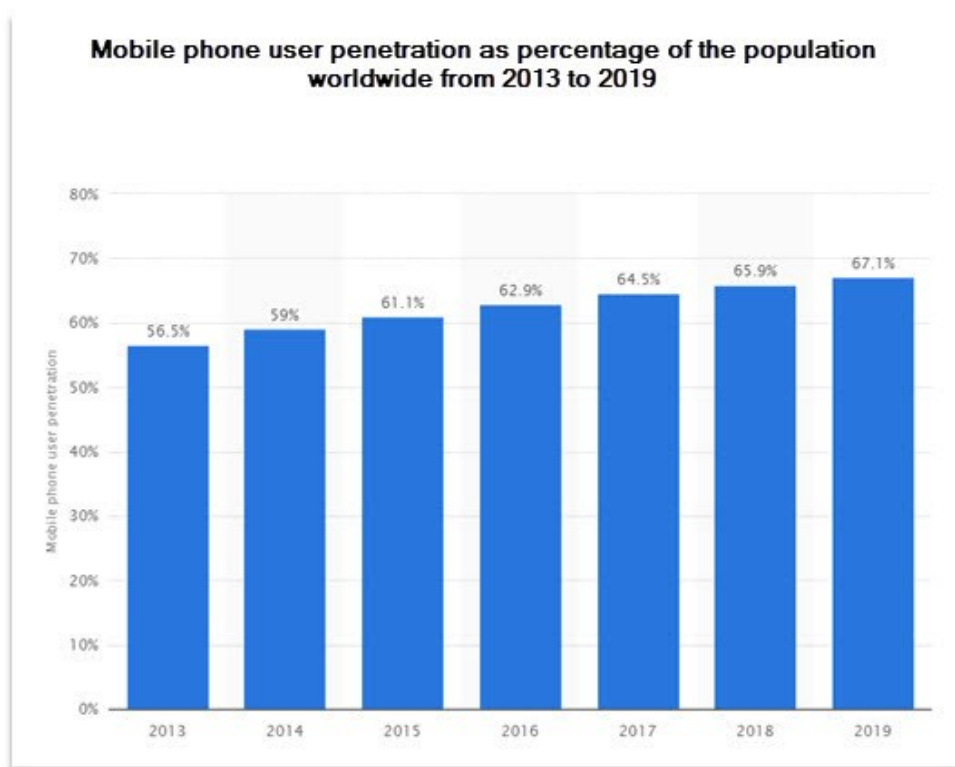
Figure 1. Mobile phone user penetration as percentage of the population worldwide from 2013 to 2019.

The first chart[1] shows that the threshold of more than half of the global population having mobile phones was crossed towards the beginning of the decade. The total number of mobile phone users worldwide in 2017 is expected to reach 64.5 percent or 4.77 billion, while the number of mobile phone connections exceeded the estimated global population of 7.5 billion in 2015 (cf. GSMA, 2015). Since most of the

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[1] Retrieved December 27, 2016 from https://www.statista.com/statistics/274774/forecast-of-mobile-phone-users-worldwide/.

development of the mobile market has been happening as a result of the growing popularity of smartphones, the global smartphone penetration rate is also among the mobile metrics to be considered.
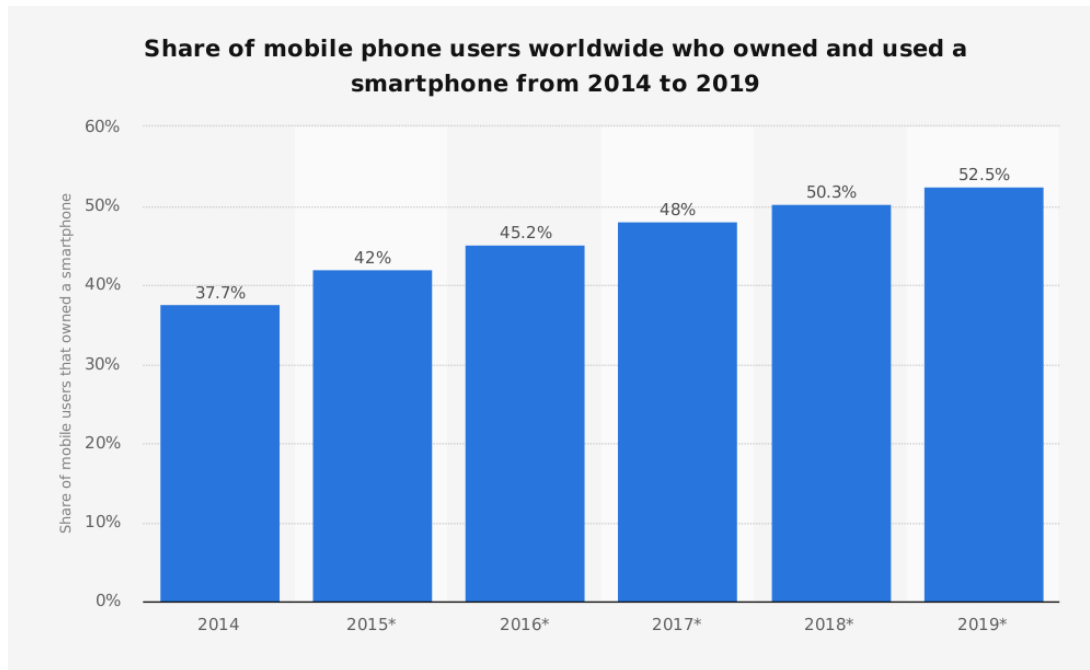
Figure 2. Share of mobile phone users worldwide who owned and used a smartphone from 2014 to 2019.

The second chart (cf. eMarketer (2015) forecasts that smartphones are set to become the devices of choice for more than a half of the worldwide mobile phone user base by 2018. This sharp rise in the use of mobile phones in recent years is in itself a fascinating phenomenon, but what is more important and indicative of a deeper transformation is the fact that the activities traditionally associated with personal computers are shifting decisively towards mobiles. Perhaps surprisingly for some, the change has already affected one of the signature activities of contemporary computing – accessing the web in search of information or entertainment.
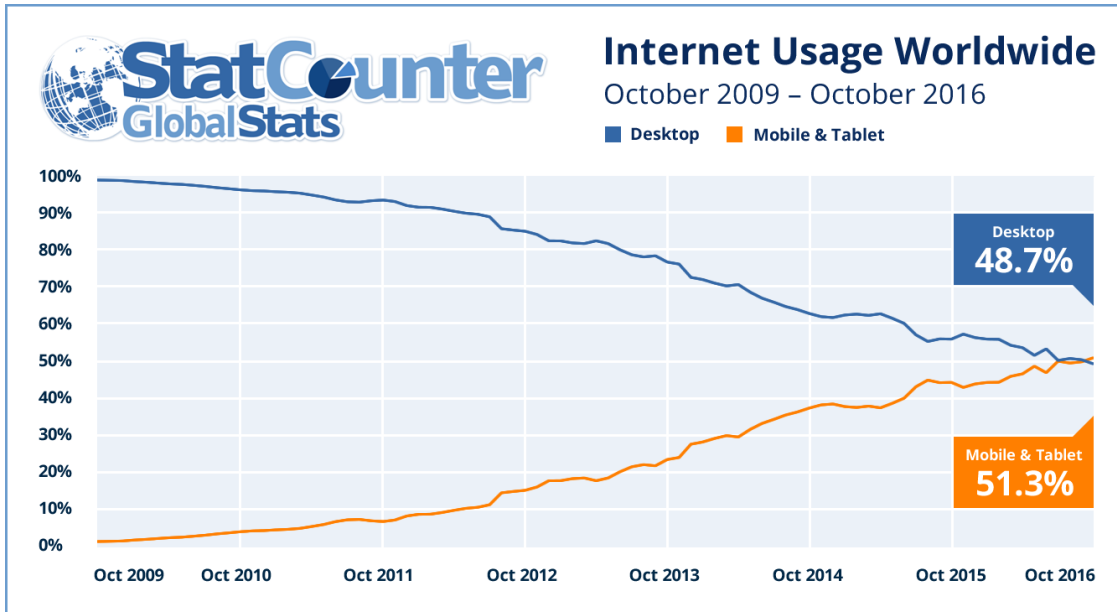
Figure 3. Internet Usage Worldwide October 2009 – October 2016

The data provided by StatCounter locate the moment of change in October 2016, when the global battle for Internet usage supremacy was won by the joint mobile and tablet forces and desktop was defeated. The defeat was apparently unavoidable, having been more than seven years in the making. Namely, desktop web traffic has been dropping steadily since the end of the last decade (cf. Skinner, 2016). And if this outcome is not enough of a surprize, here comes the *coup de grace*.
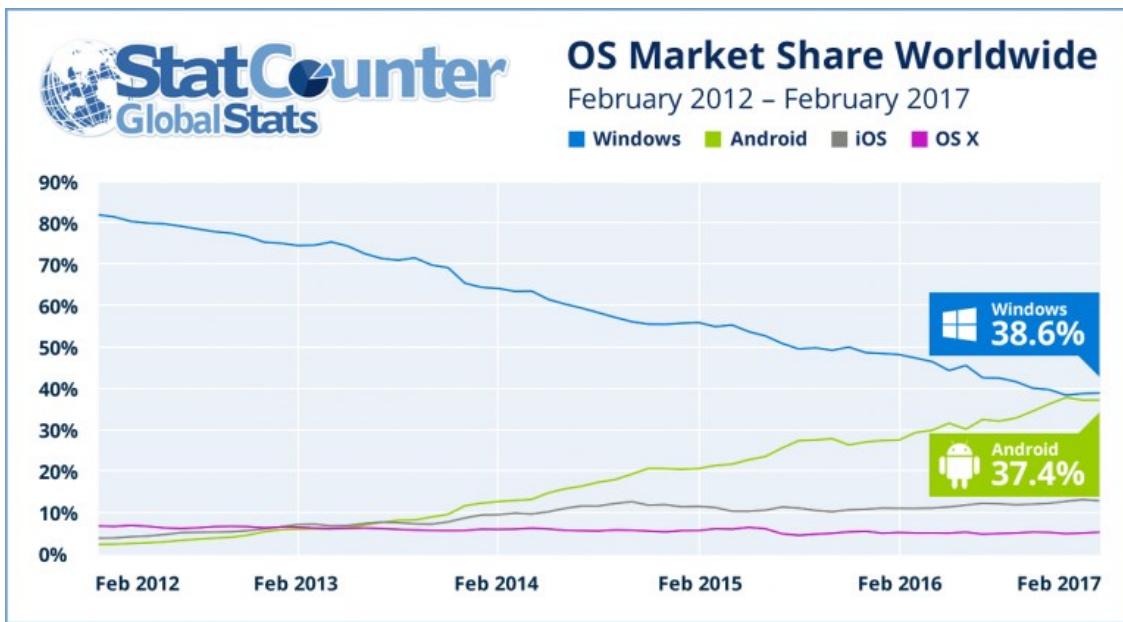
Figure 4. OS Market Share Worldwide February 2012 – February 2017

The ultimate household item from the world of technology, the king of operating systems, Windows is about to be toppled by Android. The very thought of a mobile operating system (OS) overtaking the venerable Windows, powering the vast majority of world's computers since the 1980s would have, until recently, been dismissed as wishful thinking of a much younger technology upstart, Google. However, the figures in the other StatCounter graph showing the worldwide OS market share (based on the measurement of web traffic) in February 2017 speak for themselves. The growth of Android seems unstoppable. In just five years, the market share of the mobile giant has grown from the mere 2.2 percent in 2012, when Microsoft claimed no less than 83 percent of online usage to 37.4 percent today and the tables are definitely turning. By early 2018, the world of operating systems will have a new dominant player, reflecting the trend that less and less computers are being sold and more and more online actives migrate to mobile devices (cf. Whitwam, 2017). What's more, Android has been stronger than all of its major competitors since 2013, when it became the best-selling OS, with more devices sold than Windows and iOS/Mac OS together, reaching absolute dominance two years later when more devices running Android were expected to be shipped than those running all other mobile and desktop operating systems combined (cf. McCarthy, 2014[2]). However, Apple generates much higher revenue from application sales than Android, widening the "app gap" (cf. Spence, 2016) and is considered to be far more secure than Google's mobile OS, which has more software vulnerabilities than other operating systems (cf. McCarthy, 2017). The last and possibly the most staggering figure to be mentioned here is that Android and iOS together accounted for 99.24 percent of the global smartphone operating system market share in 2016[3] and that number is expected to rise even further. While the plethora of figures included in this short statistics overview may seem overwhelming, they show beyond any doubt that the scales are tipped in favour of the brave new world of mobile devices, giving a more than palpable proof that this field deserves to be in the focus of analytical efforts across disciplines.

1.3 Parallel evolutionary patterns. Interfacing language and technology and the mediating role of metaphor. Natural language is the unrivalled communication tool

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[2] According to the statistics provided by Gartner and analysed in McCarthy, N. (2014) *Is Android Becoming the New Windows?* retrieved from https://www.statista.com/chart/2065/global-connected-device-shipments-broken-down-by-operating-system/.
[3] According to the Statista chart "Global market share held by smartphone operating systems from 2009 to 2016" available at https://www.statista.com/statistics/263453/global-market-share-held-by-smartphone-operating-systems/.

distinguishing humans both from animals and from man-made machines. Along with our bodies, it provides a yardstick by which to measure and comprehend the world around us. It allows us to articulate our thoughts and communicate with others. Language is thus the original interface, broadly understood as "a common boundary or interconnection between systems, equipment, concepts, or human beings"[4]. As a vehicle of interconnection, *language* in the most general sense encompasses "communication of meaning in any way; medium that is expressive, significant, etc."[5]. In the field of digital technology, it can refer to formal computer languages, as opposed to natural languages, namely high- or low-level programming languages, giving instructions to machines. These instructions consist of full or abbreviated words and sentences, in most cases in English, which is the *lingua franca* of computing. It turns out that we also use language to formulate the commands we issue to the many computer-like devices embedded with different levels of processing power. The increasingly less textual and more numerical instructions end in the binary machine code, the sequences of zeros and ones interpreted as signals – series of electrical pulses by the computer processor. As natural languages evolve with every generation of speakers, so do formal ones with every new generation of increasingly advanced devices. The beginning of the era of personal computing in the 1970s i.e. the move from mainframes to microcomputers and from corporations to the masses put an emphasis on usability. It led to the appearance of human-computer interaction (HCI) as "an area of research and practice that emerged in the early 1980s, initially as a specialty area in computer science embracing cognitive science and human factors engineering" (Carroll, 2014). The development of object-oriented programming languages blazed the trail for a sea change in the communication between humans and computers brought about by the new kind of graphical rather than text-based user interface. According to Tan (2014), "the human-machine interface includes the hardware and software that is used to translate user (i.e., human) input into commands and to present results to the user" where "the general idea has been to build interfaces that are based on an understanding and appreciation of human physical, mental, and behavioural capabilities". It was the language of object-oriented programming that produced the original graphical user interface of Apple's Macintosh, the ground-

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[4] interface. (n.d.). Dictionary.com Unabridged. Retrieved February 12, 2016 from Dictionary.com website http://www.dictionary.com/browse/interface.
[5] language. (n.d.). Dictionary.com Unabridged. Retrieved February 12, 2016 from Dictionary.com website http://www.dictionary.com/browse/language.

breaking, new mode of interaction and as if by magic, the world of computing became wide open to people of all ages and professional backgrounds, not just technology specialists and enthusiasts. As pointed out by Manovich (2001: 272), the programming paradigm that made it possible for multiple objects to coexist and communicate is mirrored by the multiple windows of the graphical user interface allowing simultaneous execution of several tasks and ushering the era of multitasking. It is also reflected by "the construct of the desktop which presents the user with multiple icons which are all simultaneously and continuously "active" (since they all can be clicked at any time)". The major consequences of this, at least for average users is the disappearance of the command line interface and its complex text-based instructions giving but a single command at a time. Text and language proper were thus pushed aside in favour of the graphical elements, further cementing the dominance of visual culture, already heavily promoted by television and print media. The above definitions of human-computer interaction and user interface point to the respective reliance of these fields on the insights from cognitive science and the potential contained in the human body cognition and behaviour. These concerns are shared by the discipline of cognitive linguistics that provides the analytical framework of this dissertation. The cognitive linguistics enterprise is founded on the Conceptual Metaphor Theory developed by Lakoff and Johnson, (2003, 1999), according to which metaphor is an embodied cognitive mechanism allowing interpretation of one thing in terms of another that arises from people's direct experience of their surroundings. As such, cognitive linguistics has found a fruitful area of non-linguistic application in the field of user interface design and programming (cf. Hurtienne, 2014), as will be illustrated in the following sections of this work, aiming to show that the connection with linguistics, human language and textual input is always present, although it may not be transparent. Namely the distancing from text and the shift toward the visual has not effaced either the metaphoric use of the concept of LANGUAGE in the domain of computing or the literal presence of text in visually rich multimodal interactive environments. It has just somewhat hidden it from view. Thanks to graphical user interfaces that *translate* human actions into machine-readable commands, more people than ever understand and use the *language* of contemporary computers and gadgets, the process that is part of the metaphor HUMAN-COMPUTER INTERACTION IS COMMUNICATION proposed by Imaz and Benyon, (2007). Moreover, some contemporary visual programming languages (cf. Metz, 2014) are so user-friendly that they can be used to teach children

to code. The construct of the computer as a desktop has evolved too. However, as interaction is a two-way process, human language may well be evolving as a result of our interacting with digital devices. Still, some ground truths remain valid. As Steven Johnson (1997: 15) notes:

"The crucial technological breakthrough lies instead with this idea of the computer as a symbolic system, a machine that traffics in representations or signs rather than in the mechanical cause-and-effect of the cotton gin or the automobile. In this respect, computers have a kind of surface resemblance to older technologies the Gutenberg press, say, or a Cinemascope camera. But there is an important distinction. A printing press or a camera deals with representations as end-products or results; these machines are representational in that they print words on paper or record images on film, but the underlying processes are purely mechanical in nature. A computer, on the other hand, is a symbolic system from the ground up. Those pulses of electricity are symbols that stand in for zeros and ones, which in turn represent simple mathematical instruction sets, which in turn represent words or images, spreadsheets or email messages. The enormous power of the modern digital computer depends on this capacity for self-representation.
More often than not, this representation takes the form of a metaphor. A string of zeroes and ones itself a kind of language, though unintelligible to most humans is replaced by a metaphor of a virtual folder residing on a virtual desktop."

Metaphors are therefore key intermediaries between the abstract, symbolic world of computers and human embodied cognition. Crucially, they are powered by natural languages, while informing formal ones. Understood as a conceptual mechanism, metaphors and the related phenomena of metonymy and analogy are at the heart of the present work that stands at a four-way intersection of language, technology, cognition and embodiment.

1.4 Gadgets, glossaries and the global web. Where metaphors come from. This section explains the reasons for selection of the devices featured in the Device List (see Appendix I) as viable candidates for a hands-on analysis aimed at the discovery and formulation of metaphors shaping the ways in which users interact with modern technology. It also delineates the structure of the sample of words and expressions related to mobile communications and its counterpart consisting of emoji and emoticons and includes a brief discussion of sample sources.

1.4.1. Building a collection of mobile devices. Going hands-on with handhelds. The collection of mobile devices was created with the goal of getting an opportunity to gain first-hand experience of use of a wide variety of gadgets running different operating systems and exhibiting different interaction modalities and form factors. It grew over a period of five years, from 2010 to 2015 and consists of a total of 22 items. One of the first devices to have been added was iPhone 3Gs, while Google Cardboard, virtual reality (VR) viewer for smartphones designed by Google and made of cardboard

was the last to arrive. Between these two, additional 14 mobile phones (4 feature phones and 10 smartphones) were added, along with a personal digital assistant (PDA), three tablets, one PC/tablet combo and a smartwatch. The vast majority (17) were acquired (new or second hand) exclusively for the purpose of being analysed as part of the work on this thesis, while the remaining five belonged either to the present author or family members and friends prior to embarking on the journey of exploring the metaphors associated with mobile media. The original aim was that the collection of devices (launched by 12[6] well-known technology brands from 2000 to 2015) should be representative of as many operating systems (15)[7] and form factors (11)[8] as possible (see Appendix II and Appendix III for details), since these are regarded as primary sources of metaphors. However, the collection process was affected by the limited availability of devices in the local market and to some degree by financial constraints.

The reasoning behind certain acquisitions was based on the following criteria: some of the featured gadgets are either among the last representatives of their kind (e.g. Nokia 808 Pureview, the last smartphone running the Symbian operating system, i.e. its most advanced iteration - Symbian Belle) or the first (first generation iPad, Nexus 7 - the first tablet launched by Google). Moreover, special attention was paid to the presence of diverse interaction modalities or distinctive features as another major source of metaphors.

For non-smartphones that meant, for example the presence of at least one distinctive feature (Walkman functionality and branding, dedicated Walkman button (Sony Ericsson W850i) or light notifications (Sony Ericsson S500i), a popular form factor (block or slider) or even a comparative lack of features in basic phones launched around the turn of the century (Siemens A 35 and Sony Ericsson T100i).

In the case of smartphones and tablets, the deciding factors included running a widely used, current or now discontinued (e.g. Android, iOS, Windows Phone 10, Symbian,

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[6] Sony Ericsson, Siemens, Apple, Amazon, Asus, Palm, Nokia, Alcatel, BlackBerry, Microsoft LG and Google.
[7] Sony Ericsson proprietary software and user interface, Siemens proprietary software and user interface, UIQ, Windows Mobile, iOS, Apple Watch OS, Amazon Fire OS, Android, Palm Web OS, Palm OS, Symbian, MeeGo OS, Firefox OS, BlackBerry OS, Windows Phone OS.
[8] Block; vertical slider; block with a resistive touchscreen, physical rocker QWERTY keyboard and a stylus; horizontal slider with a full QWERTY keyboard, resistive touchscreen and a stylus; capacitive touchscreen with a physical home button; vertical slider with a capacitive touchscreen, physical home button and a full QWERTY physical keyboard; resistive touchscreen, dedicated buttons and a stylus; capacitive touchscreen without physical buttons; capacitive touchscreen with physical buttons; capacitive touchscreen with a full QWERTY keyboard, tablet with a capacitive touchscreen, PC/tablet combo with a capacitive touchscreen and a detachable physical keyboard, touchscreen smartwatch and a VR headset.

UIQ, Windows Mobile) or otherwise distinctive (e.g. Palm WebOS[9] , Fire OS[10], MeeGo[11], or Firefox OS[12]) operating system.

Wearables and personal digital assistants (PDAs) are respectively the latest and oldest category of devices analyzed. They are also the least represented, with only two wearables (Apple Watch and Google Cardboard) and one PDA (PalmOne Zire 72) on the device list. The PDA is featured as a precursor of smartphones, introducing some important features that were later adopted and refined by smartphone makers. Wearable devices, on the other hand, provide an indication of where mobile technology is going and hold the promise of its exciting future.

The devices on our list incorporate a diverse set of interaction modalities that rely on metaphor and are defined by hardware and operating system software, such as the use of a physical keyboard or the use of hardware and/or software buttons for navigating the operating system, touchscreen (resistive or capacitive), stylus input, single- or multitouch gestures and speech recognition. Besides, the issue of screen size determines the nature of devices. The increasingly blurred boundaries between smartphones and tablets are highlighted by the emergence of phablets, a new kind of devices, characterized by screen sizes of over 5 and less than 7 inches, combining the form and functionality of both, requiring adaptations of operating systems and modes of interaction and giving rise to new metaphors.

Among the smart devices in our collection there are those that have the ability to react to voice commands (like the voice search feature in more recent iterations of Android activated by uttering the "OK Google" prompt) or respond to them both in human voice and by completing the requested tasks curtesy of intelligent personal assistants (such as Siri and Cortana in the service of iPhone and Apple Watch and Windows Phone owners). These recent features offer a glimpse into the future marked by conversational interfaces and the technical and conceptual innovations they will bring.

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[9] The successor to the venerable Palm OS powering pre-smartphone smart devices - PDAs (personal digital assistants). Its features were copied in many subsequent – current operating systems. Acquired by LG, it now runs on LG smart TVs and smartwatches.
[10] An Android fork, strongly backed by an unlikely contender among the manufacturers of smart devices – Amazon (known for its retail business and e-readers) that launched a string of tablets and failed line of smartphones running the same operating system.
[11] A Linux-based open source smartphone operating system, highly praised for its elegance and ease of use, adopted by Nokia, but subsequently quickly discontinued.
[12] Developed by the non-profit organization, Mozilla, the makers of the popular Firefox browser, it was the most widespread among community-based open source systems, competing with commercially developed OS solutions powering smartphones and tablets. Having failed in that mission, its development has been abandoned.

In the light of the importance attributed to embodied cognition in cognitive linguistics and the related disciplines of cognitive psychology and neuroscience in particular, a hands-on approach to analysing handheld devices, made possible by building a collection of mobile gadgets seems fitting as one part of the strategy necessary to achieve the goal of exploring the experiential basis and linguistic impact of the metaphors guiding the interaction between people and mobile technology.

The other part of the strategy was forming a sample of words and expressions that sprung up with the advent of ubiquitous computing, mobile phones and other devices, whose appearance was facilitated by the growing presence of mobile Internet and Wi-Fi networks.

1.4.2 Words in motion. Samples, sources and structure. An automotive analogy.
In order to delve into the intricate interplay between language, mobile technology and embodied interaction, a sample of words from the domains defining modern mobility was compiled. The contemporary information and communication technology is a field in constant flux. Traditionally, it referred to the use of computers, but today it comprises mobile communications, digital television and increasingly the world of wearables and our likely sensor-filled and robot-friendly future. The effort to form a comprehensive list of terms referring to the multifold aspects of mobile media, while trying to maintain the inevitably very porous boundary between this and the related domains of the Internet (networking) and general computing began by following more than two hundred Facebook pages and Twitter profiles set up by mobile technology businesses and brands (e.g. Apple, Google, Samsung, Sony, Asus, HTC, LG, BlackBerry, etc.), technology publications and numerous blogs (e.g. Wired, Ars Technica, The Verge, ReadWrite, Endgadget, Mashable, TechCrunch, Tech Times, Gizmodo, iMore, iClarified, Android Central, Android Authority, CrackBerry.com, MSPoweruser, etc.) and using the feeds of the two social networks as a ticker to keep track of trends, devices and mobile applications, expert analyses and user comments. This provided a unique and dynamic daily insight into the language of mobile communications and resulted in slow but steady addition of words to the sample. Online technology glossaries and dictionaries of several kinds, namely, those of a general nature featuring terms referring to mobile phones and devices or entire segments dedicated to this field (e.g. *Webopedia: Online Tech Dictionary for IT Professionals*, *TechTarget WhatIs.com, Netlingo*, *Techopedia Technology Dictionary*, *Computer Hope Computer*

terms, dictionary, and glossary, as well as *PC Mag Encyclopedia*), those specializing in mobile phone terminology, maintained by mobile technology oriented web sites (e.g. *GSMArena Mobile terms glossary*, *Mobile Burn Glossary*, *Phone Scoop Glossary*) and those focused on individual aspects mobile technologies (*Mobile Marketing Industry Glossary* and *Usability First Glossary*). Moreover, the sample includes resources concentrating on individual mobile platforms (e.g. *Macworld Apple user's dictionary of tech jargon, iMore iPhone and iPad glossary*, *iOS Human Interface Guidelines*, *Greenbot Android A to Z: A glossary of Android jargon and technical terms*, *Gadget Hacks The Big Android Dictionary A Glossary of Terms You Should Know*, *Google Material Design Patterns, BlackBerry Glossary*, *Microsoft Terminology Collection*), and terms found in the official manufacturer user guides detailing the functionalities of the devices in the Device List[13] (e.g. *Nexus 7 Guidebook*, *BlackBerry Bold 9900/9930 Smartphones User Guide*, or *User Guide Lumia with Windows Phone 8.1 Update 2*). *Word Spy - The Word Lover's Guide to New Words*, *Urban Dictionary* and to a degree the *Rice University Neologisms Database* also yielded valuable entries, mainly neologisms. There is also *Wikipedia* with its wealth of information. These are primary sources, providing the bulk of the material in the sample. Secondary ones include books on mobile interface design (*About Face: The Essentials of Interaction Design, Fourth Edition*, *Handheld Usability*) and texting (*Txting: The GR8 Db8*), which along with the Twitter-specific online resources (*Twitter Dictionary: A Guide to Understanding Twitter Lingo* and *Twittonary*) contributed interface-related terms and a selection of examples of text shorthand and Twitter jargon respectively. Lastly, several definitions of terms and phrases in the sample were found in the online versions of general dictionaries (e.g. *Collins English Dictionary*, *Oxford Dictionaries* and *Macmillan Dictionary*). Collected over a period of almost six years, the sample contains a total of 1005 entries from 82 sources. There are no sources in languages other than English.

If, as stated above, Information and Communication Technology (ICT) is a field in a state of flux, mobile communications are an even more dynamic and fast-changing area characterized by constant commotion and exceptional diversity. The overview of sample sources has shown that the entries come from the existing collections of

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[13] Because of the rapid development of hardware and software features of mobile phones, the user guides of two devices not found on our list have also been used as sample sources. These are: *iPhone iOS 10 User Guide* and *User Guide Lumia 950*.

mobile-related terms and expressions and technology-oriented websites, blogs, books on textspeak, interface design, interaction design and official manufacturer user guides describing the features of mobile devices. It has also revealed that there are no examples of idiosyncratic usage or *ad hoc* formations likely to appear primarily in mobile chat situations. That indicates that the featured entries have gained some traction, which brings us to the interrelated issues of codification and sample structure. Originating from a variety of existing sources, some entries in the sample, notably, technical terms relating to mobile networks and the words describing hardware, software and interaction modalities characterizing devices or the purposes for which these devices are used use can be said to be codified, having entered general dictionaries[14]. More can be expected to be added in time, as mobile technologies develop and become popular. The rest of the entries, particularly those belonging to the category of neologisms and text shorthand are far from reaching the codification stage.

The diversity of the domain of mobile communications makes it possible to view the sample from a number of different angles i.e. apply more than one set of criteria to determine its structure. However, it seems that whichever approach is applied, the field remains almost as malleable as before any attempt at its structuring. First and foremost, mobile communications have developed as a result of technological advances in a number of areas, most importantly, information-communication systems, which have evolved to include wireless and mobile networking and computing which has become ubiquitous i.e. possible on a wide variety of portable devices besides computers proper. It is important to bear in mind that all these devices are effectively computers. Here is a fact to remember: back in 2009, just before the dawn of what would swiftly become the age of smartphone supremacy, NASA remarked: "Your cell phone has more computing power than the computers used during the Apollo era" (cf. NASA, 2009). So, even then, the devices that landed in our hands were more powerful than the technology that landed Man on the Moon. Today, top-of-the line smartphones have better processors than the average desktops and laptops and are still much more powerful than the computers currently used to accomplish space missions. The

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[14] The terms relating to types of mobile networks - *2G, 3G, 4G*, devices – *dumbphone, phablet, smartphone, smartwatch, tablet*, a mobile phone form factor – *clamshell* and, mobile hardware – *touchscreen, multitouch* or software – *jailbreak* and *jailbreaker*, informal terms like the verb to *brick* (a phone) or the noun *selfie,* as well as *selfie stick* have already found their way into Oxford Dictionaries (https://en.oxforddictionaries.com/).

reasons for this apparent paradox lie in the fact that space technology is built for durability, rather than power (cf. Gaudin, 2014). Moreover, (ultra) portable computers and laptops naturally belong to the realm of mobile media and a degree of overlap with other mobile devices is equally natural. Thus far, therefore, the terminology describing the technological facet of mobile communications can be segmented into terms referring to wireless and mobile networking (e.g. *2G*, *3G*, *4G LTE*, *hotspot*, etc.), general computing and its overlap with the world of mobiles (e.g. *computer architecture*, *bug*, *build*, *mobile virus*, *system crash*, *tablet PC*, *UMPC*). Since mobile phones and the related devices, tablets and wearables are computers, they have their own, hardware, software, operating systems and interaction modalities. The terms referring to these features and the names mobile gadgets and services (e.g. *3D Touch*, *ADB*, *candy bar*, Chromecast, *convenience key*, *dock*, *flagship*, *FOTA*, *Google Drive*, *home screen*, *IMEI*, *jailbreak*, *launcher, root, tethering*, etc.) occupy the central and largest part of the sample. A significant segment of this collection does not include technical terminology, but rather words and phrases of recent coinage that describe various aspects of the impact that mobile technology has had on its users and the world at large (e.g. *BlackBerry prayer*, *cellcert*, *couch commerce*, *digital footprint*, *gadget fatigue*, *e-textile*, *head-down tribe iPod oblivion*, *shelfie*, *social swarming*, etc.). Finally, having become one of the most important, if not the main means of modern communications, mobile devices receive and send large amounts of data from and to other connected things that are often controlled via smartphone applications. They are also involved in the creation of augmented, mixed, and virtual reality experiences. Therefore, a sizable chunk of words in the sample refer to different data-related concepts, ubiquitous computing, home automation and connected cars, as well as new forms of reality (e.g. *big data*, *CarPlay*, *data shadow*, *Daydream VR*, *human cloud*, *location awareness*, *smart home*, etc.) all of which form part of the notion of mobile communications. Last but not least, text-based communication via feature phones and smart phones is still widely used. The sending of paid text (SMS) messages coexists with a variety of free multimedia messaging applications like Facebook messenger, WhatsApp, or Viber where "textspeak" (cf. Crystal 2004, 2008) or text shorthand continues to guarantee speed and efficiency of online exchanges. A variant or textspeak or chatspeak is also present on Twitter since the social media platform, which has its own jargon, imposes a 140-character restriction on messages – tweets that are often sent and read on mobiles. That is why the sample also includes

examples of text shorthand and Twitter-specific parlance (e.g. *atm – at the moment*, *b4 – before, dweet – drunk tweet*, *ne – any*, *tweet seats*, *twiter-ific*, etc.). While text shorthand and Twitter jargon form the last portion of the sample, their evolution brought about by the spread and frequent use of emoji, colourful picture characters and their latest iteration, emoji-as-images (stickers) in all messaging situations is the reason why this collection of words and phrases is complemented by a separate sample consisting of emoji and their predecessors, emoticons, pictograms made of keyboard characters. The size, sources and structure of that sample are discussed in a separate section of this work exploring the influence of the cognitive mechanisms of metaphor, metonymy, analogy and conceptual integration on glyphs titled *A Shorthand's Progress – the Invasion of Images*.

The first task ahead, however is to investigate the impact of these mechanisms in the domain of mobile media. With that in mind, another attempt at an initial classification of the material in the sample can be made highlighting the relationship between conceptual phenomena and word-formation. Namely, as in every other field rooted in technology, shortenings are a frequent occurrence in the area of mobile communications. They are also the signature feature of texting and Twitter exchanges. According to Kövecses & Radden (1998) and Radden & Kövecses (1999) reductions of form such as abbreviations and acronyms are metonymic. Blends that mark the meeting point between shortening and compounding and are often found in the jargon of Twitter and among the neologisms arising from the presence of mobile technology in our everyday lives are regarded by Hofstadter & Sander (2013) as products of analogy. Speaking of analogies, an automotive one can be made, fittingly it seems, since mobile media are in the focus of our attention, to illustrate the possible patterns of influence of the four cognitive mechanisms on the development of meaning of words and phrases in the present sample.

Figure 5. An automotive analogy

Is the impact of metaphor, metonymy and analogy equally distributed with conceptual integration as an overarching unifying construct (as the Mercedes logo would suggest)? Are all four on an equal footing, with areas of overlap between them (as shown in the Audi symbol)? Or do they each occupy equal portions of the conceptual space with no overlap at all (if the BMW logo is the answer)? Or perhaps none of these apply? The answers to these questions can begin to be formulated after the upcoming review of the literature that provides the theoretical foundations of this study. But before that, a quick comparison between the Netspeak sample that we analyzed previously (cf. Bajić, 2009) and the current one, leading to a definition of mobile communications might prove useful.

1.4.3 A tale of two samples. The times and aims they are a-changin'. The present effort to explore the conceptual relationship between language and (mobile) technology is closely related to the previous one that focused on a cognate field, Netspeak, the jargon of the Internet and its morphological aspects. Indeed, the investigation of the word-forming patterns shaping Internet lingo ends in the same image that introduces the story of the metaphors of mobility – the cloud. At the time of the investigation of the lingo of the web, the concept of cloud storage was still very much new, with one of the first services of this kind, Dropbox launching as a student start-up in 2007. Today, cloud services are one of the pillars of modern work, entertainment and communications. Netspeak was defined as a language that is part technology part human "and necessarily incorporates a measure of technical terminology relating to computer science" (cf. Bajić, 2009: 8). Similar cyborg-like qualities can be attributed to mobile communications, the difference being that here language is to be understood both as a human system of communication and more figuratively referring to the modalities of communicating (interacting) with machines, facilitated by the medium of metaphor manifested in human language. As for the respective sizes of the samples, the Netspeak sample contained 2015 entries from 47 sources, while the current one has less entries from more sauces, indicating that building this collection of words was a more painstaking and less rewarding process in terms of quantity but, hopefully, not quantity of entries. However, emoticons were explicitly excluded from the Netspeak sample on the account of their not belonging to lexicology. In the space of almost ten years since the analysis of Netspeak, emoticons have not only been succeeded by emoji thriving in the world gone mobile. It has also

become apparent that they can be analyzed as primarily metonymic phenomena with close ties with language, so much so that they have earned a separate sample and chapter in the present dissertation. The main sample and the emoji and emoticon subsample combined have a total of 1595 entries from almost twice as many sources (80) as in the case of Netspeak. Again, hopefully, the combined samples of words, phrases and pictograms will provide a representative description of the cognitive principles guiding the speedy development of the domain of mobile media. While on the topic of speed, let us remark that the biggest problem regarding the sources of Netspeak was a dead or moribund web page or two – the sites showing examples of Internet lingo that disappeared since the collection of words for the sample began. The changes in the realm of mobile communications are far more drastic. Since 2010, when the building of the collection of mobile devices started, half of brands / manufacturers of devices or operating systems have disappeared from the mobile landscape. Palm, Sony Ericsson, Palm WebOS, UIQ, Symbian and Firefox OS are defunct, while the former giants Nokia and BlackBerry do not exist anymore as we know them, having sold the rights to production of phones under their names to smaller companies. Microsoft's mobile hardware and software business is struggling and the only platforms still going strong are Apple / iOS and Google, whose operating system, Android runs billions of phones worldwide, as shown by the statistics discussed above.

Most importantly, the Netspeak sample, which included a relatively small selection of mobile-related words provided the basis for detailing the word-forming patterns of the jargon of the Internet, while the exploration of its metaphors from the cognitive linguistic point of view was something of a digression from the main topic. In the present sample and thesis, however, mobility and metaphors take centre stage, which is why it is necessary to define the field of mobile communications.

1.4.4 Mobile communications - defining a boundary-defying field. The overview of the sample of words and phrases to be analyzed in the context of the present work has provided an illustration of the exceptionally expansive nature of the domain of mobile communications. Therefore, a tentative working definition of this field must be equally broad and hybrid, linking the areas of mobile computing and mobile media. Its foundation are mobile communication situations and the phone as their medium. Nosrati, Karimi & Hasanvand (2012: 399) define mobile computing as "an interaction between human and computer by which a computer is expected to be motivating

during normal usage. Mobile computing involves software, hardware and mobile communication". They also state that "mobile computing means being able to use a computing device while changing location properties" (ibid.) and emphasize the associated notions of portability and the lack of location and network connectivity restrictions. Pointing out that defining mobile media is particularly problematic, Fortunati (2014: 21) observes that even the use of the qualifier *mobile* in this context is not quite correct since mobile media practices exist in mobile and immobile spaces alike adding that "they are "mobile" because they follow the human body: when it moves they move, when it is stationary or sitting mobile media become sedentary". As examining the many facets of the complex notion of mobile media, among other things, its relation to politics, economy and social issues is beyond our current scope, we will opt for a broad definition that does not go into such details, like the one offered by Wei (2013: 52) who says: "I would define mobile media (which encompasses a range of hand-held devices from mobile phones, tablets, and e-readers to game consoles) primarily as a personal, interactive, internet-enabled and user-controlled portable platform that provides for the exchange of and sharing of personal and nonpersonal information among users who are inter-connected." It is also necessary to add that the consumption and increasingly production of media (photographs, video, music, documents etc.) on multimedia mobile devices, or "user generated content" mentioned by Goggin (2011) is a particularly prolific aspect of their use.

Therefore, *mobile communications* could be delimited as *the use of portable devices when on the move or not to consume, produce, exchange and share information*. Having tentatively defined the field in which the impact of metaphors and other conceptual phenomena will be examined, the next segment will be dedicated to a review of the literature that provides the theoretical and practical basis for an in-depth investigation to follow.

II THEORETICAL BACKGROUND

The analytical engine – Founding theories of cognitive linguistics and later developments and their user experiential applications.

2.1 Aristotle to AI. A school of linguistic thought that schools HCI. As the overview of the theoretical background of the present work begins, it is necessary to define the scope and depth of the discussion of cognitive linguistic theories and their reverberations in the field of human-computer interaction. The purpose of this segment is not to provide a review of different approaches to metaphor, starting from Aristotle[15], with whom theoretical interest in metaphor is said to have begun, and culminating in the views on the subject developed in cognitive linguistics and their critique, although some points of criticism will be brought to notice. Instead, a summary of the main tenets of theories of metaphor and the related cognitive mechanisms of metonymy, analogy and conceptual integration developed within this school of thought will be presented along with brief mentions of their practical applications in non-linguistic domains related to mobile communications. However, before approaching these considerations, it is important to remember the structuralist Saussurian distinction between syntagmatic and paradigmatic (associative) relations, namely, those that a linguistic unit enters into with the units that precede and follow it in a sequence and those that it forms with the linguistic counterparts that can replace it in its position. Language as a whole, thus, functions as an interplay between sequencing and substitution, combination and selection i.e. horizontal and vertical axis (cf. Saussure, 1959). Jakobson (1956) reinterprets the dichotomy between the two axes of language as the metonymic and metaphoric pole respectively, viewing the former as based on contiguity and the latter on similarity. Stating that "In manipulating these two kinds of connection (similarity and contiguity) in both their aspects (positional and semantic) − selecting, combining, and ranking them − an individual exhibits his personal style, his verbal predilections and preferences" (ibid. 77), Setting the stage for cognitive

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[15] Aristotle is credited with the definition of metaphor as "the application of an alien name by transference either from genus to species, or from species to genus, or from species to species, or by analogy, that is, proportion" (cf. *Poetics* 21, 1457b). Not all of these types of meaning transfer are regarded as metaphoric by modern standards. Crucially, he recognizes not only the stylistic, but also the cognitive role of metaphor and does not consider it to be inherently deviant use of language (cf. Leezenberg (2001: 43). In conjunction with the cognitive role of metaphors emerges their ability to result in learning by finding commonalities between the metaphor and its referent. Rapp (2010) points to this observation that Aristotle makes in *Rhetoric*, adding that learning stems from the fact that "a metaphor not only refers to a thing, but simultaneously describes the thing in a certain respect." i.e. the description provides the information that is learned.

linguistic investigations, Jakobson does not regard metaphor and metonymy as figures of speech, but as all-pervading forces of language organization.

2.2 The leap of metaphor and metonymy from an embellishment to the mind and embodiment. The Conceptual Metaphor Theory (CMT). The groundbreaking work by Lakoff and Johnson (1980a, 2003), introduced the Conceptual Metaphor Theory and led to the formulation of the Contemporary Theory of Metaphor (Lakoff, 1993). The former was presented in the seminal book *Metaphors We Live By*, as one of the first theories of cognitive semantics. Its basic premise is that metaphor is much more than a stylistic element, one of rhetoric's tropes, deviating from the norms of literal language, as was the prevalent view for centuries since Aristotle. Rather, it is a fundamental principle structuring human thought. The structuring occurs via *cross-domain mapping*, establishing correspondences between domains. The mapping i.e. conceptual projection makes it possible not just to describe, but to understand abstract notions in terms of concrete experience, to structure and interpret the unknown (referred to as *target* or *vehicle*) through something that is familiar (*source* concept or *tenor*), such as making the way a computer allows us to do things comprehensible via a structural DESKTOP metaphor. The mappings on which metaphorical conceptualization relies are always partial, providing understanding that highlights certain aspects of the topic, while obscuring others (cf. Lakoff and Johnson, 2003: 10). Thus, not all aspects of the notion of DESKTOP are mapped onto the COMPUTER INTERFACE environment. Conceptual metaphors are also systematic and often conventional. This argument is supported by their ubiquity and habitual use in everyday language. Moreover, the sources of metaphorical correspondences tend to have a bodily basis (cf. Johnson, 1987), in addition to being rooted in experience. That is, both the human mind (understanding) and the conceptual structure depend on and are constrained by the nature of our bodies and their interaction with the physical environment. This constitutes the thesis of *embodied cognition*. For example, we routinely make use of vertical and horizontal axes to orient our bodies in space and because our cognition is embodied, the use of this experiential mechanism extents to the notion of quantity which results in a systematic (conventional) correlation QUANTITY IS VERTICALITY i.e. MORE IS UP and conversely LESS IS DOWN. Thus, *stock prices rise* or *fall*, *homework piles up*. By further extension, the same principle can be applied to value judgements and emotions, yielding the metaphors GOOD IS UP, BAD IS DOWN and

HAPPINESS IS UP, SADNESS IS DOWN exemplified in the sentences: *They were in high spirits the whole evening,* or *She is down*. This is one of the metaphors that straddles languages and cultures, namely, as Kövecses (2015[16] and earlier) has shown, it is used in English, Chinese and Hungarian. In addition to such spatial or orientational and the previously mentioned structural metaphors, Lakoff and Johnson (2010: 26) also identify ontological ones. These stem from experiences with physical objects and substances and allow us to choose some of their aspects, regard these aspects as discrete and reason about them. Ontological metaphors also include reasoning about our own bodies that are clearly bounded in space and things that may not have distinct boundaries such as mountains or hedges. They are a powerful mechanism that turns diverse phenomena into entities, including events, activities, emotions, ideas, etc. (ibid.). So, not only can the conceptualization stating that THE MIND IS A MACHINE, as in "I'm switching off for today" be activated, but the same strategy allows the opposite process of personification to kick in when needed, as shown in the title of an online article: "How to stop Facebook from eating your iPhone's precious storage space"[17] where the FACEBOOK APP becomes A (presumably hungry) PERSON. Later, Lakoff and Johnson (2003: 265) modified their claim, referring to this classification "artificial" and stating that "all metaphors are structural (in that they map structures to structures); all are ontological (in that they create target domain entities); and many are orientational (in that they map orientational image-schemas)". This initial grouping into three types is useful insofar as it specifies the functions of metaphors that will be shown to coexist in the context of interaction with portable gadgets. When developing their theory and defining the categories of metaphors, the authors acknowledged an earlier contribution by Reddy (1979)[18], who provided an in-depth description of the systematic nature of the CONDUIT metaphor, which inspired Lakoff and Johnson to start their investigation, which would famously shift the locus of metaphor from language to the mind. They summarize Reddy's findings in the form of the extended metaphor IDEAS ARE OBJECTS. LINGUISTIC EXPRESSIONS ARE CONTAINERS. COMMUNICATION IS SENDING (cf. Lakoff and Johnson, 2003: 10), which also spatially represents the relation between form and content in language. Namely, if LINGUISTIC EXPRESSIONS ARE CONTAINERS, then MEANING

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[16] Kovecses, Z. (2015) *Where Metaphors Come From*. Oxford: Oxford University Press.
[17] Reed B. (November 24th, 2014). "How to stop Facebook from eating your iPhone's precious storage space". Retrieved 16.2.2015 from https://bgr.com/2014/11/24/facebook-iphone-app-tips-and-tricks/.
[18] Reddy, M. (1979). The conduit metaphor: A case of frame conflict in our language about language. In A. Ortony (Ed.), Metaphor and thought (pp. 284-324).

is their CONTENT. Since it defines the functioning of language and communication in general, the CONDUIT metaphor plays a key part in mobile communications, as will be illustrated below.

The key influence that led to the formulation of the Conceptual Metaphor Theory and subsequently one of the recurrent themes in cognitive linguistics as a whole were advances in the understanding of conceptual and linguistic categorization (cf. Taylor, 2003), particularly those made by Rosch (1978) as part of her research on prototype categorization. Embracing the principles of prototype categorization, cognitive linguistics challenges the classical or Aristotelian set theoretical view of categories as discrete entities, whose members share a set of necessary and sufficient properties according to which they are classified as belonging to a particular category and the related views i.e. that all members of a category should be equally representative or typical of that category, as well as that categories should have clearly defined boundaries and that the level of abstraction in hierarchical organization of each# is equally salient as any other. The cognitive take on categorization has shown that there exist the so-called "basic-level categories" that are the most salient. Categories are seen as overlapping and fuzzy, rather than clear-cut, with their members clustering either towards the centre or the periphery, meaning that similarity is graded and not equally distributed. Thus, there are always more and less prototypical members, and categories are defined in terms of prototypes and family resemblances of their members to the prototypes (cf. Rosch, 1975) . Thus, a *robin* is closer to being an ideal representative of the category BIRDS than its nearly or completely flightless members, like *chicken* or *kiwi*, *ostrich* and *penguin* respectively.

The combined input from Reddy and Rosch goes to show that within the experientialist cognitive framework, understanding is a product of the conceptual system that involves both metaphorical entailments and categorization.

Another contribution from psychology comes in the form of the notion of *gestalt – an organized whole perceived as more than the sum of its parts (non-decomposable into constituent properties)* that is applied to human semantic processing. It is important to remember that a large part of the human conceptual system is not metaphorical. As Lakoff (1993: 244) points out, "metaphorical understanding is grounded in nonmetaphorical understanding". Both, experiences and concepts can be either

directly emergent – understood without the influence of metaphor (e.g. concepts describing the functioning of the body − our spatial and perceptual experience, UP–DOWN, IN–OUT, WARM-COLD, generating emergent metaphors like HAPPY IS UP, based on systematic correlations between emotions and sensory-motor experiences) or *indirectly emergent* i.e. largely[19] mediated by metaphor like TIME IS MONEY (cf. Lakoff and Johnson, 2003: 58-59). Moreover, the whole of our conceptual system is grounded in our experiences (always conceptualized by interpreting the less clearly delineated in terms of the more clearly delineated) and interaction in the world. These experiences are, in turn, "structured holistically in terms of experiential gestalts", while gestalts themselves are multidimensional and structured in a non-arbitrary manner, with the dimensions characterizing their structure arising from our experiences (ibid. 225). Such dimensions are considered to be natural, that is products of human nature: our bodies and interactions with our physical environment and other people with whom we share the same culture (ibid. 117). By understanding one thing in terms of another, for instance, allowing the gestalt for WAR to be partly superimposed on the gestalt for CONVERSATION, making it an ARGUMENT, which is then metaphorically structured in terms of the correspondences with certain highlighted parts of the same multidimensional gestalt for WAR, our experience becomes coherent (cf. Lakoff and Johnson, 1980b). Experiential gestalts, therefore structure our experience and make it coherent.

Unlike other approaches to meaning, namely, formal ones that employ the analytical apparatus of logic to explain and describe meaning or componential that treat complex meanings as consisting of a limited number of indivisible semantic features that provide a way of formalizing sense relations, cognitive semantics gives an account of meanings as concepts.

The observation made by Lakoff and Johnson (2003) regarding the nature of causation, as a directly emergent concept with a metaphorically elaborated core is of special importance in the context of the current study. Rather than opting for the customary componential view of causation, they see it as an experiential gestalt, while granting it the status of a basic human concept, structuring both physical and cultural experiences. The cluster of elements that form this gestalt is most fully represented in

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[19] Since metaphoric projection is always partial, elements of non-metaphoric (literal) meaning are found in source domains.

direct manipulation, a prototypical form of causation playing the central role in our lives from infancy onwards, as we interact with the environment in all sorts of simple or complex ways, from picking up objects, opening doors or windows, pushing buttons, putting on clothes, to manipulating the computer mouse or otherwise operating the many electronic devices that we use daily. The activities involving direct manipulation have been found to share the following twelve characteristics all of which are worth citing here, as they constitute the core of touch, the currently dominant modality of interaction with mobile devices that is getting increasingly implemented in laptop and desktop computers as well.

The agent has as a goal some change of state in the patient. The change of state is physical. The agent has a "plan" for carrying out this goal. The plan requires the agent's use of a motor program. The agent is in control of that motor program.

The agent is primarily responsible for carrying out the plan. The agent is the energy source (i.e., the agent is directing his energies toward the patient), and the patient is the energy goal (i.e., the change in the patient is due to an external source of energy).

The agent touches the patient either with his body or an instrument (i.e., there is a spatiotemporal overlap between what the agent does and the change in the patient).

The agent successfully carries out the plan. The change in the patient is perceptible. The agent monitors the change in the patient through sensory perception. (ibid. 71)

This modality has successfully exploited the well-known scenario that comes completely natural to people and applied it to the situation where decision-making and physical movement on the part of human agents lead to a physical state change in the machine, which is immediately perceptible and crucially occurs through the sense of touch, but allowing auditory and spoken input, as well. The human-computer interaction variety of direct manipulation has some less prototypical forms that are analogous to those present in direct causation in in general, namely, remote (e.g. controlling your smart home appliances and switches remotely via a smartphone app) or non-human (e.g. intelligent personal assistants) agency. These still bear enough family resemblances to the central case to be regarded as causation.

Being so deeply basic to experience and so essential for our day-to-day functioning, the general concept of causation (which is thus characterized as a clearly delineated and stable gestalt with constituent elements such as control, volition, etc. that likely have an analyzable prototype structure themselves), it provides concepts that are equally and simultaneously "basic, holistic, and indefinitely analyzable". It also informs numerous metaphors arising from such fundamental concept like MAKING (e.g.

CREATION IS BIRTH), CHANGE (of state) whereby OBJECTS become SUBSTANCES and vice versa and EMERGENCE, making it possible, among other things, to view CAUSATION as EMERGENCE of an EVENT from a STATE (ibid. 73-77).

The concept of direct causation and the metaphors through which it is elaborated are one of the pillars of the functioning of modern technology as a whole and especially mobile devices, born out of miniaturization. The powerful force of convergence and the fact that every smartphone is a platform for installing applications adding functionalities to the device, embodied in Apple's catchphrase "There's an app for that!" open the possibilities of making the handheld into a great many things, from a music player to a lever.

This versatility makes an attempt to define and delimit mobile technology as tricky as it was to determine the scope of mobile communications. However, if the experientialist account of definition is applied, the task becomes manageable, since concepts are defined in relation to their role in our experiences, as well as their interactional, not just inherent properties, which makes them open-ended. This approach to concepts is the opposite of the set-theoretical view, having done away with the necessity of satisfying a fixed set of conditions in favour of prototype relations, which gives it great flexibility. The role of metaphor as a systematic means of extending the definition of concepts or even redefining categories, depending on the purposes of categorization in the context of the contemporary technological development, along with its ability to create new meanings and realities via new, creative metaphors is the main area of investigation in this dissertation.

According to Lakoff and Johnson, conventional metaphors revealed in language that lend structure to our conceptual system and culture are complemented by novel ones that reflect human imagination and creativity and hold the potential for new ways of understanding and adding new meaning to experiences and beliefs past and present. The authors (2003: 144-146) provide a striking example of creation of new realities by metaphor describing the case of the expression "the solution of my problems" misunderstood by a foreign student of theirs in terms of a chemical metaphor. The student's vision involved a container with bubbling liquid where problems, either in liquid or solid form were suspended and would either dissolve or precipitate out, depending on the type of catalyst added to the solution. Such an interpretation of the

possible treatment of problems that interestingly offers no option of them disappearing entirely, allowing temporary solutions only, therefore, creates a new reality in which the conceptual system and our everyday lives would look different under the influence of the CHEMICAL metaphor. It is clear that the experientialist framework grants metaphor much greater powers than it is traditionally taken to have as a mere figure of speech, never leaving the confines of language. This example also proves the point that meaning is always a matter of personal reality, in this case built around a misunderstanding.

Novel metaphors that emerge with new technologies are sometimes so powerful that they introduce palpable changes into our everyday life, shaping a new reality. The launch of iPhone and iPad, the devices where touchscreen technology was truly successfully implemented for the first time ever is often said to have been such a watershed moment. Computers had become personal first, mobile gadgets followed and no mobile phone, tablet or smartwatch looks the same as any other, although many people may have the same model of a device. Each reflects the personal reality of its owner.

Metaphor may have been in the focus of Lakoff and Johnson's (2003) investigations, but it is not the only phenomenon formerly regarded as a trope, a device limited to language. Metonymy too has been recognized for its conceptual qualities, the ability to structure both language and thought. However, the nature of association between the entities linked by metonymy is different from that present in metaphor. While the formulation of the metaphoric relationship as "X is Y" implies the existence of two distinct domains where one (target) is understood in terms of the other (source), the metonymic relationship "X stands for Y" is said to be referential, since one entity refers to the other to which it is related in the same domain, such as the relationship PRODUCER FOR PRODUCT exemplified in the sentence: *Driving a Tesla is good for the environment* where the manufacturer Tesla (Motors) stands for the car. Subsuming synecdoche (PART FOR WHOLE relation) under metonymy, the authors emphasize that in addition to its referential function, metonymy in general also plays a role in the way we think, behave and communicate. Like metaphor, it can foreground certain elements of a phenomenon, while backgrounding others, effectively choosing the focus of our statement and influencing understanding e.g. *The engineers were the brains of the operation and the soldiers were the brawn.* Similarly, the metonymy THE FACE FOR THE

PERSON that is very prominent in the realm of emoji and emoticons, as will be illustrated later is deeply rooted in culture and thus conventional, a matter of understanding and not simply language. Namely, people are routinely identified by their faces and not some other bodily features. Likewise, metonymic patterns are systematic, rather than random and grounded in experience, albeit based on a more direct and closer physical or causal relationship (ibid. 36-39).

The following segment highlights select significant more recent findings in the field of conceptual metaphor and metonymy, some of which have been applied to user interface design.

2.3 What metaphors and metonymies live by – structuring and processing. Major developments in the wake of CMT and their reach beyond linguistics. Following their fruitful collaboration on the Conceptual Metaphor Theory, Mark Johnson and George Lakoff explored further implications of this approach, with Johnson developing the theory of image schemas and Lakoff (1987) proposing the theory of idealized cognitive models.

In *Body in the Mind*, Johnson (1987: xiv), defines *image schema* as a "recurring, dynamic pattern of our perceptual interactions and motor programs that gives coherence and structure to our experience". They are knowledge structures of our conceptual systems arising from bodily experiences and relate to all the senses, not just vision, which makes them multimodal phenomena. Evans and Green (2006: 178-179) trace the meaning of the term "image" in "image schema" to its use in psychology "where imagistic experience relates to and derives from our experience of the external world", as opposed to introspective, subjective experiences such as feelings or emotions while the notion of "schema" implies that the concepts referred to are schematic, abstract and lacking detail. According to Johnson, notions like CONTAINER or BALANCE are preconceptual i.e. directly tied to earliest physical experiences acquired in childhood, unconscious (cf. Mandler, 2004) and non-propositional, that is they do not refer to states of affairs in the world or statements that can be judged as either true or false against mind and body-independent reason and concepts characterizing objective, external reality (cf. Lakoff & Johnson, 1999). The fact that image schemas reside below the level of consciousness makes them the basis of the human conceptual system. They store information acquired by the senses in the form of

repeated patterns, which makes subsequent conceptual representation and interpretation possible in conscious awareness. Image schemas are, therefore analogue representations of concrete sensory experiences. The outcome of this process is generation of more specific concepts in the lexicon and crucially metaphorical (imaginative) extension of image schemas to a wide range of abstract experiential domains. For example, we perceive much of our environment including spaces (e.g. *rooms*, *buildings*), objects (e.g. *cups, books, boxes*, etc.) and indeed our own bodies in terms of the CONTAINMENT schema and the related specific prepositions such as, *in, into, out* signalling in-out orientation in three-dimensional space structured in terms of an interior, boundary and exterior. Thus, the CONTAINER schema is metaphorically expanded to refer, for instance, to categories, yielding the mapping CATEGORIES ARE CONTAINERS or CLASSES ARE WHOLES and SUBCLASSES ARE PARTS showing that image schemas are gestalt structures introducing order into our experience (cf. Johnson 1987, 1991). By way of another example, direct experience and perception of balance are manifested in the expressions: *political balance*, *the balance of forces*, *balanced diet* and so on. Moreover, cognate image schemas, such as FORCE schemas form a network or a complex gestalt, sharing a number of common characteristics, namely, always being experienced though interaction, involving directionality, having sources and targets, a single path of motion, as well as exhibiting degrees of intensity and involving causal sequences related to interaction (cf. Johnson 1987: 43-44). Lakoff (1987) pinpointed several transformations that image schemas can undergo. Among the most quoted are those involving motion of objects e.g. *path-focus to end-point focus* and *following a trajectory* or *motion/action on the part of the observer*, e.g. *multiplex to mass* and *superimposition*. Following Evans and Green (2006), we will focus on the transformation from multiplex to mass and its grammatical consequences resulting from the difference between countable and mass nouns. In other words, this transformation allows countable nouns to become uncountable e.g. *She had two peaches, one each hand. After she slipped and fell flat on her face, she was covered in peach.* Wrapping up this review of the main features of image schemas, it is important to reiterate the point made by Gibbs and Colston (2006) that studies from psycholinguistics, cognitive psychology, and developmental psychology that they describe appear to provide converging empirical evidence of the psychological reality of image schemas. From the cognitive linguistic point of view, the finding proves the claim put forward by Lakoff (1987) and Johnson (1987) that polysemy can indeed be

motivated by image schemas (i.e. the various meanings of *stand* arise from image schemas related to the physical activity of standing, (cf. Gibbs et al, 2004) as cited in Gibbs and Colston.

Lakoff's book *Women, Fire and Dangerous Things* (1987) is an investigation into the impact of Rosch's empirical evidence related to prototype categorization on language and semantics. It resulted in a theory of *idealized cognitive models*, namely the idea that "we organize our knowledge by means of structures called idealized cognitive models, or ICMs, and that category structures and prototype effects are by-products of that organization" ICMs are gestalts whose knowledge structuring principles rely on the previous findings of Fillmore (1982), Langacker (1987) and Lakoff and Johnson (1980, 2003) (ibid. 68). A definition provided by Evans and Green (2006: 270) and Evans (2007) states that they are "relatively stable mental representations that represent theories about the world" "'idealised' because they abstract across a range of experiences rather than representing specific instances of a given experience", which "guide cognitive processes like categorisation and reasoning." Fillmore's frame semantics approach, Langacker's cognitive grammar and Lakoff's ICMs share the assumption that the nature of meaning is encyclopaedic, which is contrasted with the dictionary view that separates word meaning proper from the wider context of the knowledge of the world, which belongs to encyclopaedias, rather than dictionaries and is considered to be non-linguistic. This leads to the distinction between word *sense* (the meaning stored in the mental lexicon of speakers) and *reference* (that which words refer to in the world at large) and separation of semantics from pragmatics i.e. ruling out the influence of context on meaning. Cognitive approaches, on the other hand, consider lexical units to be points of access to knowledge systems. Moreover, "a context for the characterization of a semantic unit is referred to as a domain. Domains are necessarily cognitive entities: mental experiences, representational spaces, concepts, or conceptual complexes." (cf. Langacker, 1987: 147). Domains are knowledge structures that range from basic to abstract and form hierarchies and it is in terms of them that other conceptual units are characterized. Thus, for example the, the concept KNUCKLE can be understood in the context of FINGER, HAND and ARM positioned higher in the hierarchy ending in the most abstract concepts of all – BODY and ultimately SPACE. Langacker (ibid. 157) equates abstract domains to Lakoff's ICMs or frames, since they all structure categories in relation to "some motivating context"

(cf. Fillmore 1982: 119). Frames are "the cognitive structures that shape speakers' understanding of linguistic expressions" and in terms of which "the meaning dimension is expressed" (cf. Fillmore and Baker 2009: 317). So, for example, *buying* or the words like *sell* or *pay* evoke the COMMERCIAL EVENT frame and the background knowledge associated with it.

Lakoff sets his theory of ICMs within Fauconnier's (1985: x-xi) theory of *mental spaces*, which indicate referential structures, unlike *ICMs* and *frames*, which point to the conceptual structure and provide relational structure between the elements in metal spaces − roles and values. Evans (2007: 134) summarizes mental spaces as "regions of conceptual space that contain specific kinds of information" that are "constructed 'online', in the moment of speaking or thinking, and can be structured by other cognitive entities including semantic frames, idealised cognitive models or domains". Importantly, as Fauconnier (2007) points out "mental spaces are built up dynamically in working memory, but a mental space can become entrenched in long-term memory", thus turning into a frame. The notion of mental spaces will be revisited as part of an overview of the mechanism of conceptual integration or blending to which a separate subsection is dedicated in view of its significance in the process of human-computer interaction. For now, let's return to idealized cognitive models, their functions and types. ICMs, as schematic structures, account for various typicality effects from simple gradience, as in Fillmore's BACHELOR, (where the Pope is seen as a less fitting example of the category than a regular adult unmarried male, since his bachelorhood is based on the fact that priests are not allowed to marry) to cluster models like the category MOTHER. It consists of several models including BIRTH, NURTURANCE or MARITAL model, among others, and which is the right one depends on the context of different motherhood-related situations (cf. Lakoff, 1987). The most important in the context of this work are typicality effects arising from metonymy and ICMs whose structure is image schematic, metaphoric or metonymic. Part-whole relations are a widespread metonymic pattern and A MEMBER OF THE CATEGORY FOR THE CATEGORY subtype of these relations is a source of typicality effects, notably social stereotypes like regarding HOUSEWIFE-MOTHER as the prototypical member of the category MOTHER. While stereotype formation is usually a conscious activity, picking out typical examples generally happens automatically below the level of consciousness, e.g. *apples* are judged as a typical fruit, with *pomegranates* placed lower on the typicality scale.

Typical examples are a very frequently used categorisation tool, providing knowledge on the basis of which inferences are often automatically and unconsciously made and prototype effects are produced (ibid. 86-87). Ideals, (models that structure cultural knowledge including *ideal families, jobs, holidays* and also lead to prototype effects), paragons – individuals representing ideal or their opposites, e.g. *another Einstein*, or salient examples based on which people tend to make generalizations are also among the metonymic ICMs in terms of which categories can also be understood.

According to Lakoff, ICMs can be grouped into five basic structural categories. Evans and Green (2006) recapitulate them as follows: *image-schematic ICMs* are structured by image schemas, the building blocks of our conceptual structure e.g. the mental model of SPACE is largely structured by image schemas, such as UP-DOWN, CONTAINER, SOURCE-PATH-GOAL, FRONT-BACK, etc. *Propositional ICMs* feature propositional (i.e. factual) knowledge including rules of conduct in particular situations or taxonomic systems. *Metaphoric ICMs* get structured by the conceptual mapping of structure from a source to a target, e.g. THEORIES ARE BUILDINGS. In *metonymic ICMs*, a member of the category stands for the entire category, as illustrated above, while Lakoff (ibid. 289) contrasts purely *conceptual ICMs* that can be understood independently of particular languages with *symbolic* ones, where linguistic and conceptual elements combine, as in the case of semantic frames (like the above mentioned COMMERCIAL EVENT frame), making it possible to understand terms like *buy* and *sell* that are structured by language as a symbolic system. This short review of the main structural categories of ICMs marks the end of a quick survey of the theories that introduced two influential concepts, *image schemas* and *idealized cognitive models*, which is followed by an account of the application of the former concept in Lakoff's Invariance Hypothesis.

The hypothesis that reads: "Metaphorical mappings preserve the cognitive topology (that is, image-schematic structure) of the source domain" (cf. Lakoff, 1990: 54) was later elaborated as the Invariance Principle stating: "Metaphorical mappings preserve the cognitive topology (that is, the image schema structure) of the source domain, in a way consistent with the inherent structure of the target domain" (cf. Lakoff 1993: 215). It constrains metaphorical mapping, while suggesting that abstract thought mediated by metaphor is based on image schemas and therefore embodied. In the case of the CONTAINER schema, it ensures that "interiors will be mapped onto interiors,

exteriors onto exteriors, and boundaries onto boundaries" (ibid). The principle also prevents incompatible mappings from being projected from the source to the target. Evans and Green (2006: 302 provide a pair of examples related to the metaphor CAUSATION IS TRANSFER (OF AN OBJECT), namely: "She gave him a headache" (STATE) and "She gave him a kiss" (EVENT) They share the source domain TRANSFER, but the entailment of possession is valid only for states, which are not limited by time, but not for events that cannot annul the temporal limit. Thus "*She gave him a kiss and he still has it" is not acceptable. Lakoff (1993) refers to this additional constraint as "target domain override."

While the description of metaphor systems (where groups of schematic mappings structure a number of their more specific counterparts) was provided early on in the development of the Conceptual Metaphor Theory (1980), e.g., LIFE IS A JOURNEY, a particularly intricate example, the EVENT STRUCTURE metaphor, exhibiting inheritance hierarchies where lower mappings inherit the structure of those positioned higher up was introduced as part of the Contemporary Metaphor Theory e.g. a three-level metaphor: level 1: the EVENT STRUCTURE metaphor, : level 2: A PURPOSEFUL LIFE IS A JOURNEY Level 3: LOVE IS A JOURNEY, A CAREER IS A JOURNEY The metaphors that constitute event structure interact to interpret utterances and various elements of that structure, such as STATES, CHANGES, ACTIONS, PURPOSES are interpreted metaphorically for example in terms of MOTION or FORCE e.g. PURPOSES ARE DESTINATIONS, MEANS ARE PATHS TO DESTINATIONS, DIFFICULTIES ARE IMPEDIMENTS TO MOTION (cf. Lakoff 1993).

A very important development in the domain of the study of conceptual metaphors has been Grady's discovery of primary metaphors. It addressed an issue that arose as a result of the formulation of the Invariance Principle. Namely, if metaphors should map structure onto abstract target domains and the target already has an invariant image schematic structure that can override the metaphorical mappings and entailments, then the purpose of metaphors is put into question. Grady (1997) proposed primary and compound metaphors. Primary metaphors are basic and compound ones emerge through the process of unification of primary metaphors. The new take on metaphor introduced by this theory is that metaphors establish a link between two concepts that are equally basic i.e. products of direct experience and perception. Thus, the distinction between source and target understood as concrete and abstract

respectively disappears in favour of a new criterion – the degree of subjectivity. This, in turn, makes the Invariance Principle unnecessary, since primary metaphors that provide the foundation for compound ones are not regarded as transferring structure to abstract concepts. Some of the examples that Grady provides are as follows: IMPORTANCE IS SIZE / VOLUME e.g. We have a *huge* test tomorrow, DIFFICULTY IS HARDNESS e.g. This is a *tough* situation to deal with, AFFECTION IS WARMTH e.g. They greeted me *warmly*, CHANGE IS MOTION e.g. After her divorce, she realized it was time to *move on* and live life to the fullest, or DESIRE IS HUNGER e.g. They are *hungry for recognition*. Grady (1997:153) writes:

Change, for instance, can be detected in any number of realms, including non-physical ones (e.g., a change in the emotional tone of a conversation), whereas the detection of physical motion is based on physical perception. Desire is an affective state while Hunger is a physical sensation. Quantity is a parameter in any realm, while Vertical elevation is a physical variable, perceived by the senses.

Therefore, "Source concepts correlate more specifically with sensory input from the physical world, while target concepts relate to various sorts of responses to this input—judgments and analyses, of individual stimuli and of the relationships among them." (ibid. 164). This suggests that the nature of the correlation between the source and the target is experiential.

Primary Metaphor Theory maintains the unidirectionality requirement defined by the Conceptual Metaphor Theory. However, since primary source and primary target are considered to be on an equal footing – equally basic and arising from direct experiences – in their case unidirectionality has an explanation different from the traditional concrete-abstract dichotomy. Dealing with subjective responses, primary target concepts have low conscious access. On the other hand, metaphors are deemed likely to "help bring backgrounded cognitive operations and experiences to consciousness by associating them with sensory images" (ibid. 173-174). Being related to bodily sensation and perception, primary source concepts have "image content" (ibid. 139). They provide directionality to primary target concepts that have source content. This image content is not as abstract as that of image schemas, as understood outside the primary metaphor theory. They are more restricted, and exclude concepts that are dependent on culture, geography or history and are thus not familiar to people everywhere (ibid. 195). Grady introduces the concept of *primary*

scenes that tightly correlate distinct dimensions of experience (such as spatial proximity and emotional connection) that he terms *subscenes* – "minimally distinguishable aspects of larger experiences" (ibid. 87)) to replace image schemas as the basis of metaphor. In contrast to image schemas which are larger structures, mapping whole domains to other equally whole domains, the nature of primary scenes defined as "minimal (temporally-delimited) episodes of subjective experience, characterized by tight correlations between physical circumstance and cognitive response" (ibid. 24) is more local, recurrent, universal to human experience and goal oriented. Grady and Johnson (2002) elaborate on the notions of *subscene* and *primary scene* as units of experience. They clarify that although on account of subscenes being "co-occurring aspects of simple scenarios", it may be understood that primary metaphors stem from metonymies, they originate from experience-level correlations and therefore from metaphoric conceptualizations which are formed from these correlations (ibid. 540). The authors conclude that subscenes seem to be operating at the most basic level cognitive processing that are subject to our conscious attention – i.e. that "they are self-contained dimensions of subjective experience" (ibid. 550).

Primary metaphors are simple and as such they "refer to simple aspects or dimensions of subjective experience," while compound ones relate complex experience domains like THEORIES ARE BUILDINGS. As a result of that complexity, neither THEORIES nor BUILDINGS can be viewed as primary target and source concepts. Because of their simplicity, primary metaphors tend to be universal, while compound ones are likely to be culture dependent. Moreover, primary metaphors "have a direct experiential basis", and "motivate highly predictable sets of data (i.e. sets without "gaps")" (cf. Grady, 1997: 47). The mapping is thus complete and primary source concepts like SIZE or MOTION cannot be broken down inorb smaller parts. Conversely, both concepts making the metaphor THEORIES ARE BUILDINGS can be reduced to component parts. Such a metaphor exhibits mapping gaps e.g. *This theory has revolving doors, but lacks experiential basis.* Since it does not qualify as a primary metaphor, THEORIES ARE BUILDINGS has been shown to result from the unification of two metaphors PERSISTING IS REMAINING IN A POSITION/POSTURE and ORGANIZATION IS PHYSICAL STRUCTURE.

Grady's valuable contribution to the study of metaphor inspired by the experientialist approach developed by Lakoff and Johnson has been expanded by these two scholars

into the Integrated Theory of Primary Metaphor (cf. Lakoff and Johnson, 1999), a four-part framework that combines Johnson's theory of conflation in the course of learning, Grady's theory of primary metaphor, Narayanan's neural theory of metaphor (proving Grady's assumption that the cognitive structures arising from primary scenes could be analyzable at the neurophysiological level) and Fauconnier and Turner's theory of conceptual blending. The joint impact of the four theories produces a scenario whereby an extensive system of primary metaphors is acquired automatically and unconsciously in early childhood simply as part of daily interaction with our environment. The period of conflation when the two domains of metaphor are not perceived as separate (i.e. prior to the differentiation stage) is the time when neural connections are formed in a specific way that makes it natural for us to think in terms of a very large number of primary metaphors. These fundamental conceptual constructs that "pair subjective experience and judgment with sensorimotor experience" (ibid. 49) have found their way into the investigations of user experience design, as will be illustrated now. That will be followed by a mention of some of the points of criticism of the Conceptual Metaphor Theory, along with the look at the significance of the Neural Theory of Thought and Language before we turn to metonymy and analogy. Conceptual blending, another area in which Grady's views have made a lasting impact will close the overview of the theoretical background of the present study.

The influence of CMT has spread beyond English (see 2.2 above) as the theory itself and the approaches derived from or related to it have been applied to sign languages and in non-linguistic contexts, including the domains of gesture (cf. Cienki and Müller, 2008), multimedia (cf. Forceville and Urios-Aparasi, 2009) and user interface design and human-computer interaction (cf. Hurtienne, 2014, 2011), the area of particular interest here. Recognizing the role of conceptual metaphors and blends (see 2.4 below), Hurtienne makes the case for applying image schemas and primary metaphors in the process of providing concrete interface design guidance, which can improve the usability of ubiquitous technological devices (from smartphones to navigation systems and gaming platforms) intended for increasingly diverse user groups and put to a range of uses wider than ever before. Unlike conceptual blends, which are deemed more suited for descriptive than prescriptive purposes, image schemas in conjunction with the constraints imposed by the Invariance Hypothesis are

proposed as a means of ultimately making interfaces and tasks, to be completed within them, more intuitive for users by providing designers with a more abstract depiction of interface elements (cf. Hurtienne, 2014). Namely, as image schemas structure the mappings that constitute conceptual metaphors in thought and language, they highlight or hide certain aspects of the mappings and can thus help designers focus on the important features of user interface metaphors. Furthermore, being sensorimotor forms of knowledge representation, active at the subconscious level that are abstract, stored in and easily retrieved from memory and not dependent on culture, image schemas are behind the assumption that "the subconscious parts of users' mental models can be described with image-schematic metaphors that then can be instantiated in a user interface design to make it better understandable" (cf. Hurtiennne's 2014: 302; Hurtienne 2011; Hurtienne, Thüring & Blessing, 2007; Hurtienne et al, 2015). Mental models, the topic which will be considered again in relation to analogical reasoning below, are taken to be comprised of users' knowledge of the functioning of a particular system and the goals that they want to fulfil by using the system. According to Hurtienne (2011: 17) mental models "are used as a cognitive shorthand covering purposeful interactions". The author provides a telephone as an example, pointing out that behavioural expectations are the same, no matter whether we are using a landline or mobile phone, although the two are based on very different principles of transmission. Let us add, however, that the omnipresence of mobile phones and especially smartphones changes the mental models of users, especially because landline phones are fast becoming history both in the developed and Third-World countries, albeit for different reasons. In the former the landline infrastructure is becoming superfluous as the majority of the population uses smartphones, while in the latter that infrastructure has never existed in the first place and affordable feature phones are the first and only choice for voice communication and various services (cf. Ahonen, 2013, Agar, 2013). Returning to the issue at hand, there is no doubt that he best and most intuitive solutions are generally thought to be those where there is a high level of correspondence between the interface and the mental models of its users. The goal is to develop a metalanguage for user interface design that would be based on image schemas, which would be "independent from pre-configured metaphorical analysis" (cf. Hurtienne, 2011: 53). This would make the design process more streamlined and applicable to broader spectrum of scenarios of use. That is why image schemas as the more abstract elements of conceptual structure, the invariants of the

metaphorical mapping are considered to be especially useful. Moreover, primary metaphors work in conjunction with image schemas providing the conceptual link between image schemas such as the already mentioned UP-DOWN schema and value judgements such as QUANTITY (cf. Hurtienne, 2014: 307), yielding primary metaphors MORE IS UP and LESS IS DOWN. Consequently, both image schemas and image schematic primary metaphors are used to reach the subconscious mental models users have about a domain. Let us provide a simple example that pertains not only to our current area of investigation, but also to a wider area of design of electronics. In the context of mobile communications and interfaces, pressing the volume up button (on a mobile phone, tablet), increases the volume, while pressing the down button decreases it. The vertical left-right slider (whose implementation in touch-based interfaces is an instantiation of the LEFT-RIGHT schema) has the same function – moving the slider to the left decreases the volume (screen brightness or other parameters), while moving it to the right has the opposite effect. On the basis of extensive experimental evidence derived from the studies presented in Hurtienne, (2011: 211) the author concludes that developing user interfaces "congruent with image-schematic metaphors leads to higher effectiveness, mental efficiency, and satisfaction in use than using user interfaces that contradict image-schematic metaphors". On a related note and close to our own present analysis, Hurtienne et al, (2010) conducted a study across age groups and education levels where irrespective of the respondents' age, education or prior experiences with technology, a total of twelve primary metaphors (including those indicating the dimensions reflected by image schemas, namely, CENTRE–PERIPHERY, FRONT–BACK, NEAR–FAR, UP–DOWN). were shown to be valid for touch-based interface design and multitouch gesture interaction with mobile devices. Moreover, as a part of Hurtiennne's (2011) doctoral research, an image schema database has been built. The ISCAT (Image Schema Catalogue)[20] database includes examples of image schema instances in language and user interfaces. As pointed out by its author (2014), cognitive linguistic theories and findings have been a source of valuable knowledge for the domain of user interface design, which can, in turn, provide cognitive linguistics with important contributions, that is, linguists could profit from the above-mentioned database, but even more from the fact that the studies mentioned here and numerous others, along

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[20] ISCAT database is available at: zope.psyergo.uni-wuerzburg.de/iscat.

with the findings about the role of metaphor in gesture and multimedia provide a solid argument against the accusation that cognitive linguistics suffers from circular reasoning, which is the point we now briefly turn to.

The most widespread criticism against cognitive linguistics has been summed up by Gibbs and Colston (1995: 354) in the following way: "Psychologists often contend that cognitive linguistic research suffers from circular reasoning in that it starts with an analysis of language to infer something about the mind and body which in turn motivates different aspects of linguistic structure and behavior". McGlone (2001: 95) draws a parallel between the early evidence supporting Whorf's (1956) linguistic relativity claim that language shapes cognition and the arguments in favour of Lakoff's view that metaphors influence conceptual structure. Both are found to rest upon linguistic evidence, which provides both the motivation and the only source of support for their hypotheses. The inherent circularity of this line of reasoning is thus revealed. Aiming to counter this argument, Ruiz de Mendoza Ibáñez and Pérez Hernández (2011: 5-6) emphasize that linguists postulate that people think of one domain in terms of another (e.g. about LIFE in terms of JOURNEYS) because they find linguistic evidence for it.

A new direction, promising to strengthen the original claim of the Conceptual Metaphor Theory to living by metaphors is the Neural Theory of Metaphor i.e. Neural Theory of Language (cf. Lakoff, 1998, Lakoff and Johnson, 1999, Feldman, 2006), also referred to as Neural Theory of Thought and Language (cf. Lakoff 2012, 2014). The formulation of such a hypothesis presupposes the existence of the neural level, which is one of three levels of embodiment of concepts. The *neural level* comprises configurations or, metaphorically speaking, *neural circuitry* characteristic of concepts and conceptual mechanisms at the neurophysiological level. This means that human concepts like colours or spatial relations, as well as human experience are embodied in the brain. Yet this level is not self-sufficient, it cannot fully explain the links of thought and language to the body, because neural circuitry functions in conjunction with the body as a whole that interacts with its environment. The *phenomenological level* is either conscious or accessible to consciousness. It includes all the things that we can be aware of, in particular our own bodies, mental states and the surroundings, together with our physical and social interactions. This is the level at which we "feel" experience

of the way things appear to us and of *qualia*, the distinctive qualities of experience such as the feeling of physical pain, the taste of food, the sound of music, or the colour of a flower. The *cognitive unconscious* stores the mental operations structuring and making possible conscious experience, including language comprehension and use. It makes use of and guides the perceptual and motor abilities of our bodies, notably those aspects that contribute to basic-level and spatial-relation concepts. It features all our unconscious knowledge and thought processes. All human cognitive mechanisms and structures, including all levels of linguistic processing from phonology to discourse are grounded in patterns of bodily experience and activity, which is why the role of the body at this level is essential. The three levels are interdependent. The nature of neural structure gives rise to cognitive unconscious and conscious experience. Together with experience of the world around us, it defines to a large degree the character of both concepts and language. (cf. Lakoff and Johnson, 1999: 102-104). Gibbs (2006: 40) stresses that all three constitute human personality with an identity and particular cognitive abilities.

The Neural Theory of Thought and Language (NTTL) depends on the discoveries made in modern neuroscience to take the findings of Lakoff and Johnson's theory of embodied cognition one important step further, to the level of neurocognition. Having shown that physical concepts could be understood via the sensorimotor system, that abstract concepts are embodied as image schemas or primary metaphors, as well as that complex conceptual metaphors are made of primary ones whose meaning is derived from bodily experience, the challenge has been to explore how the brain produces language and thought.

A general observation such as the one made by Feldman (2006: 8) that "thought and language are inherently embodied. They reflect the structure of human bodies and have the inherent properties of neural systems as well as the external physical and social environment" provides the starting point for NTTL. Another equally general observation follows from there: the brain does not make the distinction between abstract and concrete thought, from its perspective, they are both simply physical because thought processes are carried out by neural circuitry. This is the basis of the fundamental difference between the conceptual metaphor theory and its neural counterpart. While conceptual metaphor involves conceptualization of abstract notions

in terms of concrete ones, in neural metaphor theory, metaphors emerge in the form of neural circuits i.e. result from linking neural circuitry to other neural circuitry. Bringing together existing scientific knowledge and hypotheses based on neural computation, the theory states that the brain is structures by a multitude of metaphor mapping neural circuits that asymmetrically link distinct regions of the brain, allowing application of the patterns of reasoning originating in one region to apply to another, as part of a largely unconscious process. The circuits represent actual correspondences in real physical and social experiences starting early in life (cf. Lakoff, 2014). Primitive concepts like MOTION, CONTAINMENT or FORCE are hypothesized to have "a schema structure that mediates between embodiment circuitry and complex concepts that are expressed by linguistic structures in natural language" (ibid. 6). Elements of a schema e.g. SOURCE, PATH, GOAL in the case of the Motion Schema are neurally represented as *nodes* that linked together form a *neural gestalt*. Metaphorical thought and complex concepts such as INTO, incorporating MOTION and CONTAINMENT schemas result from *neural binding*, the process during which schemas in different parts of the brain are bound together. Generally speaking, neural binding is responsible for two or more different conceptual or perceptual entities becoming viewed as a single entity. Binding circuits are thus the main mechanism of neural composition, whereby complex concepts are formed. Primary metaphors are mappings of primitive neural schemas that take place when schemas are regularly activated together because of real-world experiences. Thus, the metaphor PURPOSES ARE DESTINATIONS maps the Motion Schema onto the Purposeful Action Schema and the individual submappings, experiential correspondences, such as MOTION that maps to ACTION or MOTION GOAL that maps to PURPOSE are reflected in the brain in the form of *nodes* occurring in different regions of the brain, but firing together. It is hypothesized that the nodes that fire together strengthen as a result of regular firing. Neural links are created as *neural activation* spreads out from each neuron along existing pathways growing stronger until the shortest pathway is reached. It is then that a circuit linking the two nodes is formed. The circuit represents the metaphor in the brain, while meaningful thought is realized as activation of neural simulations. Metaphoric thought is characterized by an asymmetric activation pattern, where activation takes the direction from source to target. Primary metaphors that structure the human conceptual system are acquired through neural learning mechanisms early on, commonly before language, simply by everyday functioning in the world. Crucially, experimental evidence appears to confirm

that metaphor circuitry connects source domain brain activation to the regions in the brain that guide the behaviour of the target domain[21] (cf. Lakoff, 2014, 2008). An additional neural learning mechanism, complementing the mapping circuits and the bindings is the best-fit condition, the activity based on the principle of conservation of energy, that is "maximize the activation of existing circuitry with strong synapses that takes the least energy" (cf. Lakoff, 2014: 8). The fact that the brain is a best-fit system (cf. Lakoff, 2008) and that "neural computation involves continuously finding a best match between the inputs and current brain state, including our goals" (cf. Feldman, 2006: 5) explains why complex metaphors favour certain entailments, i.e. why in the metaphor LOVE IS A JOURNEY, LOVERS are conceptualized as TRAVELLERS whose COMMON GOALS in life are DESTINATIONS. Primary metaphors too can form complexes, as shown by the simple example of into, above. More intricate instances incorporate numerous primary metaphors that because they are so deeply embodied are learned with ease, without noticing their complexity and despite the fact that they are embodied via many different brain regions. Like conceptual metaphors, linguistic metaphors combine via grammar and produce an unlimited number of metaphorical ideas that develop in context. For, example, a sentence like: "That's just not clear" activates the THOUGHT AS VISION metaphor system where UNDERSTANDING IS SEEING CLEARLY. Here too, the best-fit principle decides what gets bound together. Its role is crucial in ensuring optimality of blends that involve metaphors and neural binding across the source and target. Namely, maximizing neural binding via best-fit leads to a maximal integration of all the elements of blends: conventional frames, metaphors, common knowledge and context and emergent inferences (cf. Lakoff, 2014, 2008). As one of the latest developments, the theory of neural cascades defined as "two-way circuits linking diverse brain regions connected to the body, allowing meaning from multiple realms of embodied experience to "give meaning" to linguistic, gestural, and other aspects of form" promises to shed more light on the ways in which thoughts (complex metaphorical meanings) and language (linguistic or other kinds of complex form) are linked. The fundamental contribution of the Neural Theory of Thought and Language is the ability to show that in the brain there is no single module, in the Chomskian sense, in charge of language and thought. What is thought to be present are cascade

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[21] For example, Zhong and Liljenquist (2006) explored what they termed "the Macbeth effect", a pattern of behaviour where the perception of a threat to one's moral purity creates the need to clean oneself. An instance of the primary metaphor MORALITY IS PURITY shows that the correlation between the two concepts is so strong that it creates the impression that washing alleviates the effects of immoral acts.

circuits that link the many different regions in the brain and provide the neural foundations of human reasoning (cf. Lakoff, 2014).

However, there is another potential benefit of a theory like NTTL which makes it additionally relevant to our current topic of investigation. According to Feldman (2006: 338-340) "a powerful computational theory of language should lead to much better programs for human-computer interaction", a form of which would be talking to our robots. The author maintains that the likelihood of computers or robots achieving the full range of human experiences and linguistic ability is slim, precisely because of their lack of embodiment, even if every single molecule of the human brain could be simulated by a computer able to predict all measurable aspects of behaviour and physiological responses. This leads to the conclusion that since the basis of linguistic meaning is to be found in bodily experience and because our subjective experiences are beyond the reach of computers, the goal of establishing natural communication with computers can ever be fulfilled only partially. Some of the contemporary advancements in the field of application of artificial intelligence in conversational interfaces will be illustrated below. Summing up the impact of neural theories of language, it could be said that important steps are being made in the direction of providing empirical explanations of key phenomena analysed by cognitive linguists, namely, embodiment, processing and contextual features of primary and complex metaphors and blends. This cursory look at some of the main assumptions of the Neural Theory of Thought and Language closes the theoretical overview of metaphor.

The investigation of metaphor has been traditionally thought to dominate the field of cognitive semantics. The shifting of focus towards metonymy became visible towards the end of the 20th century and the literature on metonymy has continued to proliferate ever since. The main points of discussion include drawing a dividing line between metaphor and metonymy, the centrality of the role of metonymy in language and thought, along with a range of related topics of interest such as the grounding of metaphor in metonymy or the interaction between these two cognitive mechanisms (cf. Ruiz de Mendoza, 2014). Defining metonymy still remains a tricky issue with several competing views advocated by scholars. The first position sees metonymy as a conceptual mapping that occurs inside a single domain, with the "stand for" relation linking related parts of a domain or one part of the domain and the domain as a whole

or vice versa and performing a referential function based on contiguity. For example, in the sentence: "Room 5 rang", the butler is referring to its occupants and the relation *X stands for Y* is indeed referential. But it may not always be the case, as shown by Brdar (2009) who provides an example where *I'll be brief* stands for 'I will speak briefly.' Also, it may not always be evident whether the mapping is metaphorical or metonymical, because the domains get conflated, as in *correlation metaphors* (contrasted with *resemblance metaphors*[22]) like MORE IS UP. Namely, since QUANTITY and HEIGHT co-occur in our experience, the relation between them may be considered to be metonymic. Still, because it makes it possible to use the source to reason about the target, the conceptual link is metaphoric. Kövecses (2013) proposes that correlation metaphors arise from mental representations resembling frames, as part of a process that includes a metonymic stage.

From the second perspective, metonymy is viewed as a reference-point relationship (cf. Langacker, 1993), where one entity affords mental access to another related entity, which makes it possible to treat a wider range of phenomena as metonymic than the original referential approach. This perspective, chosen by Kövecses & Radden (1998) and Radden & Kövecses (1999) and their comprehensive taxonomy of metonymic relations and vehicles will also be applied in our investigation of metonymy in the sample of words related to mobile communications and in particular in the analysis of the meaning of emoji and emoticons. The third way of understanding metonymy as a conceptual mapping within the same domain focuses on the target as resulting either from expansion or reduction of the material from the source yielding two subtypes of the operation, *source-in-target* and *target-in-source* (cf. Ruiz de Mendoza, 2011).

The other issue concerning metonymy is its interaction with metaphor in the conceptual system. Referring to this interaction as *metaphtonymy*, Goossens (1990) identified a total of four directions of this process. Two are less productive (*metaphor within metonymy* and *demetonymization in a metaphorical context*) and the other two are frequent. For example, *close-lipped*, meaning silent is metonymic (*metaphor from metonymy*). But when it refers to someone who does talk, but does not give much away, the interpretation is metaphoric, because s the lack of information is understood in terms of silence (*metonymy within metaphor*). As the scholarly interest in metonymy

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[22] Grady (1999) endeavours to explain metaphoric statements like "Achilles is a lion" on the basis of the perceived common traits in the behaviour of the source and the target.

grew, Goossens account was refined and various sources of the metaphor-metonymy interaction were identified such as experiential correlation, pragmatic implication, category structure or cultural models that are all found to produce contiguity between domains (cf. Radden 2000). No examples will be provided here for the reasons of space, but some of these sources will be identified in the following discussion of mobile communications related terms from the sample. The influence of metonymy has also been found to spread to grammar (cf. Ruiz de Mendoza, 2014), but this area of research is beyond our scope as the current topic is limited to the lexicon. However, the general conclusion to be drawn on the basis of this sketchy account of the scope of metonymy must be that its presence is pervasive in the lexicon and beyond. This brings us to the claim that the role of metonymy in the conceptual system might be even more central than that of metaphor. The hypothesis put forward by Barcelona (2003: 31) that "conceptual metaphor is necessarily motivated by metonymy" has grown more popular over time. Littlemore (2015) illustrations of the central role of metonymy across disciplines and Denroche's (2014) General Theory of Metonymy showing the significance of metonymy in both linguistic and multimodal phenomena are among the more recent contributions to the exploration of the vital role of metonymy.

Closing this short illustration of the main theoretical approaches to metaphor and metonymy, let us reiterate that both metaphoric and metonymic activity in the human conceptual systems are very much entrenched in our conceptual system and conventional and therefore not immediately visible. But as soon as their underlying activity was discovered by cognitive linguists, these conceptual phenomena, especially metaphor became an attractive subject of investigation for researchers in other fields, from psychology and neuroscience to advertising, with growing evidence of the multimodal potential of metaphor, an area which overlaps with the current study.

Along with metaphor and metonymy, another essential cognitive mechanism staked the claim to centrality to the way we think and live. Therefore, our next topic will be analogy, the mental tool that has spent centuries under the analytical spotlight.

2.4 More mental leaps. Analogy and conceptual blending unbound. Analogy is the ingredient that contributes to and shares features with metaphors and blends that are products of the complex process of conceptual integration. It is the ability of the

mind first to spot patterns that tend to occur repeatedly, but incorporate different elements and then abstract variation in the constituents of the patterns i.e. form concepts that are later expressed in language. This kind of relational thinking is among the things that define us as human and different from other animals, with the exception of chimpanzees, the primate species able to identify some relational patterns after receiving training. Crucially, analogizing involves the capability to look beyond the sameness of shape and discern the identity of relations that develops naturally in children at a very young age. (cf. Holyoak, Gentner, Kokinov, 2001). Both analogy and metaphor require structure mapping, the existence of partial matches and projection of structure from one domain to another. Thus, both analogical and metaphorical transfer take advantage of the more familiar source domain to draw inferences about the target. The nature of inferences is such that they are plausible, although not infallible, which makes analogy a form of inductive reasoning. Before inferences can be drawn, a mapping must be established between the domains. Since mapping implies the existence of systematic correspondences linking the source and the target, repeated analogical reasoning could result in relational generalization and the formation of a more abstract schema. This makes analogy a cognitive mechanism that brings about conceptual change and a powerful ally in the process of making discoveries. Hofstadter & Sander (2013) point out that the kind of abstraction and recategorization involved in making a discovery is often not deliberate, leading to sudden eureka moments i.e. mental leaps arising from "letting one concept play the role of another", a versatile cognitive operation that they term *conceptual slippage*.

The study of analogy is an interdisciplinary field and, in psychology, the research has historically centred on psychometric measurement of intelligence, that is on proportional analogies, studied since Aristotle, that take the form A:B::C:D as a means of quantifying and defining intelligence by testing the ability of respondents to infer the missing term D as in EYE: VISION::EAR:? (where A:B is the source and C:D the target) [23] or the geometric shape to be placed in a 3x3 square matrix. Neuropsychological and neuroimaging investigations of reasoning are the arenas of more recent application of these two techniques (cf. Holyoak, 2005). In linguistics, analogy is considered to be closely affiliated with metaphor and similarity, so much so that a unified approach to them has been developed. However, due to its many types,

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[23] For a comprehensive selection of such verbal analogies see Rasulić (2016).

metaphor cannot always be considered to be a type of analogy, because it can convey not only relational information, but also object attributes or both at the same time (cf. Gentner, Bowdle, Wolff, & Boronat, 2001). Opposing the view that metaphor is a kind of analogy is the opinion that it is better described in terms of categorization (Glucksberg and Keysar,1990). The Career of Metaphor theory, formulated on the basis of experimental evidence that explains metaphor comprehension as a process during which the shift from comparison to categorization occurs as a function of the increasing degree of conventionality offers a way of reconciling the two positions. Namely, novel metaphors are interpreted as comparisons, based on relational similarity, because being new they have not been associated with a category. They are closer to *simile* – the relation formalized as *X is like Y*, while conventional metaphors are polysemous i.e. they can be interpreted either as instances of comparison or as categorization. The authors of this theory Bowdle and Gentner (2005: 199) provide the examples "Science is a glacier", as a novel metaphor, where there is a literal sense to *glacier*, but not yet a metaphoric one and "A gene is a blueprint" that is polysemous, retaining the link to *blueprint* in its "architectural plan" sense and the expanded meaning that includes "anything that provides a plan". Novel metaphors are thus horizontal alignments between the literal source and the target; conventional ones, on the other hand can be the outcome of such horizontal organization or be the result of categorization – vertical alignment of the source concept with the metaphoric target. The life cycle of metaphor, marked by progressive conventionalization continues with stock metaphors and ends in death which is said to have occurred in two cases. The first is when all associations of the target with the source concept have been lost, that is the source entities that were polysemous become homonymous, as in the dead metaphor illustrated by the sentence: "A university is a culture of knowledge" where the seemingly literal meaning of *culture* is linked to a specific heritage or society. However, this meaning used to be perceived as a metaphoric extension of another sense, namely "a preparation for growth" of microorganisms e.g. *bacteria culture*, but this connection got lost over time. The other case refers to the metaphors whose source concept no longer exists, e.g. *blockbuster* meaning "anything or anyone highly effective or successful", which used to refer to a large aerial bomb which could destroy an entire block of buildings. In spite of this difference, both variants of dead metaphors are treated as categorizations (ibid. 209-210). However, as pointed out by Gentner, Bowdle, Wolff, & Boronat (2001: 241) some metaphors end up becoming

"conventionalized systems of reasoning" useful when developing theories. One such case is THE MIND IS A COMPUTER metaphor, as part of which THOUGHT is conceptualized as INFORMATION PROCESSING, the BRAIN as a COMPUTER, where some MOTORIC and COGNITIVE PROCESSES are viewed as PREPROGRAMED and CONSCIOUSNESS comes to be regarded as a FEEDBACK phenomenon, in cognitive psychology, a discipline that makes use of computer science terminology to construct its theories (cf. Boyd, 1979: 486). The use of metaphors in science makes the traditionally emphasized pragmatic difference between analogy and metaphors, the former having explanatory-predictive and the latter primarily expressive purposes (cf. Gentner and Markman, 2003) not that sharp. A more precise and inclusive description has accordingly been proposed to allow metaphor to be used "in either explanatory-predictive or expressive-affective contexts". (cf. Gentner, Bowdle, Wolff, & Boronat, 2001: 240). In addition to higher structural versatility of metaphors, other differences between them and analogies include the fact that the term *metaphor* applies to both novel and conventionalized conceptualizations (cf. Lakoff and Johnson 2003), the contribution of metaphors to complex blends and their interplay with metonymy in blends (cf. Fauconnier and Turner, 1998, 2002) and elsewhere (cf. Goossens, 1990), Still, all these differences do not diminish the significance of analogy i.e. the ability to discern common relations and their patterns, which is manifested by the omnipresence of metaphors, a fellow structure-mapping cognitive mechanism. Gentner's (1983) theory aiming to describe the rules that govern analogy interpretation claims that analogy is a mapping of structural relations and not object attributes from source to target. If the number of shared features is not crucial, that makes the analogical matching of features implicitly selective. The focus is instead placed on the relational structure that can be transferred from one domain to another. Analogy, therefore, differs from other kinds of comparison in the number of relations and attributes mapped from the source to the target. Namely, *appearance matches* involve the overlap in object attributes only e.g. *number 6 looks like an upside-down 9*, while *literal similarity* requires an overlap in both attributes of objects and their relationships and *analogy* needs just an overlap in relations to create similarity. An *anomaly* occurs when neither kind of overlap is present (ibid. 159-161). In an analogy, it is not just the presence of relations that matters, their hierarchy counts too, as analogical similarities often rely on higher-order, e.g. causal, logical or functional relations (relations between relations) creating systematicity. Interconnected systems of relations are more important when drawing analogies than

isolated or independent matches. It is deep connections, rather than coincidences that make analogical inferencing, using the source analogue to make new assumptions a powerful reasoning tool. For an analogy to hold, the alignment between the two domains must also satisfy the requirement of structural consistency (one-to-one correspondences between mapped elements) and parallel connectivity (if elements correspond across domains the elements that are linked to them must also correspond, that is, matching relations must have matching arguments) (cf. Gentner, 1998). Focusing on the impact of pragmatics on analogy i.e. the ways in which current goals and context influence interpretation of an analogy, Holyoak and Thagard (1995) developed their Multiconstraint Theory, which delimits analogy in terms of three related constraints linked to similarity, structure and purpose, which analogical thinking has to satisfy simultaneously. Thus, the mappings that maximize similarity of elements and relations are favoured. Moreover, structural parallelism (manifested as one-to-one correspondences between the elements) and pragmatic considerations (the contribution of elements and relations to fulfilling goals and purposes) also drive analogy comprehension. The formulation of theories is accompanied by the development of computer models of how humans use analogy as part of a wider effort in cognitive science aimed at "the representation of knowledge within computational systems" (cf. Holyoak. 2005: 122). Since this area of research is far beyond our scope, just three models based on Gentner's and Holyoak and Thagard's theory will be mentioned here. The main differences between these and many other existing models of analogy processing are related to the constraints they incorporate. Thus, Structure Mapping Engine (SME) highlights structural constraints, the Analogical Mapping by Constraint Satisfaction (ACME) model reflects the multiconstraint theory where the three above-mentioned factors are taken into account when determining the optimal mapping. Learning and Inference with Schemas and Analogies (LISA) is another model based on the multiconstraint theory, however, it also incorporates realistic psychological and neural constraints on working memory that is expected to be of critical use when manipulating structured representations of knowledge as part of analogical reasoning (ibid. 127-136). The analogy between human and computer information processing is built in the foundations of cognitive science, the interdisciplinary study of the mind that according to Gentner, (2002), "embodies a convergence of cognitive psychology, cognitive development, artificial intelligence, linguistics, cognitive anthropology, cognitive neuroscience, and philosophy" making

the development of computational models of different elements of analogical reasoning a lasting source of research interest in this field.

Before illustrating the effects of analogy in language, its role in the creation of mental models deserves a special mention because of the significance of mental models in general and in the context of developing human-computer interfaces in particular. Mental models are used when reasoning about external reality – the physical world. Forbus (2001: 33-34) attributes the centrality of the issue of mental models for cognitive science to the fact that they "appear important in reasoning about complex physical systems, in making and articulating predictions about the world, and in discovering causal explanations for what happens around us." Complex physical systems include contemporary computing devices and, in relation to technology, mental models refer to people's understanding how things work (cf. Norman, 2013), as they do in general with reference to all other kinds of things (cf. Collins and Gentner, 1987). Reasoning about the world via a mental model involves mental simulation and does not rely on logical reasoning. Holyoak and Thagard (1995: 32-33) point out that seeing an activity in the real world e.g. *a dog running* and calling up a mental image of it produces intricate patterns of electrical and chemical activity in the brain. While there may be no grounds for supposing that the pattern actually looks like a running dog mental image, it is reasonable to assume a degree of isomorphism between the two, so that the change to *a dog resting* would result in the corresponding change in brain activity. Analogy takes mental activity further by building isomorphism between two mental models, one of which is familiar and another unknown.

Summarizing the role of analogy, Hofstadter & Sander (2013: 3) refer to it as "the fuel and fire of thinking", because it provides the foundations of our ability to create concepts, that are in turn selectively evoked by analogies. Being key to thinking and reasoning, analogy features prominently in a very broad range of cognitive processes and their outcomes, including metaphor and blend creation, translation, design, humour, politics mathematical problem-solving, decision-making and learning in general, etc. Hofstadter (2001) and Hofstadter and Sadler (2013) hold that metaphor and analogy are the same phenomenon and that rather than being metaphorical, all language and communication occur via analogy, which marks all lexical items, from single words to adverbial and stock phrases to categories without a linguistic label

comprising non-lexicalized concepts activated in situations where people produce analogies in a spontaneous manner when faced with new situations that have an impact on their personal universe or the world at large. Activation takes place provided that the old and the new situation are implicitly perceived as sharing the same structure at a deeper level. The view of analogy as an all-encompassing conceptual phenomenon may not be universally shared, but the depiction of humans as "compulsive category-extenders, insatiable tourists who cannot get enough of the world of categories, old hands at semantic slippages, similarity-spotters par excellence, and last but not least, inveterate abstractors" (cf. ibid. 254.) can hardly be regarded as inaccurate.

The linguistic relevance of analogy is many-sided; it drives language change motivated by extension of regularity and simplification (e.g. the replacement of Latin plurals with regular English ones: from *stylus – styli* to *stylus - styluses* or strong verbs turning regular, as in *molten*, the former past participle of *melt*, getting replaced by *melted* by analogy with verbs ending in *-ed* such as *work/worked*, etc. In this case, the older form survived, but underwent specialization of meaning (e.g. *molten lava*). In this role, it is a diachronic process whose influence will not be discussed further, as it is unrelated to the current subject. On the other hand, the synchronic significance of analogy in the realm of word-formation i.e. category extension is profound. It yields rule-bending formations where there is no pre-existing mould into which the new word can fit and the coinage relies on precedents, individual lexemes e.g. *white hat hacker* coined after *black hat hacker*. The boundary between analogical and rule-based formations is not clear-cut, as their productivity varies from isolated instances and splinters like *docu-* referring to documentary programme e.g. *docudrama, docusoap, docucomedy, docu-fiction*[24](where the influence of analogy is clearly felt in the move from a blend like *docutainment* to a somewhat productive splinter), to prolific elements like *-aholic/ -oholic* used as a suffix, denoting "a person excessively fond of something"[25] e.g. *workaholic, computerholic, trackaholic* or indeed the highly productive *e-*, the shortening of *electronic* signifying "types of information or transaction in digital electronic format, frequently transmitted over computer networks such as the Internet" [26] . The examples such as *e-banking, e-commerce, e-journal, e-tailing*

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[24] The examples of *docu-* retrieved 14 November, 2015 from http://www.affixes.org/d/docu-.html.
[25] The definition and examples of *-aholic/ -oholic* retrieved 14 November, 2015 from http://www.affixes.org/a/-aholic.html.
[26] The definition and examples of *e-* retrieved 14 November, 2015 from http://www.affixes.org/e/e-1.html.

(electronic retailing) show that it looks like a true prefix; what's more, it gives rise to further analogical formations like *m-commerce* (*mobile commerce*). Analogy, thus proves to be a rich source of lexical creativity that has a considerable influence on other semantic strategies actively used in the field of mobile communications, namely, metaphor metonymy and conceptual blending, whose features will be reviewed next.

Conceptual integration, also known as conceptual blending is an elaboration of the mental spaces theory that in many ways relies on the conceptual metaphor theory, including sharing the view that the nature of metaphor is both linguistic and conceptual and the awareness that metaphor allows systematic projection of content (language, imagery and inferential structure) between the two domains (cf. Grady, Oakley & Coulson, 1999). Conceptual Integration Theory proposes a more elaborate framework that broadens the potential of domain-based cognitive operations by contributing a crucial new element, "conceptual integration networks" (Fauconnier and Turner, 1998) in which mapping occurs between mental spaces instead of domains. Mental spaces are temporary "very partial assemblies constructed as we think and talk for purposes of local understanding and action" (Fauconnier 2007: 351) structured by *framing* – organizing elements and relations within a mental space as an already known package, a *frame* (cf. ibid. 352) and by cognitive models be they metaphoric, metonymic or of some other kind. Created in real time, in the course of processing information, mental spaces differ from domains, which are more permanent systematic and stable. A mental space in which a group of colleagues leave the office to participate in a team building exercise at the local spa resort, for example, would be framed by a car ride covering the distance between work and the resort. It would also include a frame of following the routine of team-building exercises and numerous other frames that such a situation implies or may imply when we think or talk about it. In a sentence like "The pressure was building on the team to provide a feasible business plan by the next board meeting" that is interpreted metaphorically, a space would be created where we would mentally picture a group of people as literally feeling pressure. The bodily sensation of feeling pressure constitutes a fraction of the domain necessary to build the metaphor, but that small, transient mental space fits into and is structured by the inclusive and permanent body of knowledge characteristic of that domain (cf. Grady, Oakley & Coulson, 1999). Metaphoric mappings and frames reside in long-term memory, while ephemeral mental spaces exist in working memory, Once the elements

and relations that make up a mental space become packaged as frames, these newly-formed frames can be committed to long-term memory and called up to working memory as required by the context (cf. Fauconnier and Turner, 2002: 102). Mental spaces bring all kinds of background information, such as previous experience of the feeling of pressure in the above example. Fauconnier (1994) maintains that mental spaces have an important role in the so-called "backstage cognition" taking place behind the scenes of everyday activities of speaking and reasoning. The universal principles of backstage operations applied to pragmatic situations generate meaning constructions, with grammar acting as a link between backstage cognition and visible human behaviour. Following the requirements of efficiency, language gives minimal but sufficient clues for making constructions fitting the given context and speakers must rely on background knowledge, cognitive principles and the context at hand to supply the details left unspecified by grammar that are necessary for the requisite meaning construction to occur.

The cross-space mapping that takes place in the conceptual integration networks goes beyond producing just conventional or novel metaphoric relations that go in one direction only. Rather, the blending theory aims to explain issues related to the dynamic aspects of meaning making, as well as diverse non-linguistic phenomena with the help of the notions of mental spaces and framing. A functioning blend requires a minimum of two *input spaces* (which would belong to the source and the target in the Conceptual Metaphor Theory) containing information from distinct domains that make the creation of a generic space possible. The *generic space* features the structure, typically more abstract that all input spaces have in common. That structure is mapped on each of the inputs and it determines the essential cross-space mapping between them i.e. the cross-space counterparts in the input spaces. The *blend* or *blended space* incorporates the elements of both or, if the blend is more complex, all input spaces that are partially projected onto it. Crucially, the blend has emergent structure, information not present in any of the inputs. That new meaning is derived during the comprehension stage. There are three mutually related scenarios for the creation of emergent structure – *composition*, the projection from all the inputs, i.e. the cross-space mapping between them that creates new relations previously non-existent in the individual inputs. It is followed by *completion*, which makes use of background knowledge, context, culture and cognitive models as sources of additional

structure necessary to complete the blend. The blend is complete when the combined structure projected into the blend from inputs spaces becomes perceived as part of a more comprehensive emergent structure. In other words, completion takes place when the structure in the blend corresponds to the information in long-term memory. *Elaboration* involves real-time processing that produces the structure unique to the blend resulting from the fusion of the elements projected in the two input spaces in the blended space. This amounts to imagining or mentally or physically simulating the event in the blend, also referred to as *running* the blend (cf. Fauconnier, 1997, Grady, Oakley & Coulson, 1999, Coulson. & Oakley, 2000, Evans and Green, 2006). Following the description of the basic characteristics of blends, another facet of the conceptual integration theory should be highlighted. Namely, blending gives a richer account not only of complex metaphors, but analogies and metonymies as well.

Since the present illustration of blending aims to highlight the features of this crucial cognitive mechanism, while staying close to the subject matter of this dissertation, the computer virus analogical blend presented in Fauconnier (1997) and Fauconnier and Turner (2002) will be described and expanded here by mentioning some of the more recent incarnations of this dangerous digital phenomenon, which is fitting since the authors used this example to illustrate how new material is organized by extending conventional categories. Before examining the blend itself, it's worth taking a look at the development of the analogy that produced the notion of *computer virus*. The analogical transfer involves using the terms from the domain of medicine and biology to refer to a phenomenon belonging to the sphere of computing. The mapping of viruses onto unwanted dangerous software that replicates itself and damages or erases files and vaccines onto the software that is meant to act as an antidote or medical doctors onto computer specialists working to stop and counter the effects of a destructive program, etc. is clear and quickly accepted by the non-specialists who appreciate the useful and easily understandable parallels between the two situations. However, Fauconnier (1997:19-23) points out that even such a seemingly straightforward process is in fact complex and reflects the procedures applied elsewhere in the human conceptual systems. The above correspondences and other parallels, such as the need to protect the system against intruders are not isolated features but part of an integrated schema comprising individual schemas, namely, CONTAINER, PATH, CAUSE, force dynamics. Thus, the system is conceptualized as a

container that viruses find the way to get into; users fight viruses back or prevent them from getting in. To quote the author:

"A good part of the schema has widespread application in social life: keeping allegedly harmful intruders out of established groups, worms out of apples, spies out of the military, the Trojan horse out of Troy…"

Consequently, social life, like the domain of health is a source of the computer virus-related vocabulary. There is a class of malicious software known as *worms* (a certain worm manages to burrow into Apple's mobile devices, as will be shown below), *spyware* is a constant threat to online privacy, *backdoor* or *back orifice* is an often malicious program able to access the system by bypassing security, and of course *trojans* are notorious viruses. The partial structure mapped from the health domain happens to fit the generic characteristics of the computer scenario very well, which makes the analogy felicities. Moreover, the existing widely used analogies between machines and biological life in general and especially humans facilitate the mapping. The resulting schema arrived at via inductive reasoning is highly abstract and free from technical details that otherwise define the fields of health and computer science. This is precisely what makes the schema appealing to ordinary people who can understand the issue to which it applies, without any specialist knowledge. This high level of abstraction makes the interpretation of intricate processes and phenomena metaphorical. The next step sees the process of categorization of the target domain and creation of new conceptual structure through analogy at work. Different kinds of software become categorized as *viruses* or *anti-viruses*, the activity of removing a virus becomes *disinfecting*. This boils down to building the domain so that it fits the mapping. This dynamic of category and conceptual structure creation is manifested in language by application of the source vocabulary to the target, as in the examples above. The transfer is still felt to be metaphorical since a piece of software is not actually a virus, nor is the computer strictly speaking infected. In the final phase that follows, the subjective, metaphorical barrier between the name and the thing it refers to disappears and the new subjective perception allows calling pieces of computer code viruses and feeling that is what they really are. This does not make the metaphor dead, rather it makes the analogy alive and very much part of the conceptual system and grammar which enables speakers to conceptualize computer viruses directly, without calling up the source domain of biology and still access the desired properties of that domain. This has been made possible by the inherent projection of such properties onto the

target and the connection to the abstract schema that set analogizing in motion in the first place. But the meaning of the term *computer virus* also gets transformed in the process, acquiring the properties absent from any inputs and present in the target only, which is an indicator that an analogy-based metaphor has become a blend. The final outcome of blending may be polysemy when a term is no longer felt to be connected to the metaphor or blend and the word is perceived as having two different meanings: microscopic biological life form and computer software.

The permanent category extension brought about by the blend happens in the domain of study of artificial life. Although they are not alive by any biological standard, computer viruses show many of the characteristics of living beings and increasingly humans. For example, the latest ransomware type of malware encrypts all documents found on the infected computer or mobile device, replaces desktop wallpaper with a ransom note and speaks to the victim in a synthesized nearly human voice demanding payment in exchange for decrypting the data. *Ransomware* is another example showing that the integrated schema of the virus blend has applications in real life, specifically in the distressing and potentially life-threatening experience of being held for ransom. The input spaces of this double scope blend are organized by the frames *computer* and *biological virus* respectively. In the 20th century this new category emerged from unrelated situations, the first created by hackers writing malicious software code intended to interfere with the normal functioning of computers and the second by scientists coming up with programs simulating the evolution of life forms on a computer. Initially the blended concept was rather weak and the cross-space mapping was based on the following vague correspondences between viruses and hackers' programs, namely, the presence of an unwanted element, the ability of the element to replicate, its disrupting the functioning of the PC, as well as the fact that it is harmful both to the machine and its users. The integration network was quickly established and produced a new entity *computer virus* and moved from modelling life to the study of the tools (algorithms) that allowed the modelling to take place and the notion of *artificial life* to appear. This new concept from the domain of computing is still felt to be distinct from biological life, while sharing more and more of its fundamental features. The non-categorial blend of computational processes and biological life reached the stage where it became richer and more integrated, offering new insight into the category of life itself. Life has become something different and unexpected.

For now, *computer virus* and *artificial life* are still separate categories, but the moment when a possible megablend, combining several blends and incorporating *biological life, computer virus* and *artificial life* would arise creating a significant scientific category may not be that far away (cf. Fauconnier and Turner (2002). As a product of a relatively straightforward analogy, *computer virus* is an instance of one-sided blend (cf. Coulson, 2001). But the varieties of blends are numerous and can feature many bindings between different elements, as the projection of inferences flows in several directions. These complex configurations allow a fuller interpretation of intricate metaphors, whose implications are not rooted in either source or target domains. One such example is the Menendez Brothers Virus blend analyzed by Coulson (ibid.) as part of the argument against the undue focus placed by cognitive semanticists on understanding one domain in terms of the other and consequently examining the manner in which inferences from the source are used in the target. Nevertheless, the ability to set up connections between counterparts with a common relational structure across distinct domains and establish productive integration in blending is equally basic in humans as one-directional cross-space mapping. The projection from the blend to the inputs – retrospective projection – appears to be the purpose of some blends, particularly those that yield jokes, like the one where the computer virus blend is humorously expanded to refer to the actions of the Menendez brothers who stood trial for murdering their parents. The joke goes like this (ibid: 179):

Menendez Brothers Virus: Eliminates your files, takes the disk space they previously occupied, and then claims it was a victim of physical and sexual abuse on the part of the files it erased.

To understand the joke the reader needs to be acquainted with the controversy generated by the trial and the defence of the brothers, who claimed to have murdered their very rich unarmed parents because of the physical and sexual abuse to which their parents subjected them since childhood. Some people believed their defence to be persuasive, while others questioned their true motives in the light of the large estate they inherited. The blend functions at different levels and the directionality at each is different. Namely, the first level requires the correct mapping of human actions onto computer operations and elements of the interface i.e. linking parents to files, file elimination to murder, disk space to the property owned by the parents and virus to the brothers. Therefore, the impact of a computer virus, which is the target is explained in terms of the criminal trial that received broad media coverage. At the same time, the

blend requires understanding of the criminal case and allows drawing inferences about the defendants, that is, the creation of the humorous effect by emphasizing the absurdity of the brothers' defence by likening their gruesome act to the effects of a malicious piece of code. The asymmetric topicality of metaphors is preserved because the blend operates at two different levels. Another peculiarity of this conceptual integration network is that the same connections and the same participants invite inferences in two directions. As it is simultaneously possible to make inferences about the virus as well (such as the ability of the virus, confined to the blended, joke space, to claim to have been an abuse victim) the network is two-sided and aspects in each input can be highlighted. Moreover, the topic of the joke is not the target domain of computer viruses, but the controversial source domain – the trial of the Menendez brothers (cf. ibid, Grady, Oakley and Coulson, 1999). The highly dynamic and flexible nature of the conceptual integration process makes additional modifications of the joke possible, whereby particular construals of the input spaces are foregrounded. Coulson (2001) further explores two opposing framings of the Menendez brothers' situation, namely, their being either the victims or the authors of the conspiracy to kill their parents and shows that the joke changes its meaning fundamentally by reversing the order of the mappings. These will not be reviewed here due to the lack of space, instead the role of metonymy in conceptual blending will now be considered.

Just like analogy and metaphor, metonymy too can feature prominently in conceptual integration networks. Examining its role, Coulson and Oakley (2003), provide the example of a headline reading: "Coke Flows Past Forecasts: Soft drink company posts gains", where there is a metonymic link between the company and its product, the beverage of the same name. As the authors point out, in the case of *Coke*, the metonymic mapping does not take place within a blended space. Instead, there is a mapping to the blended concept. This shows the shortcomings of viewing metonymy as a purely referential phenomenon. The blend for this example has two spaces, the beverage (soft drink) space and the company space. the drink and the company are linked by the conventional metonymy establishing correspondences between the producer and the product. Apart from the company itself, there are additional elements in the company input space: the profit actually generated by the company over a period of time and the profit forecast for that period. Another conventional metonymic mapping connects the company to its profits. In the blended space *company* is linked

via the identity connector to *beverage* in the beverage space and via metonymy to *profit* in the company space. The blended space contains the partial structure of the inputs and its own emergent structure. Thus, in the sentence above, *Coke* is understood both as a liquid and as a company that has generated a higher than forecast profit. Furthermore, the blended properties of *Coke* contribute to the construal of the relationship between Coca Cola's actual and forecast profit. The verb *flow* is used to depict the otherwise purely mathematical relation between two sums of money, in terms of subjectively perceived or abstractly represented fictive motion (cf. Langacker, 1987, Talmy 2000). The fictive motion schema, with the trajector moving along an abstract path with a reference point provides the third input space in the blend. A series of mappings take place, among which those between profit and trajector and forecast and landmark. The former is mapped onto *company* in the blend and the latter onto *forecast profit* in the blend*,* which allows the conceptualization of the relationship between actual and predicted profit as fictive motion of the blended element *company* (fusing *beverage, profit* and *trajector*) past the blended *forecast profit* element (fusing *forecast profit* and *landmark*). The construal of fictive motion is afforded by the interlinked metonymies connecting producers and products and companies and the profits they make. This is another illustration of the use of metonymy to highlight salient features in the source domain to add particular weight to the ensuing inferences. The *Coke* example is an instance of combining several inputs in new ways (cf. Coulson and Oakley, 2003).

The complexity of configurations of conceptual integration networks can vary considerably, each featuring a number of mental spaces and conceptual domains combined with local context. The meaning may depend on several spaces and may not be contained in the blended space, evolving as a result of repeated modification of spaces, domains or frames and the links between them; successive blending may also occur, resulting in multiple blends (cf. Fauconnier and Turner, 1998, 2002). Irrespective of their structural makeup, blends tend to be motivated by the ability to fuse several events into a single one and the nature of the relations between the counterparts has no influence on this process (ibid). The elements contained in the input spaces can be related in a variety of ways that are defined by *vital relations* including identity, part-whole, cause-effect, similarity, time, space, change, analogy, disanalogy, etc. These relations exist in the space between the inputs and tend to be

compressed in the blended space. Fauconnier and Turner (2002) illustrate recurrent compression patterns. Namely, cause-effect relations frequently get compressed into part-whole relations in the blend. Likewise, a single constituent in the blended space can be mapped onto several constituents in the input spaces and a number of vital relations are susceptible to compression into uniqueness. These are category, and role, part-whole, cause-effect or representation, among others. One of the simple examples would be showing someone a screenshot of the homescreen of one's phone on a PC display and saying: "This is my homescreen", whereby the screenshot image and its actual counterpart are fused into one and the same entity in the blend. Moreover, one thing may be "become" another when compression acts upon another vital relation – representation, for example a child playing with a toothpick at the table might exclaim: "Look at my might sword! Again, two separate entities are blended as one comes to represent another. Analogy, metaphor and metonymy, the cognitive mechanisms that contribute to conceptual integration networks are devices of compression, which is also one of the mainstays of blending, because it can squeeze large conceptual structures into cognitively more manageable chunks of content resulting in what Fauconnier and Turner refer to as "achieving human scale". Coulson and Oakley (2003: 61) describe the role of metonymy in relation to compression in the following way: "Metonymic language can thus be construed as referring to compressed elements in blended spaces, while conventional metonymies help speakers to unpack mappings from the compressed element in a blended space to its various counterparts in the input spaces in the integration network".

The taxonomy of integration networks presents a continuum, with four prominent types ranging from most basic to those that are behind the human capacity to achieve stunning evolutionary feats. *Simplex networks* feature an elementary set of connections between the two inputs, where the KINSHIP frame from only one of them structures the whole basic framing configuration. These networks exploit the role-value vital relation, with roles like UNCLE and NIECE in one space, and values JOE and GINA in the other, as in the sentence: "Joe is the uncle of Gina". The generic space is reserved for gender-specifying elements MALE and FEMALE, while, vital relations get compressed into UNIQUENESS in the blended space, so that JOE can be identified as UNCLE and GINA as NIECE. In a *mirror network*, all elements – the inputs, generic space and the blend share the same organizing frame. In the sentence: "By the end of his tenure, Balmer

was way below Gates", two former CEOs of Microsoft, Steve Balmer and the founder of the company, Bill Gates are competing in terms of public image and popularity. The inputs are Balmer and Gates' respective tenures as CEOs, they are mapped onto each other and, in the blend. The CEOs share the frame where they are pitted against each other. *Single-scope networks* have inputs that incorporate a distinct frame each, and only one of the frames is projected onto the blend. Take for example the statement cited from the 2014 interview that Finnish Prime Minister, Alexander Stubb gave to CNBC (cf. Clinch, 2014): "A little bit paradoxically I guess one could say that the iPhone killed Nokia and the iPad killed the Finnish paper industry, but we'll make a comeback". One input space, referring to fighting, contains elements such as opponents, blows or shots and fight to the death and the other, referring to business contains Finnish national assets (Nokia and paper industry) on the one hand and Apple devices (iPhone and iPad) on the other. The blended space is structured by the fighting frame and in the metaphorical blend Apple devices killed both the former most famous mobile phone brand in the world and the entire paper industry of Finland. However, according to its Prime Minister, the country was not ready to go down without a fight. Today we know that it fought a losing battle. As pointed out by Evans and Green (2006: 428) describing the general structure of this kind of blends, the organizing frame is itself a blend congaing the existing relations between the spaces, including TIME, SPACE and IDENTITY, which get compressed in the blend, allowing the metaphorical interpretation of the statement. Namely, the mapping between the source and the target in the metaphor is part of an integration network that produces blends. However, while compound metaphors like BUSINESS IS MORTAL COMBAT or resemblance metaphors can be considered blends, primary metaphors are unlikely to be categorized as blends because they are based on correspondences between concepts, entities smaller than entire domains. Arising from highly salient experiential correlations, primary metaphors bring about pre-conceptual linking operations rather than matching activity, which takes place at the conceptual level. Still, primary metaphors are valid input in the blending process (ibid: 437). Double-scope networks are the most sophisticated conceptual integration networks consisting of inputs, each with a different organizing frame, whose parts are selectively projected onto the blend and used in the new emergent structure. A prominent feature of these blends is the possibility of clashes because the blend can incorporate incompatible structure coming from the inputs. This may lead to novel, imaginative and creative solutions. One such

blend is THE COMPUTER DESKTOP (cf. Fauconnier, 1997, Fauconnier and Turner, 1998, 2002), which in many ways provides the starting point for the present investigations of the metaphors of mobile communications. It is also one of the instances of blending outside linguistics, as this conceptual strategy is applied in the realm of interface design. The integration network includes two input spaces, the space with traditional computer commands, such as, *find, save* and *print* and the space with everyday office work and the rooms and objects associated with it, like offices, desks, documents file cabinets, files and folders. The cross-space mapping connects computer files to paper files, directories to folders, etc. The generic space contains a more schematic and abstract notion of information that forms part of larger information sets and is movable between them. The coherent and familiar emergent structure results from selective but extensive projection of elements from the inputs to the blend. In that structure, computer commands are no longer typed. Nevertheless, the conceptual structure of the office environment facilitates running the blend and does not affect the users' awareness that they are executing computer commands. The integrated activity in the blend is quite novel with motor activity different from that in the inputs. Although the creativity of blending stems from clashes between the element, as pointed out by Fauconnier and Turner (2002: 24) the choice of discordant structures to be projected to the blend is far from arbitrary. The incompatibilities that have no undesired consequences are tolerated, like having the recycle bin / trashcan on the desktop, which is different from the real-world situation, while some more serious cases of mismatches are regarded by users as disturbing (cf. Rohrer, 1995). Every mismatch, no matter how pronounced violates some of the constraints that when in place make blends well-integrated. It was the nature of these constraints or rather the apparent lack of them that led to voicing critical opinions of the conceptual integration theory.

Following criticism from the point of view of cognitive psychology including Gibbs's (2000) remarks concerning, notably, the refutability of the blending theory, which is more of a general framework than a single theory that can be proven or falsified, its considerable breadth and *post hoc* nature (i.e. reliance on private intuitions of theorists, rather than on experimental evidence, which is said to be a weak point of the conceptual metaphor theory too), as well as the lack of flexibility of its procedures that tend to apply to specific instances, instead of being applicable to diverse circumstances (for answers to critical remarks from Gibbs and others see Coulson and

Oakley, 2003), Fauconnier and Turner (2002) refined the optimality principles or constraints that ensure effective functioning of blends (cf. Fauconnier and Turner, 1998). The fine-tuned system of constraints is composed of two sets of principles. The first set, *constitutive principles*, defined by Fauconnier and Turner (2002: 310) as "the 'structural and dynamic principles of conceptual integration' – partial cross-space mappings, selective projection to the blend and development of emergent structure in the blend" impose strong limitation on cognitive, physical or social activities because these principles state their rules and goals. But every activity is much more than a set of rules; once it has been developed, the much richer emergent structure introduces further constraints. This second set of limitations is known as emergent, *governing* or *optimality principles* that blends must satisfy in order to be successful. These two kinds of interconnected constraints are said to influence human behaviour in general, including language, where grammar and vocabulary play a constitutive role and governing principles determine what we say, when and to whom, as well as the circumstances of the exchange (ibid. 310-311).

In what follows, optimality principles and pressures on blending will be illustrated using the example of the COMPUTER DESKTOP blend (cf. Fauconnier and Turner, 1998, 2002, Terkourafi and Petrakis 2010). The *topology principle* states that the topology (the structure of inner and outer-space relations shaping the inputs) must be preserved in the blend. In practice, that most often involves projecting the relational structure that exists between input spaces onto the blend. Therefore, abiding by the topology principle would preclude the appearance of the trashcan on the desktop. But, since that would lead to the disintegration of the entire blend, the topology is relaxed, the trashcan remains on the desktop. The non-disintegration pressure proves to be stronger than the topology constraint. *Pattern completion* requires recruiting a frame that adds structure to the blend, so that the process of running the blend could be completed. This means enabling knowledge transfer between the two domains, in this case, for instance, in both input spaces documents can be stored in folders, searched, copied or thrown into the trashcan. The connection to the familiar real-world objects from the office setting makes predicting the causal relationship between particular objects and actions possible. It also makes the interface intuitive and easy to master by new users. According to the *integration principle*, the blend as a whole should be a tightly integrated unit and integration should be present in all its constituent spaces as

well. In another case, where integration outweighs topology, neither the trashcan nor any computer folder can ever become full. In general, as any other piece of computer data, they can occupy as much space as there is free space on the hard drive. Here too, users are ready to overlook a measure of inconsistency, as long as that does not affect cross-space mapping and contributes to the goal of the DESKTOP blend, which is to "develop a conceptual basis for extended action" (cf. Fauconnier and Turner, 2002: 340). *Maximizing vital relations* means highlighting the links inside the blend and reflecting them in their outer-space counterparts, while minimizing the role of the elements that are different or not linked. The *web principle* holds that manipulating the blend as a unit must preserve the requisite connections to input spaces. A curious notoriously counter-intuitive design solution in the early Macintosh graphical user interface that sanctioned the use of the trashcan both as a container storing discarded files and as a means of ejecting floppy disks (by dragging the floppy icon to the trashcan and dropping it there, which would, in the case of any other file be equivalent to deletion) violets, the principles of topology, integration and web at the same time. Namely, using the trashcan for two quite different purposes goes against the principle of integration. It also disregards the topology of the office input space by making the trashcan a device for floppy disc ejection. The web principle is not respected either, because due to an infelicitous connection between the input spaces, floppy disks are found either inside or outside the computer space and office space respectively, depending on whether they are ejected via the trashcan or used as a storage medium during a computing session (ibid. 341). Even such a gross incongruity, felt at multiple levels had been put up with by users who needed additional mental effort to come to terms with it. As before, the reason for such high tolerance of actions that are the opposite of user-friendliness is the need to maintain integration of the blend. The controversial feature was replaced by a more natural way of ejecting disks in the subsequent iterations of the operating system, making the DESKTOP blend less susceptible to violations of the optimality principles. The *unpacking principle* refers to the ability to "unpack the blend" i.e. reconstruct all its elements: the inputs, the cross-space mappings, the generic space and the connection between all spaces just from the blend. Terkourafi and Petrakis (2010), like Imaz and Benyon, (2007) or Kaptelinin and Czerwinski (2007) before them observe that the multiplication of tasks performed by computers and the diversification of the target group of users over the years have led to questioning the applicability of the DESKTOP metaphor. They point out that if the

knowledge transfer from the office domain can no longer accommodate the wide range of contemporary uses of computers that limits the predictiveness and intuitiveness of the metaphor and demands new actions or expansion of meaning of the existing ones, as well as new special conventions to be assimilated by users. That, in turn, threatens the stability of the web of connections in the blend by causing repeated reference to the inputs and invites unpacking, undermining the integration principle as well. The *relevance* (formerly *good reason*) *principle* states that all its element should be relevant to the blend. In other words, there must be a good reason for inclusion of an element into the blend. Also, outer-space relations between the inputs significantly contributing to the network should be compressed within the blend (cf. Fauconnier and Turner, 2002: 333). Among the pressures present in the DESKTOP blend is the requirement to avoid *backward projection*, as projecting the trashcan back on the actual office desktop would lead to inefficient use of the stratagem in the real world (cf. Fauconnier and Turner, 1998: 178). This brief look at the constraints of the blending process has brought to light its dynamic nature focused on fulfilling the central goal – achieving human scale, which in the field of human-computer interaction means intuitive use of complex machines, as well as the subgoals of blending, namely, compress what is diffuse, obtain global insight, strengthen vital relations, come up with a story, and go from many to one (cf. Fauconnier and Turner, 2002). The subgoals work together, primarily towards the main aim of attaining human scale and also maintaining compression and providing global insight as signature features of blends. The reason why complex integration networks are effortlessly understood and manipulated by humans may be traced back to the fact that vital relations defining the relationship between the elements in the inputs have their foundations in human neurobiology (cf. Fauconnier and Turner, 2000). Likewise, Grady (2000) posits that the origin of operations involved in blending, namely, completion, composition and selective projection could be explained via their respective neural and cognitive counterparts: spreading activation, binding and inhibition. Compression and global insight are conceptual integration phenomena closely related to such key processes as causal reasoning and evolutionary development. The ability to view highly integrated complex events as a series of successive more basic events, linked by the cause-effect relation, where each step stems from the previous one or leads to the next one, culminating in reaching a logical conclusion, encapsulated in Aristotle's theory of causality provided the foundation for cybernetics and contemporary

computing. Causal chain formation is complemented by its opposite, global insight - the ability to understand the situation as a whole. Grasping cause and effect as a unified whole drives evolution by allowing quick comprehension of both advantages and dangers of a set of circumstances, e.g. when survival depends on the correct fight-or-flee response. Global insight is also at the heart of perception, which is itself the consequence of an interchange between the brain and the surroundings. Uniting the effect of perception with its causes gives rise to emergent meaning, where the effect becomes perceived as being located in the cause. In other words, the properties of an object e.g. colour, shape, size of a book are felt to be its intrinsic, objective features (cf. Fauconnier and Turner, 2000, 2002). However, according to Hoffman (2008, 2011, 2015), Hoffman and Prakash (2014), Hoffman, Singh & Prakash (2015) and Deception Epidemic (2015) , human perception and consciousness are not even a necessarily partial interface between ourselves and the environment. This is the point to which we will return later. The same can be said of our sensory perception, where the integration of cause and effect that produces the sensation of pain can, for example, also produce the phantom limb phenomenon experienced by amputees. Evolution thus constrains us to "living in the blend" in key ways related to causal reasoning that often happen below the threshold of consciousness. On the other hand, endeavours like scientific analyses and learning the skills requiring expert knowledge demand the opposite approach, unpacking the blend, and access to the entire integration network, so as to be able to follow the path of reasoning, so to speak. But once expert knowledge has been acquired, it gets fully integrated and the blended pattern becomes second nature. The process can be observed in individuals learning to read, who first perceive words as causal chains of letters, but later cause and effect become indistinguishable one from the other and reading becomes a natural activity. Achieving human scale remains the crucial goal of blending and compression of identity is one of its outcomes. Thus, personal identity results from compression over a lifetime, Furthermore, looking at timelines – graphical representations of events – vast expanses of history are shown as a chronological sequence of dates marking most important events related to prominent historical figures (cf. Fauconnier and Turner, 2000, 2002). Conceptual blending is able to explain not only our understanding of our own identity and that of others, the peculiarities of our perception, or global insight into evolution and history in general. It is also key to understanding the origin and the emergence of language as a uniquely human trait (cf. Fauconnier and Turner, 2008), as well as the

simultaneous appearance of art, complex technology and religion that followed between 60,000 and 30,000 years ago (cf. Mithen, 1998). According to the hypothesis put forward by Fauconnier and Turner, the sudden emergence of language does not contradict evolutionary continuity, since the ability to produce and manipulate conceptual integration networks of increasing complexity and compression potential, ranging from simplex and mirror, through to single scope and culminating in double scope ones developed gradually over long periods of time. Double scope creativity is taken to be the distinguishing feature of cognitively modern humans and its eventual mastery may have provided the trigger for the sudden appearance of language. The functioning of language, based on the principle of using a limited number of units that have unlimited combinatory capacity applicable in all sorts of situations demands the highest level of compression provided by double scope networking. In the realm of cognitive linguistic explorations, the network approach has been instrumental in providing explanations for diverse instances of language use that would have remained opaque without taking advantage of the interpretative power of blending. These include the study of meaning of simple words in different constructions e.g. *safe speed, safe bet, safe packaging, child-safe*, nominal compounds, e.g. *gun wound*, *nicotine fit*, *monster home*, adjectival compounds, e.g. *guilty pleasure, fake gun*, *hot lid*, blends like *Chunnel*, constructions, including conditionals interpretable via blends involving counterfactual spaces, explaining polysemy, jokes (where the humorous effect is produced by the incongruity in the blended space), etc. (cf. Fauconnier and Turner, 2002, Coulson, 2001, Benczes, 2006, Turner, 2007). The achievements in the field of cognitive semantics have been complemented by explorations into cognitive poetics, where the role of conceptual metaphor in poetic creativity was first studied by Lakoff & Turner in *More Than Cool Reason* (1989). Since then, the conceptual blending theory has proven beneficial in analysing literary texts from Hemingway (cf. Coulson and Oakley, 2003) to haiku (cf. Birdsell, 2014). Closely related to natural language are the use of co-speech gestures and gesturing in signed languages. The conceptual integration approach has been applied in these areas and extended to analysing the role of gestures in foreign language learning and mathematics (ibid). Other areas outside linguistics where the impact of blending has been recognized include playful behaviour, ritual, art and design. The examples of each include: Coulson's (2001) analysis of the game of trashcan basketball played by office workers, Sinha's (2005: 1539) take on children's symbolic play as an illustration of his argument

that blending theory is due for "an extension of the range of both theory and data, to encompass the socially collaborative, culturally and materially grounded nature of the human mind" which would free it from the "traditionally mentalist and individualist assumptions of classical cognitive science" (ibid.), the voodoo death ritual in which participants "live in the blend", virtually performing on a doll what they wish to happen in real life (cf. Fauconnier and Turner, 2000, 2002), a sculpture depicting the leaders of World War II Axis powers as the Four Horsemen of the apocalypse, where metonymy and metaphor provide the mappings necessary for conceptual integration to occur (cf. Fauconnier and Turner,1999), and last but not least, COMPUTER DESKTOP, the already discussed example of a blend arising in the area of technological design. These examples show that conceptual integration permeates achievements in all three areas (religion, art and technology) whose emergence marked the beginnings and continues to define the development of human of civilization to this day. With that in mind, the discussion now moves on towards examining metaphors of modern mobile communications, which is preceded by a short description of notable instances of interfaces that paved the way to 21st century interactivity. Our immediate focus will be on individual metaphors, metonymies and analogies, while blending as a uniting force will be revisited later in a separate section of this study.

III METAPHORS ON THE MOVE. The permanence of change.

3. Back to the future – prominent precursors of modern mobility. Towards ubiquity. The story of human interaction with complex machines stretches back millennia into the past. The discovery of the Antikythera mechanism at the very beginning of the last century, puts the possible starting point of the popular use of analogue interfaces to 205 BC[27]. The intricate clockwork device consisting of around thirty overlapping gears is thought to have been used to track the cycles of the solar system. The uncommon level of miniaturization of the mechanism makes it a true herald of the things to come two millennia later. Some other notable examples of analogue interfaces include Pascal's calculator, designed in 1642, where input was achieved by moving a series of small wheels, the 1801, Jacquard Loom, the first machine to be controlled by a sequence of punch-cards, allowing to change the patterns the loom weaved by altering the arrangement of holes in the card and, of course, Charles Babbage's the Analytical Engine widely considered to be the first general purpose computer. The mechanical device, whose author was inspired by Jacquard Loom to use punch cards[28] was designed in the 1830s and never reached the working model stage. It was operated by three different kinds of punch cards and employed a programming language similar to the contemporary assembly languages. The mid-nineteenth century invention of the typewriter was a significant step towards the creation of modern user interfaces. Less than a century later, in 1946, the world saw the first modern computer. The ENIAC, a 30-ton machine with thousands of vacuum tubes had an early keyboard as input. A year earlier, American engineer and inventor, Vannevar Bush published his famous essay *As we May Think*. The essay anticipated many of the pillars of the contemporary digital life including personal computers, hypertext, the Internet and the web, as well as online repositories of knowledge and even speech recognition, all as part of positing a new kind of machine – the Memex. The machine that Johnson (1997: 117) refers to as "half microfilm machine and half computer" was supposed to have slanting screens, a keyboard and be operated by buttons and leavers to allow not only reading microfilm documents, but also direct entry of user generated content. All the data would be connected via trails

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[27] The Wikipedia article "Antikythera mechanism" also cites other possible dates of creation of the devices closer to the new era. Retrieved June 15, 2015 from https://en.wikipedia.org/wiki/Antikythera_mechanism.
[28] Jacquard loom. (2017, May 16). In *Wikipedia, The Free Encyclopedia*. Retrieved May 19, 2017 from https://en.wikipedia.org/w/index.php?title=Jacquard_loom&oldid=780634744.

that somewhat resemble the modern hypertext links, as they were meant to organize information in a non-hierarchical way. Most importantly, Bush's vision inspired another engineer and pioneering inventor, Douglas Engelbart to create the foundations of modern interfaces. One of the breakthroughs shown at his 1968 presentation involved the idea of bitmapping and the concept of direct manipulation that grew out of it. The relation between the two is described by Johnson (ibid. 20-21) as follows:

The computer, in other words, imagined the screen as a grid of pixels, a two-dimensional space. Data, for the first time, would have a physical location-or rather, a physical location and a virtual location: the electrons shuttling through the processor, and their mirrored image on the screen.

But once you endowed that data with spatial attributes, what were you going to do with it? Engelbart's great breakthrough involved the principle of direct manipulation. It was one thing to represent a text document as a window or an icon, but unless the user had some control over those images, the illusion would be remote, unconvincing, like a film projected at only a few frames per second. For the illusion of information-space to work, you had to be able to get your hands dirty, move things around, make things happen. That's where direct manipulation came in.

Remarkably, Engelbart also showcased a device that would make direct manipulation possible – the computer mouse to be employed when using the first clunky version of the windows user interface that was refined in the 1970s by the computer scientist, Alan Kay. He took the original two-dimensional vision of the interface that introduced the idea of *space* to computing and added another dimension – *depth* by conceiving of the screen as a desk where different pieces of information could be placed like pieces of paper and stacked together at will. The DESKTOP metaphor was born. The addition of the third dimension created new possibilities for moving around the interface and bringing things closer or placing them farther way in a space one could enter into. It was Kay who in 1972 came up with the idea of Dynabook, a portable computing device "for children of all ages". Thanks to Its form, size, and portability, this concept educational device that looked like a tablet with an integrated hardware keyboard and never saw the light of day is thought to be the predecessor of today's tablets. From portable concept devices that were to be built for educational purposes, fast forward to the mid-1990s and the first successful handheld devices meant primarily for business people – personal digital assistants or PDAs. The leader in the PDA field was Palm, a company that made both the hardware and software for its devices. Palm PDAs had far less features than PCs, but these features worked well,

including handwriting recognition and input via a supplied stylus and hardware and onscreen buttons. The WebOS mobile platform, designed for Palm's line of smartphones was the first to introduce a number of innovative features, such as the cards multitasking interface, banner notifications or universal search subsequently adopted and still used by Apple, Google and Microsoft in their mobile operating systems iOS, Android and Windows Phone.

The significance of Palm whose business model and design philosophy are more than reminiscent of the modern-day approach adopted by Apple the company that took more than a few pages from Palm's (operating system design) book *Zen of Palm* (PalmSource, Inc. 2003) is summed up by Holwerda (2013):

Palm showed the world exactly what consumers wanted out of a mobile device. It did this not by trying to put a desktop computer into a smaller device, or by piling on the features and specifications, but by actually trying to understand the problems users were facing. The company's relentless focus on speed, efficiency, and price, combined with the concept of Zen of Palm, led it to a mobile platform that serves as the archetype for all the popular mobile platforms we have today.

Having paid due homage to the precursors of today's gadget's it's time to remember what are the seven waves of mobile computing described by Kjeldskov (2014) that have created today's mobile media tsunami and led to the formulation of the metaphors of mobile communications. These are: portability, miniaturization, connectivity, convergence, divergence, apps and digital ecosystems. The following discussion of the examples from our sample of words related to mobile media will show that each of the seven factors contributed to the creation of new words or the expansion of the senses of the existing ones used by the global connected population that lives in the anything-anytime-anywhere present.

IV THE CHANGING FACE OF THE INTERFACE – metaphors of interaction modalities

4.1 Actionable architecture - wind(ow)s of change and the deconstruction of the desktop. The phenomenon that a single target concept is understood via several source concepts has been observed early on in the study of metaphor (cf. Lakoff and Johnson, 1980) and explained by the fact that human concepts have many facets and a single source cannot cover the complexity of the target, as illustrated by the following example, AN ARGUMENT IS A JOURNEY, AN ARGUMENT IS A BUILDING, AN ARGUMENT IS A CONTAINER, AN ARGUMENT IS WAR. Noticing the absence of analyses that would explore the scope of mapping in the opposite direction, Kövecses (2002: 79) set out to show that "most of the typical specific source domains appear to characterize not just one target concept but several". In doing so he focused on the domain of buildings applied to a number of targets, e.g. RELATIONSHIPS ARE BUILDINGS, *Since then the two have built a solid relationship,* ECONOMIC SYSTEMS ARE BUILDINGS, *- ... citizens fleeing their country's economic ruins* or SOCIAL GROUPS ARE BUILDINGS, By early afternoon *queues* were already *building up* (ibid. 80-81) Similarly, our description of the metaphoric potential of the language of mobile communications begins with the source domains of ARCHITECTURE and BUILDING. For example:

- **Architecture** - When referring to computers, architecture or computer architecture is the overall design and setup of the computer. Architecture includes where connections and parts of the computer are to be placed, how each of components operate with each other, dimensions, etc. CHD

- **Open architecture** - Open architecture refers to a hardware specification or design that is publicly released, allowing other manufacturers to produce similar products that are compatible and usually compliant with one another. A good example of open architecture is IBM compatible computers; these computers allow anyone to purchase a product from any manufacturer with the understanding it will work with their compatible computer. CHD

- **Network architecture** - (1) The design of a communications system, which includes the backbones, routers, switches, wireless access points, access methods and protocols used. See communications protocol, LAN and enterprise networking. (2) May refer only to the access method in a LAN, such as Ethernet or Token Ring. PCME

- **Platform** - A platform is a description of the overall standard of a computer's hardware or software. For example, when referring to a hardware platform, X86 may be used; when describing a software platform, Microsoft Windows XP (wintel) may be used. - A platform is a description of the overall standard of a computer's hardware or software. For example, when referring to a hardware platform, X86 may be used; when describing a software platform,

Microsoft Windows XP (wintel) may be used. CHD / A hardware and/or software architecture that serves as a foundation or base. The term originally dealt with hardware and often still refers to only a CPU model or computer family. For example, the x86 PC is the world's largest desktop computer platform. The terms "platform" and "environment" are used interchangeably. PCME

- **Closed platform**, **walled garden** or **closed ecosystem** - a software system where the carrier or service provider has control over applications, content, and media, and restricts convenient access to non-approved applications or content. This is in contrast to an open platform, where consumers generally have unrestricted access to applications and content. (…) More generally, a walled garden can refer to a closed or exclusive set of information services provided for users. Similar to a real walled garden, a user in a walled garden is unable to escape this area unless it is through the designated entry/exit points or the walls are removed. *Some examples of walled gardens*: (…) Apple iOS and other mobile devices, which are restricted to running pre-approved applications from a digital distribution service. (…) WIKI

- **Clopen** - Google has made much of Android being "open" for use by anyone and thus potentially better than the "closed" system of the Apple iOS world. But "clopen" would be a better way to describe Android, as some have, because it's both closed and open at the same time. There's no doubt that Android is open for anyone to use. Amazon has used Android as the basis for its Kindle Fire, but a version of Android altered so much that you can't run apps from Google's own official Android Market. Instead, you have to use Amazon's own Android App Store. But Android is largely closed for the typical consumers who use it, because they have little choice about which version of Android will run on their device. They're left at the mercy of the device makers or mobile carriers. ML

- **Build** (1) (verb) To compile a program. (2) (noun) A version of a program. A build number is assigned to newly compiled instances of a program under development. When published, a version number is typically assigned to the software, and the build number is hidden. Occasionally, software development tools retain their build number rather than replacing it with a version number. PCME

- **Nightly build** - Nightly builds are automatically created versions of a custom ROM, which add the most recent changes to the code base each and every day. These fixes, updates and new features can be accessed and flashed nightly by those who want to test them out. However, since they are created automatically they are not checked for errors or bugs. As such, they are not recommended for daily use but more for error checking and debugging. They are typically referred to as the "bleeding edge" because they are unstable and unreliable, but have the very latest features in them. For this reason, they are not recommended for beginners. AP

- **Real estate** n.- May be used for any critical resource measured in units of area. Most frequently used of `chip real estate', the area available for logic on the surface of an integrated circuit. May also be used of floor space in a dinosaur pen, or even space on a crowded desktop (whether physical or electronic). JF

- **Screen real estate** - term becoming commonly used to refer to the area or amount of free space available to computer users for the display of desired information that is not taken up by pre-set windows, scrollbars, banner advertising, sidebars, or other framed information on the computer screen. TT-R. Pertaining to the quality and size of the handset screen, i.e., the area of which advertisers can utilize for banner placements. MMIG

- **Internet Real Estate** - is a popular buzzword that has two different definitions. First, "Internet Real Estate" can be used to describe the use of the Internet to promote, advertise, and view commercial and residential real estate for lease or purchase. (…) Second, "Internet Real Estate" has been used to describe revenue-generating online properties such as domain names or websites. Just like the now obsolete term Information Superhighway, "Internet Real Estate" is used in this context primarily when communicating with individuals who either did not

grow up with the Internet or who are not involved in the tech industry. These individuals can benefit from drawing a comparison with the established offline concept of real estate to better understand digital business assets. WIKI

On the basis of individual metaphors sharing the same source domain of BUILDINGS, Kövecses suggests the generic-level metaphor COMPLEX ABSTRACT SYSTEMS ARE BUILDINGS, along with three additional ones (CREATION IS BUILDING, ABSTRACT STRUCTURE IS A PHYSICAL STRUCTURE, ABSTRACT STABILITY (OR STRENGTH) IS PHYSICAL STRENGTH (OF A BUILDING) in order to locate the main meaning focus.

Computers and computer networks are very complex structures, so much so that a source domain much more complex than BUILDING, exemplified in the visual metaphor SOFTWARE IS A BUILDING (cf. Imaz and Benyon, 2007) is employed, that of ARCHITECTURE – the design of buildings, open areas and other artificial constructions. The use of this domain yields the computing metaphors: COMPUTER (HARDWARE/SOFTWARE) DESIGN / SETUP IS ARCHITECTURE and a networking one, DESIGN OF A NETWORK IS ARCHITECTURE, while covering other terms from the same semantic field: *hardware architecture* and *software architecture.* The generic level metaphor in this case would be DESIGN IS ARCHITECTURE. The related architectural term *platform* is sometimes used interchangeably with *architecture* or it may refer to "a description of the overall standard of a computer's hardware or software" reflected in the metaphor COMPUTER STANDARDS DESCRIPTION IS A PLATFORM. The fact that *environment* and *ecosystem* can be used instead of *platform* with roughly the same meaning shows the shift towards biological metaphors, as both terms have to do with conditions and the kind of community or system in which living organisms exist. At the same time, both ARCHITECTURE and PLATFORM can be *open* or *closed*, additionally highlighting the basic concepts of SPACE and CONTAINER. These have produced two the signature terms describing the pair of dominant mobile operating systems, Android and iOS and their respective ecosystems consisting of apps and services and the related content. The blend *clopen* (*closed + open*) was coined to encompass the dual nature of Android, as open for development and use, thanks to being open source, but essentially closed for consumers, since the choice of features they have access to is often significantly restricted by device manufacturers, software developers and mobile carriers. On the other hand, Apple has opted for a fully closed approach, where the company is the exclusive provider of the devices and the operating system that runs all applications that pass its approval process and reach the consumers through its distribution system.

This keeps the consumers locked to the platform, which is the basis of THE DIGITAL ECOSYSTEM IS A WALLED GARDEN metaphor. Kövecses' metaphors, CREATION IS BUILDING and ABSTRACT STRUCTURE IS A PHYSICAL STRUCTURE certainly apply to the use of the nominal terms *build* and *nightly build* and the verb *build* in general and mobile computing. Stemming from the experience of manipulating physical objects and paying attention to their structure, all these metaphors originate from the primary metaphor (LOGICAL) ORGANIZATION IS PHYSICAL STRUCTURE (cf. Grady, 1997), as well as from spatial relation concepts and the CONTAINER image schema structuring bounded regions in space (cf. Lakoff and Johnson, 1999). The concept of MOBILE COMMONS (cf. Goggin 2011, 157-175) proposes an approach to the communications policy based on full openness and is therefore opposite both to walled garden and clopen strategies since it advocates opening mobile networks, and the creation and use of open source operating systems and software.

Before the requirements of portability, miniaturization, connectivity and convergence combined with technological advancement made it possible for mobile devices to emerge, the DESKTOP metaphor and the associated graphical user interface were largely considered to be the optimal solution for human-computer interaction in the age of PCs. Despite its imperfections (e.g. the problematic use of the trashcan on early Macs that did not fit the metaphor, as shown in 2.4 above, the DESKTOP functioned well because it created a user illusion, thanks to the power of metaphor and the partial matching of the elements from the two domains. This is what Brenda Laurel (2013) recognizes as the application of the theatrical technique of *willing suspension of disbelief* that enables user engagement in the digital domain.

The different form factors of mobile computing imposed the modifications of the concept of the desktop. FILES and FOLDERS still exist, although the file system is hidden from the average user who, importantly, interacts with one app at the time only, as each active application always takes the whole of the space on the screen. Being small, the space on the screen is considered to be as valuable as real-world property consisting of land or buildings, as indicated by the metaphoric term "screen real estate". The metaphor is obvious, there's no need to look beneath the surface of words, THE SCREEN IS REAL ESTATE. This use is analogous to the earlier trend[29] of attaching the

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[29] The version of the Wikipedia entry *Internet Real Estate* included here is the now archived original one, published in 2006, retrieved July 28, 2015 from https://en.wikipedia.org/w/index.php?title=Internet_real_estate&oldid=94540384. In the latest

same value to online properties like domain names or websites as sources of revenue that makes the conceptualization THE INTERNET IS REAL ESTATE possible and related to the main meaning of the expression that focuses on the role of the web as a medium for advertising actual real estate and all sorts of products and services. Raymond's (2003) the Jargon File v.4.4.8 cites an even earlier and more general meaning stating that real estate "may be used for any critical resource measured in units of area", from *chip real estate* to physical or electronic *desktop real estate*, which would make the metaphor much more encompassing since AN AREA-RELATED CRITICAL RESOURCE IS REAL ESTATE. Just like the property consisting of land and buildings has its DEVELOPERS, so do the web and mobile software. It is through the work of *web developers* and mobile *application developers* that the potential of the Internet and screen real estate is fulfilled.

As our discussion of the terms related to the world of mobiles is at the very beginning, just some of the most obvious changes to the user interface in mobile devices are mentioned here. More will be considered in the subsections to come, because mobile computing architecture allows the use of actions that are impossible on computers.

4.1.1 From GUI to NUI. UX is where it's at. The interface as an experience. The three initialisms, which may appear cryptic to the average user of today's gadgets, refer to the repositories of the majority of metaphors and other cognitive phenomena in the focus of our research. *User Experience* (*UX*) and (*Graphical*) *User Interface* (*GUI*) are complementary terms belonging to the field of design. The former incorporates the area of human-computer interaction and also tackles all aspects of the experience that users might have while interacting with a software product or service[30] i.e. for our purposes, the conceptual tools they might use in the course of

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version of the entry available at https://en.wikipedia.org/wiki/Internet_real_estate, there is no mention of online properties, just the electronic variety of the real estate industry i.e. advertising housing properties for sale or rent online.

[30] NNgroup (Producer). (Jul 2, 2016) Don Norman: The Term UX. [Video file]. Retrieved November 12, 2016 from https://www.nngroup.com/articles/definition-user-experience/. In the video, Norman, a distinguished scholar and ex-Apple engineer who was one of the people who coined the term "user experience" explains it in the following way: "Once upon a time a very long time ago, I was at Apple, and you know we said the experience of using these computers is weak: The experience when you first discover it, when you see it in the store, when you buy it, when you oh, can't fit into the cars in this great big box that doesn't fit into the car, and when you finally do get it home; opening the box up and ooh it looks scary: I don't know if I dare put this computer together — all of that is user experience; it's everything that touches upon your experience with the product. And it may not even be near the product. It may be when you're telling somebody else about it. That's what we meant when we devised the term "user experience" and set up what we called the User Experience Architect's Office at Apple to try to enhance things. Now, Apple was already pretty good so we were starting with a good product making it even better. Today that term has been horribly misused. It is used by people to say "I'm a user experience designer, I design websites, so I design apps" and they have no clues to what they're doing and they think the experiences that simple device the website or the app or who knows what. No, it's everything: it's the way you experience the world, it's the way you experience your life, that's the way you experience the service, or — yeah an app or a computer system — but it's a system that's everything. Got it?".

such interaction (cf. Norman D. and Nielsen, J. (n.d.). Therefore, the latter, namely, *User* Interface and the metaphors associated with it can be viewed as forming a PART FOR WHOLE metonymy relation, or in Cruse's (1986) terms *meronymy* with the broader domain of *User Experience* functioning as its canonical holonym, not unlike *body* is to *nose*. What remains to be done before exploring mobile interface metaphors is to provide the definitions of GUIs and their evolution, NUIs (Natural User interfaces):

- **Graphical user interface (GUI)** - an interface through which a user interacts with electronic devices such as computers, hand-held devices and other appliances. This interface uses icons, menus and other visual indicator (graphics) representations to display information and related user controls, unlike text-based interfaces, where data and commands are in text. GUII representations are manipulated by a pointing device such as a mouse, trackball, stylus, or a finger on a touch screen. The need for GUI became apparent because the first human/computer text interface was through keyboard text creation by what is called a prompt (or DOS prompt). Commands were typed on a keyboard at the DOS prompt to initiate responses from a computer. The use of these commands and the need for exact spelling created a cumbersome and inefficient interface. TP

- **Natural user interface (NUI)** - a system for human-computer interaction that the user operates through intuitive actions related to natural, everyday human behavior. A NUI may be operated in a number of different ways, depending on the purpose and user requirements. Some NUIs rely on intermediary devices for interaction but more advanced NUIs are either invisible to the user or so unobtrusive that they quickly seem invisible. *Some examples and applications of natural user interfaces.* Touch screen interfaces let users interact with controls and applications more intuitively than a cursor-based interface because it is more direct – instead of moving a cursor to select a file and clicking to open it, for example, the user touches a graphic representation of the file to open it. Smartphones and tablets typically enable touch input. (…) A more intuitive type of NUI is outfitted with a camera and software in the device that recognizes specific gestures and translates them to actions. Microsoft's Kinect, for example, is a motion sensor for the Xbox 360 gaming console that allows users to interact through body motions, gestures and spoken commands. Kinect recognizes individual players' bodies and voices. Gesture recognition can also be used to interact with computers. Speech recognition allows users to interact with a system through spoken commands. The system identifies spoken words and phrases and converts them to a machine-readable format for interaction. Speech recognition applications include call routing, speech-to-text and hands-free computer and mobile phone operation. Speech recognition is also sometimes used to interact with embedded systems. Gaze-tracking interfaces allow users to guide a system through eye movements. In March 2011, Lenovo announced that they had produced the first eye-controlled laptop. (…) Brain-machine interfaces read neural signals and use programs to translate those signals into action. BCI can make it possible for someone who is paralyzed to operate a computer, motorized wheelchair or prosthetic limb through thought alone. Speaking at a 2008 conference, Microsoft's August de los Reyes spoke of the NUI as the next evolutionary stage in computing from the graphical user interface (GUI), as the GUI was from the command-line interface (CLI). WhatIs TT

While our main focus will be on the touchscreen variety of natural user interfaces, the growing trend of incorporating speech recognition in mobile phones and other contemporary communication devices will also be explored from the point of view of human-computer interaction metaphors. The implementation of gesture and gaze tracking in mobile interfaces may be far less widespread, but these interaction modalities are also illustrated in our sample. Brain-machine interfaces, on the other

hand are expected to become the next big thing in the years and decades to come. They will undoubtedly bring new metaphors that would provide the material for some new exciting research. For now, let's get back to current interaction metaphors, in an attempt to provide a tentative classification and a description of their many varieties.

4.1.2. Mobile interface metaphors. Where do they come from? What are they? Where are they going? Classification possibilities and the related criteria. User interfaces, primarily those of the graphical kind that bring machines conceptually and experientially closer to people are the common denominator of all the devices under investigation here. Their universal presence helps formulate the first line of approach to metaphor classification, that of locating universally present metaphors, as opposed to those characterizing individual or several operating systems and/or interaction modalities. A comparison of the interfaces of devices belonging to the Post-PC era proclaimed seven years ago by Steve Jobs, with the WIMP (Windows, Icons, Menus, Pointers) subtype of GUIs based on the metaphor THE OPERATING SYSTEM IS AN OFFICE DESKTOP (cf. Imaz and Benyon, 2007: 52) that marked the age of the PC might be a good starting point. Modern GUIs, many of which involve a touchscreen interface, like iOS or Android, running on smartphones and tablets are referred to as *post-WIMP* on account of the fact that they lack most WIMP features. Namely, windows in the classic sense are no longer present due to small screens of both dumb and smart phones that allow installation of applications and their running in the background (with or without multitasking capabilities). A running app always covers the whole window, because however big they might be on smartphones, phablets and most tablets or small in feature phones, non-PC screens are simply too small to show several windows stacked, cascading or side-by-side. The days of the perception of DEPTH brought about by Alan Kay's introduction of stacking pieces of information one on top of the other on the two-dimensional computer screen that enhanced the CONTAINER metaphor are largely gone, but for an occasional pop-up screen notification and some other minor interface elements. Miniaturization requires rationalization of resources, whereby each application as a rule has a single window i.e. covers the whole screen, which in turn generates new metaphors: AN APP SCREEN IS A DISTINCT VISUAL STATE OR MODE IN A MOBILE APP and A MOBILE APP IS A COLLECTION OF SEQUENTIAL SCREENS (cf. Apple Inc. 2011). As fundamental elements of GUIs, icons, defined by Ludi (2004: 337) as "visual symbols of objects, actions, or ideas" are present in all mobile interfaces. Their

dynamic nature i.e. selectability, clickablility and draggability is very much preserved in mobile devices, combined with some peculiar effects arising from handheld form factors. Since the 1984 Macintosh, icons have been visual representations of operating system elements like files (with the underlying conceptualization of FILES AS OBJECTS) objects, pieces of software and hardware configuration on computers and now mobile devices. Their purpose has remained much the same through the decades of technological development: to facilitate computing by making it user-friendly. Because their function is referential rather than explanatory, icons are metonymic devices, incorporating two patterns, THE ICON FOR THE FUNCTION or THE ICON FOR THE OBJECT (cf. Barr, Biddle and Noble 2002), e.g. the magnifying glass icon, present in all modern interfaces, representing the universal search option 🔍 or the folder-shaped glyph 📁 symbolizing a file folder or its document-shaped counterpart 📄 form part of THE OPERATING SYSTEM IS AN OFFICE DESKTOP metaphor, along with the office document management related commands like *cut, copy* or *paste*. As for their dynamic properties, in non-touchscreen PC and mobile environments, icons can be manipulated via a mouse, trackball or notebook touchpad or directional pads, joysticks or jog dials respectively. In graphical interfaces, icons coexist with or can be part of menus, which embody the general metaphor AN ACTION LIST IS A MENU. A feature of computer interfaces accompanying the use of the mouse, pointers that map user input on the screen is disappearing, getting replaced first by the above-mentioned hardware navigational solutions and subsequently by touch controls, while keeping and diversifying the visual effects accompanying scrolling over or selecting menu items or icons. The importance of visual effects (such as shading the selected menu item using a different colour, icon shade or size change, where the selected icons grow bigger, reflecting the primary metaphor IMPORTANCE IS SIZE or various animations) increased in the absence of the pointer as explicit indicator of user actions. From there another universal GUI metonymy could be formulated as VISUAL EFFECTS FOR SELECTION. Visual effects are frequently combined with tactile ones, namely, the act of selecting an item is accompanied by vibration, which is a tradition that persists in the touchscreen setting, where the finger becomes the mouse and the pointer, in a move that vividly illustrates the shift towards natural user interfaces and the everyday experience of the world. There fingers are used for pointing in many contexts unrelated to the use of technology. Finger taps that replace mouse clicks and multi-touch gestures provide a heightened

sense of control of onscreen objects because of the possibility to touch them, making this a preferred, simpler and more natural mode of interaction for users of all ages. Even this initial illustration of universal mobile interface metaphors provides answers to all three questions posed at the beginning of this section – they originate from the earlier PC-based GUI, they are the outcome of continuing evolution of interfaces, headed in the direction of achieving ever more natural ways of direct manipulation. In addition to universal interface metaphors, mobile devices abound in platform- (operating system-), device- and application-specific ones, i.e. those existing in Android, iOS or Windows Phone only, e.g. *3D Touch* in iOS, in a single device e.g. Apple Watch or application like the *Activity* app on Apple Watch, as well as cross-platform e.g. *Live Tiles* in Windows Phone and Windows and what might be termed *mixed metaphors* spanning hardware and software like the already discussed ARCHITECTURE metaphor or appearing in the products of some software/gadget manufacturers but not others e.g. the concept of software WALLET shared by Google and Apple. Another criterion, towards which the current discussion has been leading could be the media through which direct manipulation takes place, since it can be visual (graphical user interfaces), haptic (touch-based combined with graphical) or voice-based (as in the case of intelligent virtual assistants like Siri, Google Assistant or Amazon Alexa. The last possible classification parameter may be formulated in terms of the opposition technological versus cultural, as some metaphors reflect cultural phenomena and biases e.g. through references to magic, cartoons or fairy tales, rather than technological features. The examples representing all proposed categories will be examined below in the pertinent sections. After offering several possible approaches to classifying mobile interface metaphors, it is time to examine a pair of ubiquitous, overlapping conceptualizations of human-computer interaction (HCI) in graphical user interfaces, mobile or otherwise that form a well-integrated network of inter-related concepts engaged in constant interplay. The first has developed as a result of the application of the object-oriented programming approach to software development embodied in the metaphor SOFTWARE / THE SYSTEM IS A COLLECTION OF OBJECTS giving rise to the perception of HCI as DIRECT MANIPULATION (OF OBJECTS). The other involves making use of the domain of NAVIGATION to interpret HCI (cf. Imaz and Benyon, 2007).

4.1.3 Direct manipulation and navigation. By the stars or by GPS, navigare necesse est… There's no place like home. The central assumption of the embodied cognition thesis is that the human mind is embodied and situated i.e. that knowledge is linked to people's activities, context and culture in the world in which we live, implying dynamic interaction between the brain, the body, and the world. The investigations into the embodiment of metaphor are thus part of an effort to show that numerous aspects of language and cognition are grounded in sensorimotor experiences. The neural level of embodiment in the brain that concerns the structures behind concepts and cognitive operations at the neurophysiological level has been shown to provide the foundation of the Neural Theory of Thought Language (cf. Lakoff 2008, 2012, 2014, Feldman, 2006). The findings from neuroscience, such as that the existence of spatial concepts depends on the brain's topographic maps and the orientation-sensitive cells in the visual system (cf. Lakoff and Johnson 1999, Lakoff, 2012, 2014) make spatial relations one of the most basic means of bodily interactions and experience of the outside world. Bodily movements and action require orientation in space and so does perception. Gibbs (2006: 49) emphasizes the key role of movement in relation to perception, which is not static, for as we move, our perception changes. Moreover, MOTION, SPACE and BODILY MOVEMENT are among the most frequent sensorimotor domains of primary metaphors (cf. Lakoff and Johnson, 1999). Primary metaphors, along with image schemas are in turn, considered as being able to provide a viable design language for user interfaces and tools for intuitive use of and interaction with technology (cf. Hurtienne, 2011), as discussed in 2.3 above.

The conceptual link between SOFTWARE, HARDWARE and the physical domain of ARCHITECTURE (see 4.1 above) presupposes the ontological entailments that both are SPATIAL STRUCTURES and SURFACES, which consequently applies to USER INTERFACES as well, making their elements, e.g. WINDOWS, ICONS, FILES, or FOLDERS OBJECTS that can be viewed as CONTAINERS or placed into them. This makes it possible to produce an illusion of different levels of DEPTH i.e. HIERARCHY of directories that users can NAVIGATE through and rearrange objects by directly manipulating them, thanks to the overall organizational principle that DATA ARE STORED AS FILES. All these inter-related conceptualizations form a string of structural metaphors as noted by Barr, Biddle and Noble (2003). These core conventions largely survive in mobile interfaces with a few caveats, the main one being that, as said before, windows are largely gone and file

system hierarchy is partially or completely hidden from view of users. Essentially, both concepts have been flattened out and simplified. This is done by design, since phones are marketed as devices where ease of use comes first and tinkering, particularly with the operating system and to a degree with the interface is not encouraged by the manufacturers, some more than others. Still, a new level of direct manipulation introduced by touch-based interfaces makes some operations easier and gives us new metaphors like DRAGGING ONE APP (ICON) OVER ANOTHER ON THE HOME SCREEN IS MAKING A FOLDER.

Navigation too has been evolving to fit the requirements of the mobile user experience We navigate not only our physical environment, but a variety of virtual environments as well, from device interfaces and the web to virtual worlds. That is why navigation, as represented by following selection of terms in our sample now comes into focus, as another universal feature of mobile interfaces.

- **App drawer** - All the application icons in an Android device. Also called an "app tray," it is a series of screens with the icons arranged alphabetically. The apps can be launched by tapping the icons, and the icons can be copied to the home screens by dragging and dropping them to the desired location. PCME

- **Breadcrumbs** or **breadcrumbs trail** - a graphical control element used as a navigational aid in user interfaces. It allows users to keep track of their locations within programs, documents, or websites. The term comes from the trail of bread crumbs left by Hansel and Gretel in the fairy tale of the same name. WIKI / Breadcrumbs appear at the top of the screen when navigating between different apps in iOS. For example, on the iPhone running iOS 9 or later tapping a banner notification will jump to the associated app. If there was already another app running, a shortcut to return to the previous app will be present at the top of the screen. This is a breadcrumb to help navigate directly to the previous app, without having to exit to the iOS home screen first. IF

- **Card view** - Card view shows you all the applications that are currently open, displayed as a series of cards (small active windows). PPUG

- **Drawer** - Drawers are a clever idiom that provides access to a vertical list of navigational elements similar to tabs. They use minimal screen real estate by hiding in a panel that lives in a layer under the main content area. The drawer icon is also called the **hamburger menu icon** due to its shape: three short, stacked lines. AF

- **Forking (software fork)** - Forking is to take the source code from an open source software program and develop an entirely new program. To be considered a fork, the newer version of the software must have its own name and its own developer community. When a new program remains compatible with the original program, it is referred to as a *shallow fork*. (WhatIs TT) "Think of Android a bunch of code. There are two portions -- the open-source parts, which is what AOSP is, and the proprietary parts that Google keeps to itself. If someone wants to take Google Android and make changes to it, they will download the code to use as a base, and form their own project with it. Samsung does that, HTC does that, and your favorite ROM developer might do it. Anytime someone takes existing code, and starts an *independent* (that's an important distinction) project based on it, they've created a fork." AC

- **Home page** - The first page retrieved when accessing a website or the first screen displayed when a smartphone or tablet is started. It provides the main menu and starting point for the rest of the content on the site or device. See home screen. PCME

- **Home Screen** - The first screen of information displayed when a smartphone or tablet is started. Also called the "home page" and "main menu," it typically displays a group of icons that are clicked or tapped to activate applications and internal functions. See home button, widget and main menu. PCME / The front end of Apple's Springboard app launcher that consists of 11 screens that hold app icons, Folders, the Dock, the Fast App Switcher, and the Spotlight Search screen. iMG / The main screen that displays available apps and folders in iOS. You can flick left and right to show more apps and folders. AUD

- **Launcher** - The most visible part of an OS, where users launch apps. Depending on the OS, this may also include home screens, the lock screen, and other screens such as settings. Some OSes - such as Android - make it easy to replace the default launcher with a third-party launcher. Third-party launchers may offer greater customization, added content, and alternative ways of navigating the OS. PSG / The home screen on Android devices, used to open and manage apps. The default launcher on any device can be replaced by simply installing a third-party launcher from the Google Play Store. GH

- **Notification drawer** – The notification drawer in Android typically shows notifications in reverse-chronological order, with adjustments influenced by: the app's stated notification priority, whether the notification recently alerted the user with a sound or vibration, any people attached to the notification and whether they are starred contacts. *Stale notifications*. The notification drawer is intended to show the user information relevant to this very moment in time. If a notification you sent earlier is no longer relevant, automatically dismiss it. GMD

- **Notification panel** - Also commonly called notification tray or notification shade. This option is accessible by sliding one finger down from the status bar, and shows all new notifications, such as messages and missed calls, which can be swiped away or cleared, as well as persistent notifications. Indicators will appear in the status bar whenever new notifications are available. GH

- **Overflow button** - You know the three dots that appear in the upper right-hand corner of the screen in many Android apps? It has a name—the Overflow button. Tap it, and you'll be able to get at additional options, tools, or settings that don't have a home in an app's toolbar. GB-AAZ

- **Springboard** -The internal name of the program Apple uses to run the iOS home screen, including the app launcher and fast app switcher. iMG

- **Wallpaper** - A graphic or photo that serves as the background for other on-screen graphics, typically on a home screen, lock screen, or main menu. Often it is customizable by the user. PSG

Android has all APPLICATIONS (ICONS) as OBJECTS alphabetically arranged in a DRAWER, almost served to users on an app TRAY. Conceptually, *app drawer* resembles the All Programs menu in Windows, where programs are also alphabetically arranged and from where PROGRAM SHORTCUTS can be made to be placed on the DESKTOP. In Android APP SHORTCUTS are placed on the HOME SCREEN or HOME PAGE (mirroring the use of the term on the web), both of which inform the metaphor NAVIGATION IS A JOURNEY, with SHORTCUTS making the journey quicker and HOME as the point of departure and a place where to return. Mobile devices by default allow the creation of multiple sequential

home screens where applications (as in Apple's iOS operating system) or their shortcuts (as in Android) appear when installed. The home screen in Android is by default referred to by Google as *launcher* – the typically highly user-customizable space from where to start (launch) applications. Since Google Android is known for making Android an open source operating system, whose source code is available for everyone to introduce modifications to a certain degree, smartphone manufacturers often provide different launchers and home screens. Thus, LG has named home screens on its phones *canvases* which invokes a metaphor that could be phrased as INSTALLING APPLICATIONS ON THE PHONE IS PAINTING. Amazon, on the other hand is the company that has developed its own subtype of the OS naming it Fire OS, as part of deeper-level software modifications known as *forking.* The process of forking that has also resulted in the differentiation of UIQ as a distinct variant of the Symbian operating system in the past brings to mind the metaphor SOFTWARE DEVELOPMENT IS A JOURNEY and (DISTINCT) SOFTWARE/OPERATING SYSTEM VARIANT IS FORK IN THE ROAD as its subordinate. The launcher in the Fire OS is named CAROUSEL. It is essentially a type of slideshow consisting of app icons on the home screen that users can quickly cycle through, by making a series of (in this case left-to right only) sliding finger gestures on the touchscreen. The cycling motion resembles the turning of a merry-go-round or a conveyer belt, hence the name and meaning extension of the word yielding another orientational metaphor. Apple has kept the generic term home screen for the front-end [31] of its SPRINGBOARD app launcher that generates a metaphor which links LAUNCHING AN APP to its MAKING THE JUMP and possibly the app SPRINGING INTO ACTION. In addition to home screen and app launcher, Springboard in iOS also controls the app switcher, the feature that provides an additional layer in window-less mobile interfaces. Lying beneath the home screen it is accessed in different ways depending on the operating system, e.g. via the physical home button in iOS or a dedicated software recent apps key in Android provides access to multitasking. It shows all open apps originally (since its introduction in iOS 4) as a row of icons or app preview card carousel – a vertical stack of cards, taking a cue from the praised card view solution implemented in Palm WebOS first, giving a snapshot of the open application screen. The icons or cards in the iOS app switcher and in the card list in the Android and

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[31] WhatIs com defines *front-end application* as the "one that application users interact with directly" and *back-end application* or *programs* as "serving indirectly in support of the front-end services, usually by being closer to the required resource or having the capability to communicate with the required resource". The definitions are an instance of metaphorical use of the FRONT-BACK orientation schema. Retrieved July 29, 2015 from http://whatis.techtarget.com/definition/front-end.

Windows Phone 10, BlackBerry, Symbian Belle, MeeGo and Firefox OS versions act as shortcuts to the recently open apps or tasks. Being CONTAINERS, they are manipulable, namely, they can be swiped to be dismissed in app switchers or elsewhere, dragged, rearranged, and again swiped and dismissed. The visual metaphor AN OPEN APP IS A CARD, exploiting the resemblance of the interface element to a card, just like the names of concepts and terms like CAROUSEL, SPRINGBOARD or CANVAS, as well as many others, including the notions of DRAWER and PANEL to be mentioned presently may have been the result of lexical and design creativity of individual software makers and device manufacturers. Nowadays, they are well established mobile design patterns, widely used by product managers in charge of running the process of mobile application development, and especially by designers and developers creating applications, which shows that OS-dependent design conventions have become more formalized and stable, particularly those related to navigation (cf. Neil, 2014: xiii). A frequent navigational aid helping users orient themselves in interfaces and online BREADCRUMBS or BREADCRUMB TRAIL is a metaphor rooted in Western European culture, namely, inspired by the German fairy tale *Hansel and Gretel* recorded by Brothers Grimm. Like the siblings, abandoned by their parents in the woods, leaving a trail of pebbles (or breadcrumbs) so as to be able to return home, by navigating around the interface we leave a trail – it can be the PATH, reflecting the operating system's hierarchical structure, showing in the address bar of every interface window as in Microsoft Windows e.g. *Computer ► System (C) ► Media ► Sonata* or in iOS, if a web link published on Twitter and viewed inside the Twitter app is opened in the browser instead, a shortcut to return to the Twitter app, looking like ◄ *Back to Twitter* will appear in the left-hand corner of the screen. The same system that incorporates arrows and pointers showing direction or position is universally present in web browsers, allowing going back and forth as many pages as have been visited. This is another element of the overarching NAVIGATION IS A JOURNEY metaphor.

The parallels with the web continue since *home page* is a synonym of the mobile device *home screen* and, as we have seen above, there are parallels regarding the presence of the ARCHITECTURE and the more general CONTAINER metaphor, because both web space and screen space are conceptualized as REAL ESTATE, while the synonymous use of the term *main menu,* also known as *start menu*, forming part of the MENU metaphor establishes a link between Windows and mobile operating systems.

The classic main menu has been transformed into DRAWERS an efficient space saving tool in the mobile environment represented by the icon of the same name that is also referred as the hamburger menu icon ☰. The Unicode glyph representing the Chinese trigram for heaven is also used in mobile interface design and now quite often in web design to represent side *drawers* in a stylized fashion. The three lines stand for three drawers and may be also interpreted via another picture metaphor as a hamburger-shaped menu. In a strange turn of events, because of the strong visual similarity between the glyph and the prototypical variety of fast food, hamburger is not on the menu, HAMBURGER is the menu. Another three-part pictogram ⋮ is the *overflow button* in Android that when tapped reveals additional information – tools, options, etc. Implying that ADDITIONAL INFORMATION IS AN OVERFLOW, this button is often part of Android toolbars which indicate that SOFTWARE COMMANDS ARE TOOLS and TOOLBARS ARE TOOLBOXES. These two metaphors are universal, since toolbars are a standard feature of both desktop and mobile interfaces. The button in Windows Phone 10 and iOS giving access to additional – advanced options looks like three horizontally stacked dots or the ellipsis punctuation sign that can represent a continuation of a list. The function of the button is similar, as it hides additional commands that when revealed continue the selection of the available onscreen commands. Drawers, on the other hand, invite another general metaphor, INTERFACE ELEMENTS ARE OBJECTS, as well as a specific one DRAWERS ARE CONTAINERS. Drawers - containers store all sorts of information-objects from operating system-wide notifications, in-app settings and tadeonal commands to website sections if this interface element is implemented in web design. As they cover only a portion of the screen when opened, drawer lists and menus offer another way of creating layers of content in a predominantly flat mobile environment. Common to all digital user interfaces, PANELS ARE CONTAINERS too that can cover the whole screen or just part of it and feature different elements, including, for example notifications or widgets. Panels can also be shaded, as another means of layering the screen space i.e. facilitating visual organization of information on mobile screens, particularly notifications. This is where the PART FOR WHOLE metonymy SHADE FOR CONTAINER (PANEL) informs the metaphor A PANEL IS A SHADE. This selection of examples illustrates the metaphoric nature of mobile interfaces. Some other interface elements will crop up in the sections to follow, as part of the examination of other mobile media phenomena. For now, we return briefly to the issue of the overlap

between architecture and navigation and introduce the third conceptual cornerstone of the use of modern mobile computing devices.

The user interface element *home screen* and the hardware and software term *home button* (also mentioned in the next section dedicated to interacting with hardware and software) are not used just with reference to navigation. In conjunction with *wallpaper*, a background image appearing on a selection of important screens, especially the home screen, they bring back the domain of architecture and invite another parallel with websites exemplified in Boardman's (2005) finding that the structure of institutional websites implies that they are conceptualized as metaphorical buildings. The same applies to mobile phones, since apparently A MOBILE PHONE IS A BUILDING (HOME), where SCREENS ARE ROOMS covered with WALLPAPER, where architecture meets interior design.

Interfaces are the principle setting where direct manipulation and navigation produce HCI metaphors. Another essential metaphor whose presence has become permanent in desktop and mobile environments alike is a modification of the existing one, namely HCI IS NAVIGATION, where information takes centre stage. HCI IS NAVIGATION OF INFORMATION SPACE and the notion of INFORMATION ARCHITECTURE refer to information in general, although information architecture primarily refers to web site design (cf. Imaz and Benyon, 2007). In the next segment, such metaphors will be further modified to investigate the impact of information transfer and access to the web through mobile devices, which allows mobile devices, among other things, to replace the atlas of the sky or dedicated navigation devices and take advantage of the in-built GPS (Global Positioning System) chip in phones and tablets to see additional information about individual stars and constellations visible in the night sky on any given day, or find our way on the map and use turn-by turn navigation in our cars, based on the information about geographical location received from GPS satellites.

4.1.4 Information on the go. Living on the EDGE of WAPathy becomes LTE living in the fast lane. Before laptops and mobile phones could become the modern standard for carrying and accessing information while on the move, both wireless telephone signal networks and other standards of wireless networking had to be developed. Moreover, mobile phones had to acquire the ability to store the same type of information as computers and synchronize that information with them and there was a time when mobile

access to the Internet was a thing of the future. The gap between the dumb, featureless past, and smart, feature-rich future, full of very capable mobile devices (which could be said to have begun with the moving into the era of true mobility, ushered in by the appearance of the first truly portable mobile phone, the Motorola 800 in 1984 was bridged in the 1990s by a new class of devices, Personal Digital Assistants (PDAs). It was not before 1996 that the first successful device of this kind, the Palm Pilot handheld was launched. These gadgets could manage addresses, appointments, memos, to-do lists and expenses electronically, as users took advantage of a stylus in place of a pen to write directly on the screen, no paper needed. What made these devices genuinely usable was the possibility of synchronizing data, including e-mails with computers, keeping the information up-to-date on both sides. As ever, new advances of technologies require new technical terms and a learning curve, which is where the cognitive tools in the focus of this work come in handy as the following examples show:

- **Cellular network** - a radio network distributed over land through cells where each cell includes a fixed location transceiver known as base station. These cells together provide radio coverage over larger geographical areas. User equipment (UE), such as mobile phones, is therefore able to communicate even if the equipment is moving through cells during transmission. Cellular networks give subscribers advanced features over alternative solutions, including increased capacity, small battery power usage, a larger geographical coverage area and reduced interference from other signals. Popular cellular technologies include the Global System for Mobile Communication, General Packet Radio Service, 3GSM and Code Division Multiple Access. TP

- **PDA (Personal Digital Assistant)** - A handheld device with basic computing and organizing functions. Most of them have a large touch screen, a stylus and support handwriting recognition. Normally, they also have faster processors than typical mobile phones and can run more complex software. Most of the PDAs run a standardized OS such as Windows Mobile for Pocket PC or Palm OS. Today, PDAs are being pushed aside by capable smartphones, which can do all the same functions but also offer telephony. GSMA

- **Enhanced Data GSM Environment (EDGE)** - a high-speed wireless data service that can deliver speeds of up to 384kbps using all GSM channels. This speed now enables the possibility of the delivery of multimedia and other broadband application to mobile phones and computer users. TP

- **General Packet Radio Service (GPRS)** - a packet-based mobile data service on the global system for mobile communications (GSM) of 3G and 2G cellular communication systems. It is a non-voice, high-speed and useful packet-switching technology intended for GSM networks. GPRS can be used to enable connections depending on Internet protocols that support a wide variety of enterprises, as well as commercial applications. It enables the sending and receiving of compact data bursts and large data volumes across mobile phone networks. Prior to sending the data, it is broken into individual packets and shifted through the core network and radio. The data is then reassembled at the recipient's end. GPRS provides computer and mobile users with a steady Internet connection. TP

- **WAP (Wireless Application Protocol)** - A technology designed to allow efficient transmission of optimized Internet content to cell phones. In practical terms, special scaled-down web sites designed specifically to be used on phones. WAP version 1 relied on the WML markup language and special protocols designed for ultra-efficient transmission of content to limited

devices over slow wireless data connections. WAP version 2 relies on a new set of standards (chiefly, HTTP and XHTML) that have much more in common with Internet standards used on the "regular" web. Although not as efficient as WAP 1.x, more powerful devices and faster wireless data technologies make this change possible. WAP is still common and relatively popular, although even faster data connections and more powerful devices with larger displays have made "full" web browsers capable of viewing "full" web sites increasingly popular. PSG

- **WAPathy** n. - The general lack of interest in Wireless Application Protocol, the technology that enables web pages to be viewed on the latest generation of cell phones. Etymology: *WAP ("Wireless Application Protocol") + apathy.* WS

- **Packet Data** - A method of transferring data by breaking it up into small chunks called packets. Packet data is how most data travels over the Internet, and, in recent years, over cell phone networks as well. In cellular networks, all 3G data is packet data, and 4G networks can use packet data for voice calls as well. With packet-switched data, each user only consumes network resources when they are actually transferring data. This is superior to circuit-switched data, where an open data connection must be maintained, using network resources even when idle (like old voice connections.) Packet-switched is the more modern type, and usually faster. In a mobile phone, data is used for functions involving the Internet, as well as most kinds of streaming video and audio. There are many different types of packet data for mobile phones, with different maximum speeds. PSG

- **Fourth generation wireless (4G) is a**n abbreviation for the fourth generation of cellular wireless standards and replaces the third generation of broadband mobile communications. (…) The premise behind the 4G service offering is to deliver a comprehensive IP based solution where multimedia applications and services can be delivered to the user anytime and anywhere with a high data rate, premium quality of service and high security. Seamless mobility and interoperability with existing wireless standards is crucial to the functionality of 4G communications. TP

- **Long Term Evolution (LTE)** refers to a standard for smooth and efficient transition toward more advanced leading-edge technologies to increase the capacity and speed of wireless data networks. LTE is often used to refer to wireless broadband or mobile network technologies. (…) LTE is referred to as the next generation network beyond 3G, with the capacity to support a high demand for connectivity from new consumer devices tailored to new mobile applications. TP

- **Downlink** - The downlink part of a network connection on a mobile device is used to receive, or download, data to the mobile device from the remote server. The uplink connection is used to send data from the mobile device back to the remote server. MBG

- **Uplink** - The uplink part of a network connection is used to send, or upload, data from a mobile device to a remote server. The downlink connection on a mobile device is used receive data from the remote server. MBG

- **Forward Link** - The wireless connection over which information is sent from a cellular base station (tower) to a mobile phone. The opposite of a reverse link. The forward link is analogous to downloading as opposed to uploading. PSG

A fine example of technology imitating life, a cellular radio network through which mobile phones communicate consists of hexagonal cells forming a honeycomb-like structure that has proved to be a very functional visual analogy. Contemporary cellular networks may be many, e.g. *GPRS*, among others, with different technical specifications, but their form and the function – transferring chunks of data called *packets* is the same. The conceptualization of PIECES OF DATA as PACKETS ensuring the

stability, speed and efficient use of networks is linked to the manifestation of the CONTAINER metaphor taking the form of PACKETS ARE CONTAINERS. The transfer of packet data through networks is comprehended via the broad CONDUIT metaphor homologous to the understanding of communication via language as a conduit for transferring meanings between interlocutors' minds. By the same token, networks transmit data between computing devices. The improved performance of cellular wireless networks over time led to the current dominance of packet data, with all 3G data being transferred using this method, allowing a steady mobile Internet connection and 4G LTE, going beyond 3G and using it for voice calls as well and providing rich multimedia experiences on the move. The enhancements referred to as generations (abbreviated as *G*) via the metaphor A NEW VERSION IS A GENERATION, make it possible for technical standards like Wireless Application Protocol (WAP) providing a mobile web experience that left much to be desired to be superseded by HTML which is supported by modern mobile phone browsers. In view of the lack of user satisfaction with WAP sites, it is no wonder that there was little interest in this technology, which resulted in the coining of the jocular blend *WAPathy*. As a pre-3G technology, Enhanced Data rates for GSM Evolution (EDGE) does little else than get users to the edge of their nerves. Today, the appearance of the abbreviation E in the corner of the screens of our mobile gadgets means that the transfer of mobile data to and from the web has been virtually brought to a halt. While it has been replaced by more advanced technologies like Long Term Evolution (LTE), EDGE still remains the only option for mobile Internet access in rural areas. However, its name, like the name of its much more advanced counterpart LTE does provide yet another nature-inspired metaphor, TRANSITION TO A MORE ADVANCED TECHNOLOGY IS EVOLUTION, showing just how routinely people turn to the natural world and their everyday experiences with animals (bees forming honeycombs consisting of hexagonal *cells*) or passage of time from a human perspective (*generation* as a single step in the natural descent, similar to *evolution* as a process bringing gradual progressive change) to explain the artificial world of technology, in this case network architecture. The initialisms mentioned here are just a small selection of abbreviations that abound in the world of technology. Metonymic in nature, resulting from the impact of the Reduction Idealized Cognitive Model (cf. Kövecses & Radden (1998) and Radden & Kövecses, 1999), they are an effective way of shortening long names of technological standards and other phenomena, making them more memorable and reducing the cognitive load.

The motivation for naming a digital media delivery technique (introduced to mobile media as soon as higher Internet speeds became available) *streaming* is very much the same. Requiring a connection to the Internet, this method involves the continuous flow of data, whereby portions of packet data content are temporarily downloaded to the user's device and playback can begin before the entire file is downloaded. The file itself is never remains on the receiving machine in its entirety, as the successive batches of data are received only to be deleted immediately after the corresponding portions of digital media content have been viewed, heard or read. The process is thus based not only on the fundamental CONDUIT metaphor, but also on a more complex one, since the movement of data resembles water running down the stream. This resemblance is the source of the metaphor DATA TRANSMISSION IS THE FLOW OF LIQUID, whose significance to modern computing will be shown to be considerable. A different kind of data transfer, *downloading* and *uploading* relies on more basic sensorimotor experiences that are the input of primary metaphors. It allows both receiving and keeping files on the user's end and sending them over the Internet. As another abstract operation in need of experiential grounding, it requires metaphorical attaching of the basic physical attribute of WEIGHT to the otherwise ethereal concept of data that is behind the terms such as *information overload, upload download* and also the frequently mentioned term *packet data* and the perception of UNITS OF DATA as SUBSTANCES. Besides, terms like *uplink, downlink* and *forward link* point to competing conceptualizations of the direction of data transition via mobile networks. The direction can either be horizontal typical of the older method, i.e. downloading where RECEIVING IS DOWN and SENDING IS UP, as opposed to the more recent streaming method where data moves forward, as it passes though devices and the process is unidirectional. Here too, motion and orientation in space as primary domains play a key role, as human directed data navigates the network on its journey to and from end users.

The access to the Internet via mobile networks has been a feature of both slightly more advanced dumb phones (like all of the devices, in our collection belonging to that category, with the exception of Siemens A35 launched in 2000) and smartphones, at least since mid-2000s. But high costs of mobile Internet have made another wireless option, Wi-Fi, a more popular choice, since the devices equipped with Wi-Fi chips can connect to local Wi-Fi networks, ensuring broadband data transfer speeds, for free, provided that their owners have network access passwords. The device needed to

make any wired connection to the Internet, obtained through local Internet Service Providers (ISPs) a wireless one is a router to which the user's cable or ISDN modem is connected. Nowadays these are more often than not combined into a single device that receives and forwards *Internet traffic*. The purpose of a router is to assign IP (Internet Protocol) addresses to each device in the network and keep track of their requests for data from the Internet, so as to be able to direct the response to the device that made it. While the term *IP address* evokes the general metaphor AN INTERNET ENABLED DEVICE IS A BUILDING, *Internet traffic* and *router* focus the attention of users on the view of THE INTERNET as A SUPERHIGHWAY, which is today largely considered to be outdated (except in very specific contexts like those created by the net neutrality issues), and succeeded by other partial mappings to be discussed below.

- **Hot Spot (Hotspot)** - An area where wireless service is made available for Wi-Fi enabled devices or computers to access the internet. Most hot spots charge users for access by the day or month, however some are free. The area size can vary. A hot spot at a coffee shop, for example, might be accessible from across the street, but not the next block. At an airport, a hot spot might cover just a few gates, or the whole airport. Mobile devices can also create their own small hot spots, including phones and dedicated data devices. The service is enabled by one or more Wi-Fi "access points" set up by whoever offers the hot spot. The access point is a small electronic box connected to the Internet, with a Wi-Fi radio and antenna. The term "hot spot" was popularized by T-Mobile, and is often used to refer to an access point owned and run by a company as opposed to an individual. PSG

- **MiFi** - MiFi is a portable broadband device that allows multiple end users and mobile devices to share a 3G or 4G mobile broadband Internet connection and create an ad-hoc network. Although MiFis are manufactured by Novatel, the name is often used as a generic label for any device capable of becoming a personal hotspot or pocket router. Although some smartphones have the capability to be used as hotspots, they do not have the management capabilities that Mifi offers to control data consumption on connected devices. Additionally, because the phone is not a dedicated device like Mifi, the phone's owner must turn the hotspot feature on whenever sharing is desired - and during that time, the phone itself cannot behave as a Wi-Fi client. On some phones, taking a voice call disrupts 3G/4G data flow, suspending personal mobile hotspot service for other Wi-Fi devices using it at that time. The name MiFi is thought to stand for "my WiFi." Some 3G/4G carriers sell MiFis (or similar devices) with pay-as-you-go plans, while others require a monthly fee or annual contract. WhatIs TT

- **Tethering** - In the context of GSM mobile phones, tethering describes the process of connecting a phone to a computer so that the computer can access the internet via an EDGE/UMTS/HSDPA network. In this way, the mobile phone acts as a modem for the computer. That specific use of the word "tethering" stems from the fact that to be used as a modem, the mobile phone usually has to be connected to the computer via a USB data cable. In recent years however the same thing has become possible without cables by using a Bluetooth connection. Thus, tethering has turned into a generic term for using your mobile phone as a GSM modem for your computer. GSMA

- **Handoff** - refers to the process of transferring an active call or data session from one cell in a cellular network to another or from one channel in a cell to another. A well-implemented handoff is important for delivering uninterrupted service to a caller or data session user. In Europe and other countries, a handoff is known as a handover. TP

- **Apple handoff** - A technology that allows users to start an application in a Mac and pick it up on their mobile device and vice versa. Starting with the mobile iOS 8 and desktop OS X 10.10 (Yosemite) versions of Apple's operating systems, Handoff requires that both devices be signed into the same iCloud account. Also called "liquid computing." PCME / The Handoff feature on Apple Watch and iPhone lets you move from device to device without losing focus on what you're doing. For example, you can easily check email on Apple Watch, but you might want to switch to iPhone to type a reply using the onscreen keyboard. Simply wake iPhone, and you see an icon in the lower-left corner of the Lock screen that matches the app you're using on Apple Watch—for example, Mail. Swipe up on the icon to open the same email on iPhone, then finish your reply. You can use Handoff with these apps: Mail, Maps, Messages, Phone, Reminders, and Calendar, as well as Siri. For Handoff to work, your Apple Watch must be in close proximity to your iPhone. AWUG

- **Bluetooth** - This wireless technology enables communication between Bluetooth-compatible devices. It is used for short-range connections between desktop and laptop computers, PDAs (like the Palm Pilot or Handspring Visor), digital cameras, scanners, cellular phones, and printers. Infrared once served the same purpose as Bluetooth, but it had a number of drawbacks. For example, if there was an object placed between the two communicating devices, the transmission would be interrupted. (You may have noticed this limitation when using a television remote control). Also, the Infrared-based communication was slow and devices were often incompatible with each other. Bluetooth takes care of all these limitations. Because the technology is based on radio waves, there can be objects or even walls placed between the communicating devices and the connection won't be disrupted. Also, Bluetooth uses a standard 2.4 GHz frequency so that all Bluetooth-enabled devices will be compatible with each other. The only drawback of Bluetooth is that, because of its high frequency, its range is limited to 30 feet. While this is easily enough for transferring data within the same room, if you are walking in your back yard and want to transfer the address book from your cell phone to your computer in your basement, you might be out of luck. However, the short range can be seen as a positive aspect as well, since it adds to the security of Bluetooth communication. TTCD

- **Conduit** - the code that handles the exchange of data between the Palm and the desktop. PPDG / the term Palm, Inc., uses to describe the software that connects data on your Zire with similar data on your computer. The Calendar conduit, for instance, makes sure the Zire's Date Book and the computer's calendar (be it in Palm Desktop or Outlook) stay completely in sync. Every application on your Zire that has a corresponding program on the PC is connected with its own conduit, and the Custom menu option is where you turn to adjust these conduits. HTDE-Z

- **Minibrowser (Browser)** - In wireless phones, built-in software that allows the user to access special Internet sites using their phone. While nearly all browsers in phones can view sites made especially for phones, only some can also display "full" web sites. PSG

- **Surf** v. [from the `surf' idiom for rapidly flipping TV channels] To traverse the Internet in search of interesting stuff, used esp. if one is doing so with a World Wide Web browser. It is also common to speak of `surfing in' to a particular resource. JF

- **Sideloading** - Sideloading means installing and running applications on mobile devices that haven't been authorized or approved by the device's official app store. WP /Sideload (Side-load) To move files / content from one local device (such as a computer) to another local device (such as a phone.) This may be accomplished via a direct cable connection (such as USB,) or via manually moving a physical memory card (such as microSD,) or wirelessly, via a wireless standard such as Bluetooth or Wi-Fi. The term side-loading is derived from downloading (to move from the Internet down to a local device) and uploading (to move from a local device up to the Internet.) The concept is similar, but since both devices are local, it is neither "up" nor "down", therefore it is "side"-loading. PSG

Although Wi-Fi is a popular solution, unlike mobile Internet, it is not available everywhere while on the move. Once users leave their Wi-Fi equipped homes, where the signal is available everywhere thanks to wireless routers, they depend on *Wi-Fi hotspots*, differently sized public areas or on small private spots created by mobile device owners who have decided to share their mobile data connection wirelessly with others by switching on the personal hotspot option built in the operating system of their gadgets. Regardless of the nature of the connection, the metaphorical mapping of the temperature term *hot* produces a positive set of associations to the activity and availability of access to a communication channel in a metonymy-based metaphor, where the modifier of the noun phrase could also be said to be loosely related to the adjective's meanings pertaining to the spheres of electricity, namely *hot* as in "live, charged or energized with electricity" i.e. *connected*, e.g. *hot wire* and more closely linked to popularity (e.g. *one of the hot young jazz clubs* and even speed, "very fast, capable of quick response and great speed" e.g. *a hot sports car* (cf. Advanced English Dictionary and Thesaurus, 2006). This is because computing is ultimately reducible to the interpretation of electrical signals by the central processing unit (CPU) and people usually flock to wireless hotspots, which become popular places where to get quick and free access to the web. *MiFi* is a blend (*my + Wi-Fi*) showing the usefulness of analogy when naming new concepts and the things they refer to, provided that they share relational structure with the existing ones. Thus, a dedicated pocket device for sharing personal mobile broadband connection - *my Wi-Fi* and creating an *ad hoc* Wi-Fi network anywhere becomes a means of providing that kind of Wi-Fi, *Mi-Fi* for short. A new word easy to remember, merging the old and the new enters the lexicon. *Tethering* is an interesting case of semantic widening, the opposite of *Mi-Fi* in that it requires a cable connection to the PC or another device in order to use the mobile phone as a modem and mobile data to access the web. The primary meaning of the verb *tether* is "tie (an animal) with a rope or chain so as to restrict its movement", e.g. "the horse had been tethered to a post" [32]. The meaning related to the digital technology is therefore an image metaphor (cf. Lakoff & Turner, 1989). The connection cable is a tether and computers and smartphones have become our beasts of burden, so to speak, able to carry the load of the numerous good and bad uses we put them to.

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[32] Oxford Dictionaries entry for Tether retrieved June 27, 2015 from https://en.oxforddictionaries.com/definition/Tether.

Significant technological innovations bring about visible changes in the fields they influence, until the whole perception of the field undergoing a transformation has become altered to a degree where new metaphors are necessary to help interpret the conceptual shift. Neither the Internet (cf. Osenga, 2013) nor the world of computing in general are immune to this inexorable process. The INFORMATION SUPERHIGHWAY metaphor may be an outdated way to refer to the Internet, but BROWSING THE WEB IS SURFING still. Developed by analogy from *channel surfing,* or *channel hopping*, quickly changing TV channels, *surfing the web* implies freedom of movement when hitting waves of information organized as links, associative devices forming part of the non-linear phenomenon of hypertext. Johnson, (1997: 107-109) makes a point of highlighting the discrepancies between the two metaphors:

"Surfing at least implied that channel-hopping was more dynamic, more involved, than the old routine of passive consumption. Just as a real-world surfer's enjoyment depended on the waves delivered up by the ocean, the channel surfer was at the mercy of the programmers and network executives. (…) The links that join those various destinations are links of association, not randomness. A channel surfer hops back and forth between different channels because she's bored. A Web surfer clicks on a link because she's interested."

It may well be that SURFING is not an altogether fitting metaphor for visiting various web SITES during the online NAVIGATION JOURNEY, because of the differences between TV, as a passive, consumption-oriented medium and the web that is at least partly based on active searching for information. However, *surfing* may have arisen from another analogy – the connection to the 1960s Californian drugs and surfer cultures, as well as computer subcultures from the 1980s that espoused the idea of individual freedom (cf. Shortis, 2001: 50). Anyhow, iPhone was rightly hailed as the first mobile phone offering a comfortable, even enjoyable surfing experience thanks to porting the Safari browser, previously existing on the Mac only, to the handheld. It was not a dumbed down minibrowser other phones had at the time. It could show full websites and use a Wi-Fi connection along with mobile data. In the case of *handoff* and *Apple handoff*, another functionality of the devices designed by the Californian tech giant, everything possibly starts from an analogical relation to sports, American football to be precise where, the term *handoff* is used to refer to a play in which one player passes the ball to another. Likewise, in the domain of cellular networking, in the U.S. the same word is used (while Europeans use *handover*) to describe "transferring an active call or data session from one cell in a cellular network to another or from one channel in a cell to

another". In a different kind of networking situation, information can be seamlessly transferred between devices belonging to the Apple *ecosystem* (which also happens to be the term that Osenga (2013) considers to be the most promising metaphor for the Internet in its current form). The nature of the transfer is such that the user is able to continue using a specific app or working on a task on the one device, just where he or she left off on the other, thus hopping between the computer and the mobile phone connected to the same Wi-Fi network and iCloud account. Luckily, this kind of communication is possible between Apple Watch and iPhone too. So, if for example the owner of the wearable initiates a voice search of the web on the watch and the result cannot be displayed on the device itself (due to rich multimedia content of the page containing the search result, for instance) the search query will be instantly transferred wirelessly via Bluetooth to the iPhone to which the watch is connected. This uninterrupted seamless flow of information between diverse devices has given rise to the notion of *liquid computing*, describable by a CONDUIT-type metaphor COMMUNICATION BETWEEN COMPUTING DEVICES IS THE FLOW OF LIQUID. This highlights the importance of wireless data networks to modern computing and communication and, at the same time, serves as a reminder that Internet access enabling networks, like mobile data ones or Wi-Fi are not the only players in the field.

Other networking standards, like *Bluetooth* and its predecessor *infrared* (still present, alongside Bluetooth in the 2006 Sony Ericsson W850i feature phone, for example) have also been part of mobile media's steady rise to dominance. Describing the etymology of the name of the widespread wireless technology built in mobile phones, and PCs, as well as in many portable devices, from mobile phone handsfree headsets and Bluetooth speakers to PC peripherals – keyboards and mice, cameras and gaming consoles, Oxford Dictionaries state that it is "said to be named after King Harald Bluetooth (910–85), credited with uniting Denmark and Norway, as Bluetooth technology unifies the telecommunications and computing industries"[33]. The analogy between the eponyms is based on the shared power to unite dissonant entities, be it nations or industries. Establishing a connection between Bluetooth-enabled phones, tablets or computers, in order to transfer address book entries or photos, for example, consists of two successive processes, *pairing* and *bonding*[34] aimed at ensuring

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[33] Oxford Dictionaries entry for *Bluetooth* retrieved July 8, 2015 from https://en.oxforddictionaries.com/definition/bluetooth.
[34] As explained in the Wikipedia article "Bluetooth" retrieved July 8, 2015 from https://en.wikipedia.org/wiki/Bluetooth.

security, since access to a connected device can mean gaining partial control over it or insight into private data stored on it. Pairing is the stage where user interaction is required to confirm that the connection is desired and allow it by answering a question to that effect that usually pops up in a dialogue box − the interface element that is an instantiation of the CONTAINER metaphor and a reminder that the conceptualization HCI IS A CONVERSATION is in place. After a bond is formed during pairing, the devices can connect to each other and the relationship can be ended whenever the user wishes to do so. Thus, two metaphors related to this networking standard can be said to be active, namely, INITIATING THE CONNECTION IS PAIRING and MAINTAINING THE CONNECTION IS MAINTAINING THE BOND. These replicate the dynamic of human relationships.

Palm's software for syncing data between the PDA and the computer, first via cable only and in later models using Wi-Fi too is the clearest manifestation of the CONDUIT metaphor, with which it shares the name. Every application producing data that can be synched has its own dedicated conduit, a communication channel allowing the transfer of data between devices, on condition that the PC has the HotSync software installed. In *HotSync*, the modifying adjective most likely highlights the speed of the process. This practice that made the handheld fully dependant on the computer, a portable extension of it is the reason the founder of Palm, Jeff Hawkins used the tentacle metaphor to refer to PDAs reaching back to PCs (cf. Rhodes and McKeehan, 1999).

The analogical formation *sideloading*, modelled on *uploading* and *downloading*, gives a hint that it is possible to do a little something *on the side* with our mobile devices. The operation in question is local and involves installing the software unauthorized by the official app stores run by operating system manufacturers. This means sidestepping the rules and stepping outside the walled garden. The ways and implications of taking such a big step are the topic of the next segment.

4.1.5. Another brick off the wall. Dismantling the garden wall and the risks and rewards of freedom. The *walled garden* concept has been developed to keep the customers of mobile technology companies locked in, tied to individual ecosystems consisting of hardware products, software and services that come from a single source and are tightly controlled by it. The business model known as "vertical integration", championed by Apple Inc. from the very beginning and adopted by many in the

meantime is supposed both to keep the customers safe from the dangers of the outside world, such as malicious software and ensure a reliable income stream from customer purchases and subscriptions. While owners of mobile devices cannot be prevented from modifying the software of the gadgets, they can be discouraged from doing so by varying degrees of threat of likelihood of losing warranty. So, at least for a loud minority, the call of freedom is just too strong to be resisted. The following selection of terms describes a fraction of the world where "software wants to be free", to quote the old cyberpunk slogan.

- **Rooting** – the term used to describe the process of gaining root access or privileged control over devices, most commonly Android smartphones and tablets. Rooting can also be done on devices based on Linux environments. Although similar to terms like unlocking and jailbreaking, conceptually rooting is quite different from these terms. Rooting enables a normal user to have administrator-level permissions to the operating system environment. In the case of Android devices, it helps in circumventing the security architecture, but if not done correctly, could potentially cause problems. Rooting is normally done to overcome the limitations on devices usually put in place by the service providers or hardware manufacturers. In most cases, once rooting is performed, an application named "Super User" is available in the application manager. A user with root access can install new applications, revoke existing permissions to system applications, uninstall system applications, and perform a number of otherwise-restricted actions. (…) Once rooting is accomplished, the user gains root access and can install custom ROMs and special applications which were not possible earlier. Certain default applications which could not be uninstalled from the device could now be uninstalled. New themes can be introduced. One of the primary advantages of rooting is in boosting battery life. Rooted devices can stop any unwanted application from running. Another advantage is in transferring applications from internal storage of the device to a memory card. This helps in freeing memory space in the device. Custom firmware can also be introduced with help of rooting. (…) If the rooting is done incorrectly, there is a high risk of bricking. Most manufacturers void the warranty of the device if rooting is performed. Furthermore, rooting can potentially introduce security vulnerabilities. TP

- **ROM** - A ROM image is a data file that contains information used on a Read Only Memory chip. For our purposes, that means a complete system image of a device. Each Android device has its own ROM image that contains files and code needed to boot the device up and run Android on it. But this is only part of a ROM. A ROM also contains a GUI (graphical user interface), required and useful applications, support files for those applications and the kernel. XDA

- **Cooked** - Refers to ROMs which have been modified and optimised by users to offer better performance than a carrier ROM or a release by Microsoft. XDA

- **Locked Phone (Unlocked Phone)** - Although there are several types of "locks" that can apply to a phone, the most talked-about type is a carrier lock, also known as a SIM lock or subsidy lock. Many phones sold by carriers come "locked" to that carrier. A "locked" phone can only be used with that carrier; it cannot be used with another carrier's service. (Not counting roaming.) This lock can usually be removed by entering a special code or numeric password. In some situations, some carriers will supply this code upon request by the customer; not all carriers will do this. There are also third-party companies that sell such codes, or other types of unlocking services. PSG

- **Jailbreak** - Slang term used to describe the action of gaining access to an iPhone's private file system to override some of the device's restrictions. Jailbreaking also enables an iPhone user to install third-party applications. WP / Breaking open the root jail Apple uses to secure iOS, allowing a user to customize the device and install apps outside of the App Store. iMG

- **Cydia** – Open source software for iPhones that allows the installation of third-party applications that come from sources other than Apple's App Store. Cydia, along with an earlier "installer.app" program, were available even before the App Store debuted in 2008. In order to use Cydia, named after the destructive *Cydia pomonella* moth found in apple orchards, the iPhone's restrictions must be overridden (see iPhone jailbreaking). PCME / Created by Jay Freeman (Saurik) in March 2008, Cydia is an application for jailbroken iOS devices that allows for the purchase and installation of 3rd party extensions or apps that Apple does not allow in the App Store. iMG

- **PWN** - In gaming, to trounce an opponent. To be "pwned" is to be defeated unmercifully. The term has also come to mean "hacked." For example, the website www.haveibeenpwned.com lists the top 10 website breaches, and people can check to see if their e-mail address was compromised. Pronounced "pone," "pwen," "pawn" or "pun," the derivation of the term is not definitively known. Some believe it came from a common typo of the word "own" when typing too quickly "I own you!" On a QWERTY keyboard, the "o" and "p" keys are next to each other. PCME / (…) pwn means to compromise or control, specifically another computer (server or PC), website, gateway device, or application. It is synonymous with one of the definitions of hacking or cracking, including iOS jailbreaking. The Pwnie Awards are awarded by a group of security researchers. WIKI

- **Superuser** - In Linux-based systems like Android, the superuser is a user account with administrator permissions, which allow for the modification of system settings and files. If your Android device is rooted, you've achieved superuser status. GH

- **SemiTethered Jailbreak** - A semitethered jailbreak means that you still have a tethered jailbreak but if you lose power or your iPhone, iPod Touch or iPad crashes it will re-boot into a semi-functioning state where you can use applications such as Phone/SMS. To put your iDevice back into a functioning and jailbroken state you will need to plug your iDevice back into your computer and re-run the jailbreaking tool you originally used to jailbreak your iDevice. iJB

- **Tethered jailbreaking** requires users to reconnect (tether) to their computer every time the device is restarted while an untethered jailbreak is a one-time activity and is free of this restriction. Both tethered and untethered jailbreaks give users the ability to install "unauthorized" software on iPhones, iPads and iPods, i.e. applications that are not downloaded from Apple's app store and have not been approved or vetted by Apple. These include apps from the Cydia app store. With every new version of iOS, Apple makes it more difficult to jailbreak and there is usually a lag before jailbreak software catches up to the latest iOS version. Software for tethered jailbreaks is released first because untethered jailbreaking is more difficult. Jailbreak software may be different for each iOS device type (iPhone, iPad and iPod). DF

The terms *rooting* and *root access* used in relation to getting a higher level of control of Android, are part of the well-established computing metaphor representing a hierarchical filesystem in the form of a TREE. This data visualization technique presupposes the presence of BRANCHES and LEAVES and ROOT as the top node. So, a successfully performed procedure gives one access to all levels of the operating system structure, something well beyond the reach of average users. The definition of *rooting* also mentions *security architecture* and *privileged control* i.e. *administrator-level permissions*. The former once again underlines the conceptual link between aspects of SOFTWARE and ARCHITECTURE, while the latter harks back to the office and business setting where an administrator is a position of responsibility and control.

Similarly, in the realm of computing, ADMINISTRATOR IS A PERSON IN CONTROL OF THE (OPERATING) SYSTEM. The level of control that is gained is indeed superior as reflected by the name of the application installed as part of the rooting process – *Super User*. The former average users, turned *superusers* with administrator permissions, can install and uninstall all sorts of applications at will, including installing modified versions of the entire system including the graphical user interface, the so-called (cooked) ROMs. Therefore, MODIFYING THE OPERATING SYSTEM IS COOKING. Rooting allows installing applications unapproved by Google, custom designed to take full control of the behaviour of other applications as wholes or their individual features. *Lucky Patcher* and *Rom Toolbox Pro*, for example belong to the category of unofficial application management software. Metaphoric references to household activities continue with MODIFYING SOFTWARE (APPLICATIONS) IS PATCHING IT as we return to the target domain of mechanics to incorporate the above-mentioned view of SOFTWARE FUNCTIONS as TOOLS. Importantly, rooting allows stopping any running applications, either by killing or freezing them. While the act of KILLING, requires prior attribution of ANIMATENESS and has a temporary effect, until the device is rebooted, the metaphor STOPPING AN APPLICATION IS FREEZING IT, describes a lasting action that prevents a piece of software from running until the user activates it again, which is especially useful for memory intensive apps or the ones causing excessive battery drain. Rooting can remove many restrictions imposed by hardware and software manufacturers or by carriers, but it does not amount to UNLOCKING an Android device LOCKED to a network i.e. accepting the SIM card of a single provider that it was purchased from at a subsidized price, hence the term *subsidy lock*. As for Apple devices running the iOS operating system, unlocking carrier-locked iPhones was one of the main reasons for getting root access to the system through *jailbreaking*, so that the people who lived in the countries where Apple phones and tablets were not officially sold could use the devices they bought abroad. The underlying conceptualization OPERATING SYSTEM IS A JAIL invites a comparison with the metaphoric expression MY JOB IS A JAIL. Lakoff (1993) argues that this expression, analyzed by Glucksberg and Keysar (1990) as a categorization statement, (where *my job* belongs to the same set of confining, unpleasant situations as *jail* that is a prototypical example of that category) is in fact an example of the interaction between the GENERIC IS SPECIFIC metaphor and the metaphor system in general. The interaction is founded on a knowledge schema of jails severely limiting the movements of prisoners, whose image schematic structure

is preserved by the GENERIC IS SPECIFIC metaphor and to which additional metaphors apply, namely, ACTIONS ARE SELF-PROPELLED MOVEMENTS, which is part of the larger EVENT STRUCTURE conventional metaphor and PSYCHOLOGICAL FORCE IS PHYSICAL FORCE. The mapping produces the perception of one's job as the source of psychological limitations of one's actions. Thus, the EVENT STRUCTURE metaphor explains the link between a situation like having a job and the spatial notion of confinement and no resorting to categorization is needed (cf. Lakoff, 1993: 236). Mentioning the same example, Holyoak and Thagard (1995: 221-222) take a different approach, while pointing out that Glucksberg and Keysar consider metaphors to be more structured than similes on account the fact that both notions linked by the metaphor belong to the same category, while the simile, *my job is like a jail* is weaker, simply implying a measure of similarity between the two concepts. In their view, a metaphorical category is a schema formed by the mapping between the source and target analogues and the way in which analogical mappings constrain the formation of the schema (i.e. why *jail* is generally perceived primarily in terms of confinement and not as "room with bars" or "building" or otherwise) can be accounted for by their multiconstraint theory whereby analogy is limited by the interrelated impact of the three factors: similarity, structure and purpose. Like Lakoff, Holyoak and Thagard see schema formation as a more general process than the setting up of categories, since schemas can be established from metaphors unrelated to categorization. They find that the connection between analogy and schema formation explains why metaphoric interaction between the source and the target can result in changing our understanding of both. In this case, both *job* and *jail* come to mean something different than before the mapping took place. By analogy, *job* becomes confining and *jail* acquires a more abstract meaning as the source of the CONFINEMENT schema and it does not have to keep the specific characteristics like walls and iron bars. Since this partial mapping is unidirectional and goes from source to target, the source adapts to the target in that the meaning of *jail* is extended to become more abstract, while *job* still refers to *"my job"*. By the same token, Apple's operating system remains what it is, but its notoriously closed nature invites an analogy with *jail* and by extension yields the metaphor ACCESSING/MODIFYING (BREAKING INTO) THE OPERATING SYSTEM IS BREAKING OUT OF JAIL. Installing Cydia, the unofficial store offering mostly tweaks – adjustments, finetuning the existing options of the operating system or creating new ones is part and parcel of the jailbreaking process. Known for a wide variety of such extensions, some paid,

some not, e.g. tweaks improving notifications, and various other aspects of the interface, as well as built-in apps and third-party ones downloaded from the App Store, Cydia's name, originally referring to the *Cydia pomonella* moth is a subtle metaphor. The moth is an agricultural pest found in apple orchards, whose larvae burrow into the fruit. At the centre of the analogy on which the metaphor is based is the fact that Cydia tweaks insert pieces of code into iOS, just like larvae get into apples. While getting unauthorized full access to any operating system, creates security concerns, the impact of Cydia tweaks in iOS is far from detrimental. Some modifications or added functionality provided by independent developers have proved so useful and popular that Apple copied and incorporated them into the official release of the operating system, notably Notification Centre and the recent Night Shift mode feature (automatically adjusting warmer hues on Apple device displays as the night falls) inspired by the long-standing f.lux tweak available for free from Cydia. A combination of thousands of cosmetic adjustments to the system, wallpapers, ringtones and themes and more ambitious modifications, Cydia remains a hotbed of iOS development.

Now that the metaphoric foundations of rooting and jailbreaking and the positive aspects of these interventions have been demonstrated, the risks of such an undertaking must also be considered. The following terms refer to those:

- **Brick$_1$** – "the largest phones are affectionately referred to as 'bricks'." HU

- **Brick$_2$** – Bricking refers to a consumer electronic device that has been damaged beyond repair, making it utterly unusable, often because of damaged firmware. The use of the term stems from the brick-like shape of many consumer gadgets, and the fact that once they are rendered inoperative, they are virtually useless except as a paperweight or a doorstop. Strictly speaking, a device is bricked when it completely loses its functionality. However, the term is being used with more flexibility these days, and in some cases, bricked electronics are still recoverable with some hardware replacement or additional software. Bricking can occur for any number of reasons. A thwarted attempt to update a device is one of these. Firmware updating for some gadgets is a process that must be successfully completed without interruption. As such, a power outage, user intervention or any other form of interruption that makes the update process stop, albeit inadvertently, may cause the existing firmware to be overwritten, rendering it useless. Bricked equipment is also the unwelcome consequence of malicious or incorrect software, such as when firmware intended for a different hardware version of the device is installed. In some cases, a consumer electronics company may intentionally create corrupt software that can brick a device as a way of penalizing users who unlock their gadgets to avoid the limitations the company imposed through its official firmware. For instance, Apple was reported to have been deliberately bricking jailbroken iPhones via software updates - a claim that the company has since denied. In the hands of experts, a bricked piece of equipment still has the potential to become "unbricked," with the use of complex software and hardware solutions. However, there is no guarantee that a procedure that works in recovering one bricked device will work with another. TP / Bricked - A device whose software has been compromised (generally by the user) to the point where it will not boot into Android, rendering it as useless as a paperweight or brick.

The term **hard bricked** is used to refer to a device in such a state as a result of failed hardware, while the term **soft bricked** generally denotes a software failure that can potentially be fixed. GH

- **ibrick** - A term used to describe a useless Iphone due to failed jailbreaking to another service provider by someone who had no idea what they were doing. The term is specifically used in more technologically inclined persons. Someone who knows how to jailbreak a phone will know when an iPhone has become an ibrick. (…). RUNDb

- **Hard Reboot** - Also referred to as a hard reset. The act of pressing and holding the power button (or power and volume down on Samsung devices) to force a device to reboot when its software is misbehaving. GH

- **Hard reset** – A hard reset, also known as a **factory reset** or **master reset**, is the restoration of a device to the state it was in when it left the factory. All settings, applications and data added by the user are removed. The term is often heard in reference to smartphones and tablets but laptop and desktop computers, as well as most other electronic devices, can usually be restored to factory conditions. Factory reset may be accomplished through various procedures, depending on the particular device, or may be available as a device or operating system feature. Android Factory Reset, for example, is a feature that erases all settings, user data, third-party applications, and associated application data from an Android device's internal flash memory. The most common reasons to restore factory conditions are to fix a malfunctioning device or to remove user data before selling or otherwise disposing of a device or returning it to the manufacturer. Hard reset contrasts with **soft reset**, which just means to restart a device. WhatIs TT

- **Soft Reboot** - Also referred to as a soft reset. A function available on some custom ROMs and via root apps (see above) that shortens the time it takes to reboot a device by simply restarting Android as opposed to fully rebooting through the bootloader. GH

- **Boot Loop** - The Boot Loop is an error with the ROM's ability to fully boot into a working stage. It starts off pretty nice where you see the splash screen followed by the animated boot animation. Unfortunately, you may find yourself watching that boot animation for some time. When the boot animation never stops and just keeps on repeating for more than 5 minutes, you are now officially in a device breaking Boot Loop. AG

- **System Crash** - System Crash is pretty much the same as a system crash on a regular PC. This happens when you are actually using the device to do something, then all of a sudden, the device stops working. Now on a PC, all you would need to do is to launch task manager and end the process of the malfunctioning app. On an Android device, it may vary depending on the device's response. One scenario could simply lead to a period of unresponsiveness followed by a pop-up message that says an app needed to force close. This is easy and is usually caused by the app that you were previously running. You can try to reinstall the app and see if the issue persists. If it does, get rid of the app. Another scenario is when your phone just completely reboots on its own after a short period of unresponsiveness. This could be caused by a system or ROM issue, or it could be caused by a tweak you recently made. Try to undo your tweaks and see if the error persists. The last scenario is a total freeze that can only be stopped the same way you would stop a SOD – a manual reboot, or a battery pull. This can have the same causes as the second scenario. Either way, if the crash persists, consider a wipe and reinstall before you start thinking of a hardware problem. AG

- **APK** Short for **Android application package**. - The extension used in Android app installation files (e.g., app.apk). Similar in nature to an EXE file on Windows. GH

- **ipa** - An .ipa file is an iOS application archive file which stores an iOS app. Each .ipa file includes a binary for the ARM architecture and can only be installed on an iOS device. Files with the .ipa extension can be uncompressed by changing the extension to .zip and unzipping. WIKI

One of the biggest scare factors of getting control of mobile devices through rooting or jailbreaking and one of the worst fears of those who attempt to do it is getting your gadget bricked. The metaphorical meaning of the term widely used in connection with electronics comes from the expression to be *as useless as a brick*. The verb *to brick* is a result of the word forming process of conversion and the action denoted by it can have many causes. As shown in the definition above, user action directed at removing operating system restrictions is not the only way to render a device inoperative. The corruption of firmware, "a fixed form of software programmed into a read-only memory"[35], during a regular update of the operating system can have that effect and so can the installation of a malicious program. An analogical formation modelled on its subordinate term, *software, firmware*, whose malfunctioning is certain to cause bricking could be said to be based on a metaphor similar to the primary metaphor CERTAIN IS FIRM illustrated by the sentence "Next year's budget is fairly *solid* at this point", proposed by Grady (1997). PERMANENT IS FIRM describes the nature of *firmware* that cannot be deleted by users like an ordinary piece of software, which makes it more permanent. Fortunately, in some cases, the undesired consequences of compromising software are reversible and handhelds and other electronics can be *unbricked* by tech savvy individuals, depending on the severity of the problem. A hardware failure makes a device *hardbricked* and harder to repair, if at all, while the chances of restoring a *softbricked* gadget i.e. resolving a software issue are higher. Whatever its fate, while out of order, it will be refer to as *brick*. i.e. DAMAGING A DEVICE BEYOND (EASY) REPAIR IS BRICKING IT. If it is an iPhone, a new word, iBrick, blending *iPhone* and *brick* will apply. The term *brick* has another less ominous meaning, with a different conceptual basis. The malfunction-related meaning relies more on the functional aspect of the link between the source and target, emphasizing lifelessness and the lack of usefulness. The meaning that has to do solely with the thickness and the overall square shape of earlier phones that were not as slim and sleek as their modern counterparts stems from a pure image metaphor. When phones were *bricks* in that sense, they were much less likely to become *bricked* because their software was either non-upgradeable or the available upgrades were less frequent and more importantly, phones that looked like bricks were also dumb, having existed in the pre-smartphone era. As such, they posed no challenge to hackers to modify their features.

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[35] firmware. (n.d.). *Collins English Dictionary - Complete & Unabridged 10th Edition*. Retrieved March 25, 2015 from Dictionary.com website http://www.dictionary.com/browse/firmware

But ever since devices got smart, hackers have had their minds set on outsmarting them.

Less severe problems caused by software modifications or misbehaving apps may be solved by a *soft reboot* (synonymous with *soft reset*), that is, simply restarting the device whose operating system still responds to software commands. When the device becomes unresponsive, *hard rebooting* it by simultaneously pressing a combination of hardware buttons usually helps to restore it to a functional state. While the etymology of these terms is unclear, the connection to *software* and *hardware* respectively seems undeniable, which would make the heads of the compounds *soft reboot* and *hard reboot* metonymic clippings of *software* and *hardware* respectively, Raymond (2003) claims that the corresponding use of *hard boot* in relation to computers "connotes hostility towards or frustration with the machine being booted". Hard feelings towards the machine certainly do play a part when it comes to unresponsive devices and the potential loss of data. In *hard reset,* though, the adjective does not seem to be related to hardware. Rather, it refers to the seriousness of the consequences of that type of reset of a phone or tablet, since it involves deleting all installed applications and user data and restoring its software to the initial state it was in when the device left the factory, which explains the name *factory reset*, also referred to as *master reset* since it's a single command that restores different settings to their original system state.

Boot loop, on the other hand, is a more complicated condition where the device cannot finish booting up properly. Instead, the process gets stuck at the boot screen, where the boot logo appears and does not disappear, as the operating system cannot complete its boot cycle due to a corrupted line of code and it tries to do it over and over again, causing an endless loop. This can occur during a software update or after installing an incompatible application. Kicking the device out of the loop requires either performing a hard reboot or a running a specialized piece of software on a computer to which the device is connected. The etymology of the computing term *boot* hides another literary reference and is therefore another instance of culture influencing technology. Quinion, (2002) provides the following explanation:

"For the computer sense, we have to think of footwear, in particular the saying "to lift oneself by one's own bootstraps". That's hardly a practical proposition, but it does give the intended idea of a person achieving success by his own, unaided efforts. A bootstrap is not a bootlace, by the way, but a pair of

loops inside the top of a heavy riding boot, something to pull on to get the foot past that awkward bend at the ankle. (…) The process of bootstrapping a computer involved reading in a short program, either by pressing keys on the console or reading them from paper tape. This series of commands was just powerful enough to read in a slightly more complicated program, say from punched cards. In turn, this was just sufficiently complex to load the whole operating system. Modern personal computers still do something a bit like this: when you turn one on, it first runs a program that is permanently wired into a chip in the machine. This loads a small start-up program from disk, which in turn loads the main operating system."

Switching on or restarting a computing device causes it to load a small piece of software, known as PC BIOS (Basic Input/Output System) or phone bootloader launching a self-sustaining process that unfolds without external help and ends in the loading of the operating system. The machines that perform these steps are said to be pulling themselves by their bootstraps. The phrase supposedly originated from Rudolph Erich Raspe's 1785 book, *Baron Munchausen's Narrative of His Marvellous Travels and Campaigns in Russia,* since the baron is believed to have saved himself after falling into a swamp by pulling himself by his hair (or bootstraps). Still, Quinion adds that in the 1950s, computer scientists as great readers of science fiction, may have been inspired to use the phrase in question by Robert Heinlein's 1941 short story *By His Bootstraps*. Having entered the vocabulary, the term *bootstrap* was subsequently shortened and the noun *boot* also became a verb after undergoing conversion. As a phrasal verb, it features the adverb *up*, as in *to boot up*, and together with the verb *shut down* describing the opposite action, it provides the evidence of the presence of the orientational metaphors ACTIVE IS UP and PASSIVE IS DOWN (cf. Lakoff and Johnson, 2003. The derived verb, *reboot*, meaning to restart a device can be applied to humans as part of the PEOPLE ARE MACHINES metaphor, the Jargon File (Raymond 2003) example: "You've lost me." "OK, reboot. Here's the theory...." being one of many.

System crashes affect both computers and mobile devices. Their different manifestations, similar in all electronics are sources of two widespread metaphors: A SUDDEN FAILURE IS A CRASH (the other domains to which it applies are businesses and stock markets, among others) and UNRESPONSIVENESS IN FREEZING (that also works for humans who can *freeze* or *go numb with fear*). Unlike the above-mentioned other metaphor involving freezing (STOPPING AN APPLICATION IS FREEZING IT), this one does not involve constructive user action and control of the system. Rather, it effectively

renders it impossible, since the entire system fails to respond to any user input. Scary crashes that can sometimes be solved by simply pulling out and reinserting the battery of the phone (provided the battery is removable, which is rare nowadays in more advanced phone models) tend to be caused by a problematic app or a tweak installed by the user. Mobile app extensions such as *.apk* short for *Android Application Package* and *.ipa* short for iPhone Application or *XAP* for Windows Phone and *.cab* (*Cabinet*) for PocketPC and Windows Mobile devices show that FILES are conceptualized as CONTAINERS (*packages, cabinets*, etc.). Namely, as *archive files* (a collection of compressed files) APPLICATIONS ARE CONTAINERS too. As containers, they can be cracked open by crackers, people with skills to break into computer systems by finding cracks i.e. flaws in them or remove copy protection from commercial software and apps, which are then made freely available on the web from where they can be downloaded. Like any other APPS, SOFTWARE, indeed, UNITS OF DATA in in general (see 4.1.4. above), cracked apps (which now belong to the category of *warez*[36]) are considered to be SUBSTANCES that have WEIGHT that is carried in the form of PACKETS, compressed as archived files - PACKAGES over the Internet, the CONDUIT carrying the LOAD of information, including software between the parties that use the network to communicate or exchange data. Once downloaded to a computer, application packages are sideloaded into the devices by using direct manipulation to navigate first the computer operating system to locate the downloaded app and then the system of the mobile device to have the app installed. The activities of modern-day pirates and the existence of pirated digital material in the sea of information available online are an unwelcome fact of digital life. This is likely to remain an issue in the foreseeable future, as it was in the past, irrespective of the previously or currently dominant modes of interaction with our mobile gadgets that will be looked into more closely now.

4.2. **Interacting with hardware and software. How it used to be.** As mini computers, mobile devices (used to) have hardware keyboards and a variety hardware or software buttons that enabled interaction with these modern machines. Some early smartphones and occasionally more recent models have styluses as input that create

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[36] A clipping of *software* with a deliberate misspelling of the plural -*s* which has developed a meaning indicating illegal activities, warez denotes "cracked version of commercial software, that is versions from which copy-protection has been stripped" (cf. Raymond, 2003: 660)

new interaction modalities. Here are some terms describing pertinent modes of interaction:

- **Stylus** - A small mechanical tool used to work with touch-screen devices. It is usually a simple stick of plastic or metal in the shape of a thin pen which has a softened tip so that it does not damage the screen. Because of its familiar shape, handwriting and drawing on the touch-screen is much easier for the user, and it achieves far greater accuracy than a fingertip. GSMA / A stylus (pronounced STAI-luhs, from the Latin stilus or "stake") is an instrument for writing and, in computers, an input device used to write text or draw lines on a surface as input to a computer. The term was first used in workstations designed for graphics applications, such as CAD/CAM, where the stylus was attached to an electronically-sensitive tablet or surface on which the stylus user wrote. Later, in handheld computers such as Apple's Newton and 3Com's PalmPilot, a stylus was provided as an instrument for writing text characters and simple pictures. In most of today's handheld computers that accept written input, the writing instrument is referred to as a stylus or a pen. WhatIs TT

- **Soft keys (a.k.a context keys)** - keys with varying functionality depending on the context they are used in. These are usually situated right under the display and their current function is shown above it. GSMA

- **Convenience key** - Your BlackBerry smartphone has one or more convenience keys on the side of the smartphone. Depending on your theme, you might not be able to change the application that is assigned to a convenience key. BBUG

- **Jog dial**, **jog wheel**, **shuttle dial**, or **shuttle wheel** is a type of knob, ring, wheel, or dial which allows the user to shuttle or jog through audio or video media. It is commonly found on models of CD players which are made for disc jockeys, and on professional video equipment such as video tape recorders. More recently, they are found on handheld PDAs, and as the scroll wheel on computer mice. "Jog" refers to going at a very slow speed, whereas "shuttle" refers to a very fast speed. Sony Corporation holds a patent for a 5-way version of jog dial. A 5-way jog dial allows up and down scrolling, right and left deflections, and a press-to-click action. Such jog dial was a feature of Sony CLIÉ PDA series and SonyEricsson P800, P900 and P910 smartphones. A 5-way jog dial has not been used by Sony or its subsidiaries since 2006. WIKI

- **Candy bar** - A candy bar or candy bar mobile is a mobile phone form factor where the phone is a solid device with no moving parts except for the keypad buttons, and in some cases, the antenna. WP / A candy bar phone is one of several cell phone form factors in the mobile phone industry. A candy bar mobile phone is rectangular in shape with no lid or hinged enclosure, resembling a traditional candy bar. This term is also known as a slab, block or bar phone. The screen and keypad of a candy bar mobile handset are usually found on one face of the unit. With the keypad exposed, a bar phone is susceptible to accidental dialling. Therefore, most of them are equipped with electronic keypad locks. A candy bar phone is a smaller and more modern version of the bulky brick phone, which was the earliest cell phone form. Candy bar phones with monochrome screens dominated cell phone screens in the mid-1990s to the early 2000s. The Nokia 1100, a monochrome bar phone, is reported to be the best selling phone ever, having sold over 250 million units since its release in 2003. Although candy bar phones now come with more advanced features such as colored displays, cameras, digital music players and Web browsing capabilities, these units share the market with other mobile phone factors such as the flip or clamshell, slate, slider and swivel phones. TP

- **Clamshell** - A clamshell or clamshell mobile is a mobile phone form factor where the phone is divided into two equal halves with a hinge connecting the halves, enabling users to basically fold the phone in half to close when not in use. This type of mobile phone usually has the buttons on the bottom half and the display and speaker on the top half. Some clamshell mobiles

may also have a small display on the outside, so when the phone is folded you can view connection details, incoming calls and the date and time without opening the phone. Clamshell phones are more frequently called a flip phone. Flip phone is used in everyday language as a generic term, however Motorola owns the trademark on the term flip phone. WP

- **Slide** - A slide or slider phone is a mobile phone form factor where the phone is designed like a clamshell phone, in that each half of the phone is dividing the display and speaker from the keyboard buttons. However, rather than the halves being hinged to open and close, the two halves slide open. On a slide phone the main display screen can be viewed when the phone is in the closed position. WP

- **Rocker keyboard** – Rocker QWERTY Keyboard with two letters sharing on one key (key pressed left for one letter and right for the other letter. WIKI

- **Illuminations** – Four lights that you can set to illuminate and notify you of events. Illumination pattern - All the illumination lights flash at the same time, except when the panel button is pressed and only the bottom left light flashes. Illumination priority. A higher priority event overrides a lower priority event. For example, incoming call illumination appears when receiving an incoming call (higher priority), even if the battery is being charged (lower priority). After the higher priority event expires, an illumination for a lower priority event may appear again. For example, charging illumination appears after the incoming call is answered, if charging is still going on and no other priority event (for example e-mail received), has occurred. SE X1 UG

The terms describing pre-smartphone phone form factors are instances of what Lakoff & Turner (1989) name "image metaphors" and Grady (1999) terms "resemblance metaphors". They directly invoke the image in question. The folding phone opens and closes like a CLAMSHELL, the phone that has no moving parts looks like a CANDY BAR and the one that has a keyboard that slides out is a slide(r). Some phones, like Sony Ericsson UIQ smartphones had *rocker keyboards*, a special kind of full QWERTY keyboard with each key allowing the input of two letters placed on the left-hand and right-hand edge of the key with a concave middle, which gave a rocking (chair) sensation while typing. *Jog dials* also called *shuttle wheels* are useful variously shaped pieces of integrated hardware, their names revealing the focus on the nature of movement through the virtual space they allowed, which could be either not very fast and steady like a jog, so that stopping and selecting an item is easier or very quick – shuttling up and down and right and left. These knobs, rings, wheels, or dials were made with speedy navigation through menus and media in mind. *Stylus*, a once popular input device on the pre-multitouch resistive touchscreens, resembles ancient Roman styluses. *Soft keys* or *context keys* are the opposite of the hardware key variety, since they are part of the software and not hardware of the device. Their alternative name *context keys*, although without figurative potential explains their nature well. Namely, their function changes depending on the context of the interaction event on

the screen. The main name *soft keys* contains a metonymic clipping of the word *software* analogous to the most likely scenario describing the etymology of the *reboot-*related examples mentioned above. Moreover, just like the full word *software*, and perhaps even more so, due to clipping, it implies a kind of metaphorical softness, malleability absent from hardware, i.e. said ability of contextual modification. A formerly trusty and popular smartphone brand, Blackberry created an even more convenient solution. One or more *convenience keys* can be assigned different functions via the phone's operating system and the user can change or turn off these functions any time. This feature gives rise to a metaphor that can be phrased as CUSTOMIZABILITY IS CONVENIENCE. Another less flexible, though eye-catching feature of some early and more recent feature phones and smartphones are light notifications or alerts. Sony Ericsson S500i feature phone has the option of assigning the sidelight of a specific colour to individual contacts in the user's phone book, which comes in handy as the owner can identify the caller even without looking at the screen. The model W850i made by the same manufacturer has a dedicated Walkman button that turns red when pressed and briefly changes all other lights on the phone to red to indicate that the device has entered the music player mode, while the Sony Ericsson Xperia X1 smartphone has *Illuminations* – preconfigured and partially modifiable light combinations to alert users of various events. All these are manifestations of a generic-level metaphor THE CHANGE OF LIGHT IS THE CHANGE OF EVENT and its variations, THE CHANGE OF LIGHT IS AN ALERT / NOTIFICATION. The diverse form factors, buttons, keys, light effects and other mostly hardware design solutions mentioned here are part of the trend that Manovich (2007) calls "anesthetization of information tools", where the purely functionalistic perspective is replaced by the focus on emotions, since gadgets are designed with the aim of providing emotional satisfaction. More effects of this change will be explored below in connection with the ways in which mobile devices involve all our senses. Before that, staying on the hardware side of the experience, we zoom in on the hand, the part of the human body that inspired the name of a whole category of devices to which this study is dedicated – *handhelds*, and pinpoint one particular finger that rose to dominance in the pre-touchscreen times.

4.3 Rule of the thumb vs. of mice and men. The digital focus shifts to a digit.

Before the gradual evolution in wireless communications led to phones cutting the cord and becoming wireless, the computer mouse had been device for experiencing direct

manipulation on-screen or as Johnson (1997) puts it "in dataspace", where the mouse acted as a representative of the user, the extension of his/her hand, translating the hand's movement into the movement of the cursor. Handheld devices made the use of the mouse redundant. The gadget fits the user's hand and is operated by the hand pressing the buttons. Thus, the advances in communications technology led to gradual changes in direct communication with the devices that rely on that technology, making embodied interaction more directly embodied and technology use a more immersive experience for gadget owners. A particular cluster of words exemplifies this process in interesting ways:

- **Thumboard** n. - A handheld device keypad designed for thumb-based typing. Etymology: thumb + keyboard. Example: [Nokia] recently launched two new phones, the 3300, targeted at the youth market, features a color screen, a full thumboard keypad and will store and plays digital music. —Kenneth Li, "Nokia Turns the Light Out on Carrier Rebound," TheStreet.com, March 11, 2003. Notes: This term began life as a trademark, the application for which was filed on January 24, 2001 by Seiko Instruments. That trademark is now abandoned. The earliest citation is the earliest media use of thumboard in its generic sense, although generic references to thumboards appear in Usenet as early as October, 2001. WS

- **Thumb-typing** - To type with your thumbs. It is what more and more of us will do once we communicate via handheld devices (in fact, manufacturers are actually designing small keyboards for optimal thumb-typing). NL

- **Thumbo** n. - An error made while using the thumbs to type, particularly on a mobile device keypad. Etymology: *thumb + typo*. WS

- **Thumbstopper** n. - An eye-catching or compelling item that makes a person stop scrolling through a list of posts, particularly when using the thumb to scroll a touchscreen device. Etymology: cf. showstopper. Examples: Logic would suggest that thumbstoppers are much easier to accomplish with big consumer brands like Oreos, McDonalds, and Wendy's because there's a wider audience of cookie and hamburger lovers than there are krill oil aficionados. — Bryan Evans, "Fishy Facebook Campaign Gets Users To Stop Scrolling," Business 2 Community, August 6, 2014. WS

- **Thumb culture** n. People who are skilled at using their thumbs to manipulate objects such as cell phone keys, small joysticks, and notebook computer pointers. Notes: Another name for the thumb-proficient is the thumb generation. In Japan, they're called *oyayubizoku,* which means "clan of the thumbs" or "thumb tribe." WS

- **D-Pad (Direction Pad)** - A circular- or square-shaped pad that provides navigation keys for the four directions: up, down, left and right. These are the equivalent of the "arrow keys" on a computer keyboard and are used for navigating the user interface. An enhanced version of the D-pad called an 8-way D-pad allows for scrolling diagonally as well. Some D-Pads have a center button usually called "select" or "OK". It is used to select a highlighted item in the user interface. GSMA

New experiences expand our conceptual and lexical categories and can lead to shifts in perspective of varying magnitude. The blend *thumboard* is the case in point. Since mice exited the scene, the keyboard underwent a logical transformation due to

miniaturization – its size shrunk and the number of keys got reduced to allow one-handed operation. Besides, *d-pads* (sometimes optical, replicating the haptic experience of the computer touchpad) or less often *joysticks* were introduced to allow efficient directional navigation in mobile devices in the absence of mice. With full-sized computer keyboards, the perceptual focus is on the keys as input method, while in *thumboard* and *thumb-typing* it shifts to the users and one or two fingers they use while typing (as opposed to ideally using all ten on a regular keyboard). As the rule of the thumb tightened, analogical formations started cropping up e.g. *thumbo*, a kind of *typo* and *thumbstopper* modelled on showstopper, a compellingly attractive thing that makes people look away from their devices and stop using their thumbs to scroll through messages or other information on their screens. New cultural experiences followed with the emergence of sub-culture-like social/generational groups, where one distinctive feature metonymically stands for the group as a whole, a digit for the entre digital generation known as *thumb tribe*. Thus, embodied interaction with the (digital) environment is both shaped by and shapes culture. It also has an unparalleled direct effect on our senses, which is the phenomenon to be approached next.

4.4 Making sense of the senses. The force of touch and gestures. The digital focus shifts to digits. The contemporary devices make use of most of our senses. Much like PCs, keyboard keys and power and volume buttons used to be all we touched on phones. Ten years ago, almost to the day, with the now legendary iPhone presentation, when the groundbreaking new device was unveiled, touch began to spread to the screens of both phones and PCs. With the addition of touch capability, representing such a huge paradigm shift, it is easy to forget that mobile phones had been demanding and receiving the attention of most of our senses well before the smartphone era. Vision has always been focused on the screen and the keyboard. Using the keyboard has always required touch. Ringtones make use of hearing and multisensory internet and mobile devices and accessories are still in experimental stages. Returning to the sense of touch in the most basic sense of the word, the following correlation can be observed: the greater the portability, the greater the contact of portable devices with our bodies. Computers used to sit on top of desks (desktop PCs) and all there was to be touched regularly was the keyboard and the power button, then they moved to our laps. We seem hardly able to put down our phones and other handheld gadgets which we keep in our pockets and when they

vibrate to notify us of an incoming call or message, they touch us. It turns out that touch has always been there, but it took a novel perspective – the application of the multitouch technology for mobile phones for it to become such an integral part of our everyday lives. With the iPhone as the ultimate disruptive device, the body has become a medium. This is how Apple Inc. (2011: 22) describes its implementation of the concept of direct manipulation via multitouch gestures:

When people directly manipulate onscreen objects instead of using separate controls to manipulate them, they're more engaged with the task and they more readily understand the results of their actions. iOS users enjoy a heightened sense of direct manipulation because of the Multi-Touch interface. Using gestures gives people a greater affinity for, and sense of control over, the objects they see onscreen, because they're able to touch them without using an intermediary, such as a mouse.
For example, instead of tapping zoom controls, people can use the pinch gestures to directly expand or contract an area of content. And in a game, players move and interact directly with onscreen objects. For example, a game might display a combination lock that users can spin to open.

All intermediaries are gone. This is haptic direct manipulation at its most direct. The iPhone has a single button below the screen that is almost as big as the device itself, the device that, when turned off looks like a blank slate. Unlike the feature phones and early smartphones, existing before capacitive touchscreen equipped devices became ubiquitous that sported a variety of form factors (see 4.2 above) all modern smartphones and tablets look the same. They are rectangular slates dominated by screens. The only immediately visible differences between them are either sharp or rounded edges of devices, the shape of the physical home button (if they have one) and the shape of the camera module on the back. The hardware side of the seduction game that gadgets play with their owners (cf. Manovich, 2007) has been reduced to these subtle differences in appearance and the choice of surface finishes, aluminium, plastic, glass or a combination of those i.e. the feel to the touch. This largely unibody approach to hardware design does away with all the previously prominent elements, such as the physical keyboard or direction pad and reduces hardware buttons to the necessary minimum in order to make the space necessary for performing multitouch gestures, as touch established itself as the primary communication channel between humans and mobile devices. Even the choice of colours of devices has been reduced to just a handful, black, silver, white and recently gold and even that is no longer that important since users opt for a wide variety of removable colourful covers to protect

and personalize their pricey pocketables, thus expressing their emotional connection to technology. With this in mind, it is important to point out that technical specifications have always played a key role when choosing digital companions, at least for early adopters and advanced users. This is the 21st century take on the trend that Manovich (ibid.) traces back to the moment when technology, notably computers, left the workplace to be used in the everyday life, outside the office setting focused on efficiency and functionality, only and became "friendly, playful, pleasurable, aesthetically pleasing, expressive, fashionable, signifying cultural identity". These factors still apply, but the influence of most of them is felt at the level of the interface (through visual effects and animations mentioned in 4.1.2 above) and applications, that is software rather than hardware. When new smartphones and tablets first reach their owners, they resemble blank slates, being equipped only with the functionalities provided by the interface itself. Much of their ability to please and express cultural identity is therefore literally in the hands of the users who make their devices truly personal by installing applications. Our smart gadgets are therefore as smart as we are. However, interacting with them has never been easier, since the interaction almost entirely depends on finger gestures performed by the user and finding and installing apps is a breeze thanks to the app stores integrated in the interface. Examples of touch-based interaction include:

- **Pinch-to-zoom** - Gesture made on iOS devices and Mac trackpads. Made by pinching finger and thumb together on screen, or 'unpinching' them apart. Often used to zoom in on items (web pages, photographs, and so on). Technically speaking it's usually the 'unpinch' that zooms into maps and so on, whereas the pinch zooms out, but we still call the feature 'pinch to zoom' in a general sense. AUD

- **Flick** - The term used to describe a quick finger movement across an iPhone screen that will quickly let you scroll through lists of songs, e-mails or pictures. WP / A gesture used in iOS. Made by moving the finger swiftly in any direction (usually up or down). Often used to quickly move up and down a web page or through a long list of items. AUD

- **Pull to refresh** - User slides finger down and lets go (pulling the screen down). This action often tells the app to refresh or update to the latest information. ALTG

- **Tap** - a gesture used on iOS whereby you quickly place and then remove a single finger on the screen. Comparable to a 'left-click' used on a desktop mouse or trackpad. AUD

- **Knock Code** - The Knock Code feature allows you to create your own unlock code using a combination of knocks on the screen. You can access the Home screen directly when the screen is off by tapping the same sequence on the screen. LGUG

- **3D Touch** - 3D Touch is a pressure-sensitive feature introduced by Apple on its 2015 iPhone 6S and iPhone 6S Plus smartphones. 3D Touch uses capacitive sensors integrated into the smartphone's display to sense three degrees of pressure in a user's touch and respond differently based on the amount of pressure exerted. Apple developed 3D Touch as an

evolution of its Force Touch and Multi-Touch capabilities that were introduced in earlier iPhone and Apple products, adding features like "Peek" and "Pop" with 3D Touch to the existing Multi-Touch Tap, Swipe and Pinch gestures. The Peek (light tap on the screen) and Pop (harder tap) features make it possible for a user to preview content in apps without having to actually open the app itself.

- **Force touch** - A touch-sensitive feature from Apple that distinguishes between a tap and a press. Force Touch is used in the Apple Watch and Mac trackpads and was added to the iPhone 6/6 Plus as "3D Touch" with more sensitivity. PCME / Force Touch is a feature developed by Apple that senses the level of force exerted on a touchpad or similar display surface, and responds accordingly. Force Touch uses tiny electrodes around the display to distinguish between taps and harder presses, and then provides a specific action or contextually specific controls based on the force of the input. WP

- **Taptics**, or a **'taptic engine'** - A contraction of 'tap' and 'haptics', this is Apple's take on the haptic concept outlined above. Most famously, a taptic engine in the Apple Watch vibrates in such a way when you get an alert that it feels like it's tapping you on the wrist. AUD

- **Force-Close** - A term used to refer to an app suddenly closing, either as a result of a bug, or the user intentionally stopping the app through Android's "App Info" menu. Often abbreviated as FC. GH

- **Force Quit** - In the Fast App Switcher, tapping and holding an app will put it in Jiggly Mode and tapping the X badge will force it to quit. Built-in apps like Mail and Messages will automatically and immediately restart while 3rd party apps will restart the next time you launch them. iMG

Gestures in human computer-interaction are emblematic. Their meaning is common knowledge among owners of touchscreen equipped computing devices. They are conventionalized signs and in certain cases, illustrated here, different device/ operating system manufacturers favour different conventions for the same gestures, which thus become homonymous. Moreover, even owners of devices sometimes have the chance to change gesture-related conventions at will, as discussed below.

The names of the gestures are mostly not metaphoric – users actually tap or flick their finger up and down the screen or shake their devices. The pinching gesture is an analogy-based image metaphor creating a cognitive link between the gesture made by the index finger and the thumb and the on-screen objects existing in the graphical user interface environment, with touchscreen affording direct manipulation. The name of the gesture, *pinch-to-zoom* is therefore counter intuitive. Namely, by *pinching open* i.e. spreading the fingers, the user zooms in on the content (images or text) and *pinching close*, bringing the fingers closer together, zooms out. That is PINCHING IS UNZOOMING and UNPINCHING IS ZOOMING. Being flat and hard, the phone screen surface is, in fact, impossible to pinch. It is not a chubby cheek or a nose. However, looking beyond the level of meaning of individual gesture names and viewing their

metaphoricity as a cognitive "potential to engage an active cross-domain mapping, that is, the cognitive process of understanding something in terms of something else" (cf. Cienki & Müller, 2008: 486), they come across as metaphoric and participate in the process of *doing* one thing via another – manipulating on-screen elements by using gestures. This is a true leap forward in the development of haptic human-computer interaction. If we remember that according to the Neural Theory of Metaphor (cf. Lakoff, 2008) metaphor is a neural phenomenon, a statement like this one about smartphone use should not sound (too) strange:

"I incorporate it as a prosthetic extension of my corporeal being. Not merely an extension of my ear, as McLuhan would have argued, it is me. My body/myself—my iPhone/myself. I become the cyborg I always wanted to be" (cf. Balsamo, 2012: 251-252)".

Tapping is the most basic touch gesture. It predates the introduction of multitouch capability, having been used on earlier resistive touchscreens where it required the use of a stylus or even a finger (with the resulting lack of precision). It equals the single click or left click of the mouse and serves to control or select an item, the basic metaphor of all touch-based interfaces being TAP IS CONTROL. A double tap can have a number of functions depending on the device interface. Generally, it has the same effect as pinch open/close to zoom in/out − one double tap zooms the content in, the next zooms it out. It can also be used to wake (turn on the screen of) a Windows Phone device or lock/unlock LG phones running Android. These phones also have a feature called *Knock Code*, a combination of taps to unlock the device similar to the standard security feature in Android that requires the user to drag his/her finger across the screen to connect the dots by creating a preterminal memorized pattern in order to unlock the device. While the SLEEP/WAKE combination of taps implies animateness or anthropomorphization of the device, LOCK/UNLOCK gestures are a sure sign of presence of the CONTAINER metaphor. Since after unlocking the user lands on the home screen, it could be said that LG's choice of name for the unlock feature yields the following counterintuitive entailment of the architectural metaphor A MOBILE PHONE IS A BUILDING (HOME) – UNLOCKING IS KNOCKING, which is incompatible with real-life experience, where knocking on the door means that someone has to unlock it from the inside. This gesture is present only on LG phones and might rightly be called a gimmick, while the ones like *flicking* (also known as *swiping*) and *pulling to refresh* are present across touch interfaces. The former is key to navigating interfaces, i.e.

orientation in data-space, while the latter gesture links the primary metaphors MORE IS UP and LESS IS DOWN to the concepts NEW and OLD that combine to give another pair of orientational metaphors, NEW IS HIGH and OLD IS DOWN reflected in the fact that when a page is pulled down to be refreshed, the latest news appear on the top, while old information is pushed further down. It is important to add here that device and software manufacturers are not the only ones who can customize gestures. The owners of jailbroken iPhones have had this option available to them for quite some time now via the indispensable Activator tweak that can be installed for free from Cydia. It allows the ultimate freedom of choice of gestures and hardware key functions, as a wide variety of gestures can be assigned to numerous actions and hardware keys can be remapped to execute commands different from those defined by Apple.

The latest innovations in touchscreen technology add new functionality, as touch is combined with force to yield new interactions. Discussing the nature of FORCE image schemas Johnson (1987) identified their shared characteristics listed in Evans & Green (2006: 187).

Force schemas are always experienced through interaction. Force schemas involve a force vector, i.e. a directionality. Force schemas typically involve a single path of motion. Force schemas have sources for the force and targets that are acted upon. Forces involve degrees of intensity. Forces involve a chain of causality, a consequence of having a source, target, force vector and path of motion, e.g. a child throwing a ball at a coconut.

The ability of advanced touchscreens to distinguish between the levels of force exerted on their surface, amounting to the difference between a tap and a press, generates new metaphors such as ADDITIONAL FORCE IS ADDITIONAL INFORMATION / OPTIONS made possible by the invention of new modes of interaction, Force Touch and its more sophisticated counterpart 3D Touch that provide vibration feedback as a confirmation that the tap involving additional pressure has been registered by the system. Force Touch on Apple Watch makes it possible, for example, to choose new watch faces by applying pressure when touching the current one, which opens a carousel featuring other watch faces that the user can select. The capacitive sensors applied in 3D Touch technology enable the screen to respond to three degrees of intensity of pressure that translate into new interface-wide features – *Quick Actions*, *Peek* and *Pop* that are increasingly becoming integrated into third-party apps. Increased pressure on an app icon makes it possible to call up quick actions i.e. access a small window with list of

additional options relating to the app without opening it. For instance, force touching the Contacts app icon produces a menu with a selection of commands, including quickly creating a new contact without having to open Contacts and navigate inside the app to select that particular command. Of course, this is very similar to clicking the right button on the computer mouse. But Force Touch is much more than that. *Peek* provides a peek inside the app by producing a preview of a received message or a location on the map. When the finger stops applying the pressure and taps anywhere else on the screen, the quick menu or the preview disappear. Conversely, if the screen is pressed a little harder and longer, *Peek* turns into *Pop*, as the application in question pops open. The metaphors behind these novel interactions could be formulated in the following way, A PREVIEW IS A PEEK and LAUNCHING AN APPLICATION IS POPPING IT OPEN. Both are manifestations of the underlying CONTAINER metaphor that has been shown to exist at different levels: hardware, software and individual applications, since devices themselves, the interface as a whole and its various elements, as well as standalone apps and their features are conceptualized as containers. The application of force of different intensity has been made possible by another recent technical innovation, the Taptic Engine, whose name is a blend between the term describing the basic gesture, *tap* and the adjective *haptic* referring to the sense of touch in relation to the perception and manipulation of objects, in this case, the objects existing in the digital environment of graphical user interfaces. The engine produces tiny vibrations that correspond to the intensity of the pressure on the screen. Namely, it provides the users with pressure-related feedback. But reactive feedback is not the only thing it can do. Proactive feedback is its best signature feature, activated when Apple Watch users receive alerts that feel like the wearable is tapping them on their wrists. Such alerts include notifications from the apps installed on the phone, like a new text message or e-mail alert or a reminder from the Activity app integrated into the interface of the wearable that prompts the watch owner to get up and move around for a minute every our (aimed at reducing the negative effects of the modern day sedentary lifestyle). Thus, the watch acts almost like a stranger or an acquaintance who taps you on your shoulder in the street to get your attention. Despite their being not exactly intuitive and requiring a bit of learning curve, both Force Touch and 3D Touch have a clear purpose – the former is a handy way of displaying additional features on the small screen of the wearable, when needed and the latter significantly reduces the number of taps necessary to perform actions on phones and tablets. Given that Apple makes a

sustained effort to systematically implement new features, such as this one, in its operating system and provides application developers with the tools to integrate them in their apps[37], 3D Touch and Force Touch are likely to be more than a short-lived fad. Following the development of technology often revels that certain features have existed for a relatively long time before becoming transformed by a wave of innovations. Like touch, the concept of force has been present for years now in mobile operating systems in a different form and with different meanings.

Force-close, is the option given to users when an Android app or a process suddenly stops working, which amounts to an accident. It is sometimes used synonymously with *Force stop* which is the action that an Android user takes to exit an unresponsive app. The difference between the two is that force-close equals to informing the user that an app has stopped working and little else. The user just has to acknowledge the fact by tapping the force close button, which closes the pop-up window containing the message. The incident has been caused by a system-internal force majeure and thus exhibits a chain of causality that is different from the one present in *Force stop*, which demands deliberate action on the part of the user who has to navigate the interface to locate the force stop option for a particular misbehaving application. The key semantic component in these events is intentionality that is complementary to force dynamics. It indicates whether the agent performs an action on purpose or accidentally. *Force stop* is analogous to using the Ctrl-Alt-Del combination of keys on the PC keyboard that opens the task manager to close a program that cannot be closed normally, which is why that must be done by force. *Force quit* in iOS also implies intentional action performed by the user who is the one to exert force, by taking the steps required to manually close the applications running in the background. User actions include long pressing app icons to put the apps in Jiggly Mode that makes the app shake to indicate that it is ready to be manipulated i.e. have its state changed (closed, moved or deleted), reflecting the primary metaphor CHANGE IS MOTION. These background apps are well-behaved, they have not become unresponsive. They simply cannot quit the background automatically because that is something that requires user action by design. Moreover, while the concept of force in 3D Touch and Force Touch involves

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[37] Gaming and drawing apps have the potential for making good use of 3D Touch-like features to open up new ways of interacting with phones and tablets.

exertion of physical force on hardware, touch- and force-sensitive screens, in order to access additional functions, in the above example software (an app) must be dealt with by force because it has stopped functioning.

Sometimes direct manipulation in the context of modern mobile interfaces does not have to involve the use of finger gestures performed in contact with the touchscreen. There are a variety of ways to control devices otherwise, still using hands, for instance:

- **Bump** - Touch one phone to another by tapping them together lightly (often used by apps as a signal to begin transferring information). ALTG

- **Android Beam** - A data transfer function added to Android phones starting with Android 4.0 (Ice Cream Sandwich). Using near field communication (NFC), Android Beam lets users copy data from one Android device to another when both are brought into physical contact with each other. *Bluetooth and Wi-Fi Are Much Faster*. NFC is fine for transmitting contacts, links and other text but too slow for copying a photo or video file. Starting with Android 4.1, Android Beam establishes the connection via NFC; then turns Bluetooth on and pairs the phones; completes the transfer via Bluetooth (30 times faster than NFC) and turns Bluetooth off.

- **NFC tag (Near Field Communication tag**) - An RFID-based electronic device that is made up of a chip and antenna. It can be embedded into other objects such as a business card, poster, prescription bottle or key fob, or it can be a stand-alone sticker that is pasted onto a surface. PCME

- **Shake** - To initiate an undo or redo action. iOS-HIG

- **Flip to silence** - To silence an incoming call, press the volume down key. If you have switched Flip to silence on, you can simply turn your phone face down. LWPUG

- **Raise to Wake** – On the iPhone 6s and later, lift iPhone or press the Sleep/Wake or Home button to see the Lock screen IphUG / Just raise your wrist or tap the display. Apple Watch sleeps when you lower your wrist. AWUG

Applications and functions like the formerly available *Bump* and *Android Beam* respectively make it possible to transfer data by establishing physical contact between two devices, like literally bumping them together or letting the backs of devices, where the Near Field Communication chip is placed, come into contact, which is accompanied by an audio signal. This is where tangible interaction becomes doubly embodied, since we use our bodies (hands) to manipulate devices and the contact between the bodies of devices initiates communication i.e. sending and receiving information. This expands the scope of the CONDUIT metaphor, adding an entailment of the COMMUNICATION IS SENDING part of the process, namely SENDING IS ESTABLISHING PHYSICAL CONTACT. This creates new interaction possibilities, such as using NFC tags to transfer information (like phone book entries) or execute commands, including launching an application on a phone or tablet, just by placing the device on an NFC

sticker or touching it with an NFC pendant. Shaking the device to undo or redo typing action is another novel way of engaging in embodied interaction and so is placing the phone face down to silence calls. The latter is an interesting instance of the MORE IS UP / LESS IS DOWN primary metaphor, just like the *Raise to Wake* action in iOS-run devices and *Lift to Wake* in Android. Namely, face down means less communication, i.e. not answering the phone, while raising the phone, that is picking it up or raising one's wrist with a wearable on it means more information since the screen automatically lights up to show the latest notifications. All this is rooted in everyday experience where AWAKE IS UP and ASLEEP IS DOWN. The sensors in our mobile devices allow us to go even further in using our body to interact with them. There comes a point where tactile control is no longer a necessity.

4.5 Look, no hands! When touch is too much. Like metaphor, touch and other senses are mediators that convert thoughts to actions. Touchless control is already here, albeit, for now, it is not much more than a gimmick, with the exception of voice commands and conversational interfaces (to be discussed in the next chapter) whose presence is felt more strongly by the day.

- **Floating Touch** - The technology makes it possible for the smartphone to detect a finger up to 0.79 inches (20mm) above the screen. However, the functionality was largely limited to live wallpapers and the browser until the smartphone [Xperia Sola] received an update to Android 4.0.4 Ice Cream Sandwich which introduced "Glove Mode" an extension to this feature. Glove Mode, as the name suggests, allowed users to control the smartphone wearing gloves. It is the second smartphone after Nokia Lumia 920 to sport this feature. Additionally, the entire user interface could be controlled by hovering in combination with floating touch. In Glove Mode, a cursor ring showed where the touch was being registered by the screen. The software could also distinguish between a "normal" touch, and a gloved touch, meaning normal control of the device was possible without disabling Glove Mode on the device. WIKI

- **Air move** - Move icons to other panes and screens by holding down the icon with the finger of one hand, then moving your other hand to the right or left across the sensor. GS4MM

- **Air View** - This feature, which originated on the Samsung Galaxy Note II, lets you hover your finger over the S4 to get information from it. For example, hovering over a web page magnifies it, hovering over a picture in the Gallery opens it, hovering over a Calendar event reveals more details about it, hovering over a truncated text message reveals the full message, and so on. GS4MM

- **Gesture shot** - The Gesture shot feature allows you to take a picture with a hand gesture using the front camera. There are two methods for using the Gesture shot feature. Raise your hand, with an open palm, until the front camera detects it and a box appears on the screen. Then close your hand into a fist to start the timer, allowing you time to get ready. Raise your hand, in a clenched fist, until the front camera detects it and a box appears on the screen. Then unclench your fist to start the timer, allowing you time to get ready. LGUG

- **Smart Scroll** - When this is turned on, the S4 uses its camera and software magic to let you scroll through screens and web pages by merely tilting your head. Tilt your head down to scroll

down, and up to scroll up. You'll know Smart Scroll is turned on when you see an eye icon in the status bar. If you prefer, you can instead tilt the S4 forward or back to scroll. But what fun is that? GS4MM

Hover sensing technologies Like Sony's *Floating Touch* or Samsung's *Air Gestures* (cf. Gralla, 2013) that make touchscreens capable of detecting finger hovering in addition to touch are designed to provide full interface control without touching the display, that is navigation, acting on buttons, launching applications, etc., or allow performing specific actions like magnifying web pages and displaying more information related to on-screen items. One of the Air Gestures, *Air Move* is a result of the synergy of different modes of interaction, as the user simultaneously touches the screen with one hand to select the icon to be moved, while moving the other hand left or right, holding it in the air, above the sensor. The use of air as a modifier in these compound gesture names stems from the speculative metonym AIR FOR GESTURE that informs the general metaphor THE ABSENCE OF PHYSICAL CONTACT IS AIR. LG has implemented gesture recognition to facilitate taking photos using front cameras of their smartphones. Instead of button presses, a simple gesture is enough to activate the camera and timer. Multimodal interfaces go beyond gestures to include gaze tracking as shown by the Samsung Galaxy S4 feature called *Smart Scroll* where tilting one's head up and down scrolls through the screens. Whether any of these novel interaction solutions will stand the test of time remains to be seen. For now, one thing is certain, the only aspect of multimodal interaction that seems to have caught on involves speech recognition enabling voice-based communication with intelligent agents, which is one of the topics of the next chapter.

V US AND THEM, OVER AND OVER AGAIN. Machines are like us and we like them (for it). Metaphors of personal, social and economic import of mobile media.

5.1 It's alive, it feels, it speaks – the anthropomorphization effect. With the development of neural networks, natural language processing and speech recognition, it looks as though the mechanistic view of human cognition reflected in the metaphor THE MIND IS A MACHINE is being offset by the reverse tendency has been steadily gaining momentum resulting in THE MIND IN THE MACHINE. The sheer number of examples in our sample, where mobile and the related devices are endowed with human qualities testifies to that effect, e.g.

- **Sleep/Wake Button -** Physical hardware button on top of the iPhone, iPod touch, and iPad. Used to power on, wake from sleep, put to sleep, and power down iOS devices. iMG / The button at top of iOS devices that enables you to wake up the device, or put it back to sleep. If you hold it down you can power the device down completely. Sometimes also called the power button. AUD

- **Doze Mode -** A battery saving feature introduced in Android 6.0 Marshmallow that prevents apps from disrupting a device's low-power deep sleep cycle. After Android has detected that the device has been lying flat and motionless for a period of time (sitting on a table, for instance), Doze Mode kicks in and ensures that no nonessential apps request a wakelock or sync in the background, which would otherwise drain the battery in a situation where the user is obviously not actively using their device. GH

- **Wakelock** - The Wakelock is a nasty, battery draining error where the phone remains active and awake even though you are not using the device or the screen is turned off. It is often caused by a faulty kernel, or a faulty app. (…) If the Android device is left alone long enough, it gradually enters what we call "deep sleep" this is a state where there is minimal to no system resources running other than the SMS and Call acquisition service. This is the state where the phone saves battery the most. Even if you continue to not manually turn on your device, the Android device "takes a peek" or "wakes" momentarily to check if there are new updates like new emails, new notifications on your social network, new chat messages, or pretty much any cloud based notification service. After that, it goes back to sleep. The Wakelock is a problem where your device never enters Deep Sleep. This means that the processors are constantly running, and the battery is constantly being consumed. (…). AS

- **Hibernate** - A term popularized by the app Greenify, which partially disables other apps when they're not in use to save battery life. Android Marshmallow includes a similar feature called App Standby, and Hibernate is often used in reference to the actions performed by this feature as well. GH

- **Skin** - See Theme GSMA (1) A custom look and feel for a graphical interface (GUI). Operating systems and applications may have a built-in selection of skins or accept new ones from third parties. Also called "themes," skins include the background scenes, menu and button styles, colors, fonts, window borders and sometimes different arrangements and locations of the elements. See theme aware and app reskinning. (2) A covering for hardware. There are numerous vinyl coverings that stick onto cellphones, iPods, the backs of laptops and the sides of tower cases. They depict myriad subjects such as sports, high-tech and fantasy. PCME

- **App reskinning** - Changing the graphics, colors and sound in an application without modifying its functionality. The term typically refers to games that use freely available source code with only cosmetic changes. PCME

- **Theme aware** - Applications and operating systems that allow their appearance, called a "theme" or "skin," to be changed. PCME

- **Live Tiles** - Tablet-style (Metro) icons on Windows Phone and Windows, starting with Windows 8, that continuously pull information in real time from social networks, messaging systems, the Internet and local content. PCME

- **Live Wallpaper** - A type of wallpaper for Android devices that displays non-static images on your home screen. Generally installed as an app from the Google Play Store, many live wallpapers are capable of responding to touch, detecting motion, looping video, or shuffling between multiple images. GH

- **Location awareness -** refers to a presence-technology component that provides information about the physical location of a device to another application or user. This term is frequently used to refer to cameras and mobile communication devices; however, it may also be used with websites that request the zip code of a user for delivering targeted information. Location awareness also signifies devices that feature the ability to actively or passively discover their location. For vehicles and vessels, navigational instruments offer location coordinates. TP

- **Chatbot (chat roBOT)** - Software that provides a text or verbal interaction with a person using native language. Also called a "chatterbot," the chatbot is designed to emulate normal human responses. Chatbots can be very limited in scope, although they may be able to improve with use. The terms "chatbot" and "virtual assistant" are increasingly used synonymously; however, chatbots preceded virtual assistants and generally provide suggestions or answers to questions about a specific topic or product. Chatbots may also be embedded within an app or Web page, whereas virtual assistants such as Siri and Cortana are stand-alone, ask-anything programs. PCME

- **Virtual assistant** - An application that lets people ask questions by speaking in their natural language and listening to verbal answers. Although virtual assistants are in tablets and desktop computers, they caused the smartphone to become an incredibly useful electronic companion. No matter where people are, they can ask about anything that is public knowledge and get an answer. Also called a "personal assistant," "digital assistant," "intelligent agent" and "voice assistant," Apple's Siri popularized the concept in 2011. Siri was followed by Google Now in Android and Chrome devices, Cortana in Windows, Amazon Echo (Alexa) and Facebook M. The Viv platform was created to revolutionize this technology (see Viv). See Siri, Google Now, Cortana, Amazon Echo and Facebook M. PCME

- **Skill** - A capability or ability of Alexa. Alexa provides a set of built-in skills (such as playing music), and developers can use the Alexa Skills Kit to give Alexa new skills. A skill includes both the code (in the form of a cloud-based service) and the configuration provided on the developer portal. See also custom skill and smart home skill. ASKG

- **Proactive assistant** - Based on how you use your iPhone, proactive assistant gives you suggestions for what you might want to do next. iPhUG / "Proactive," a contextual, predictive personal assistant that's tied in with Siri to deliver personalized information based on a user's preferences, habits and location. WP

Humanizing technology is a major indicator of its acceptance in our personal lives and in the society as a whole. The choice of human characteristics attributed to machines varies greatly and crucially depends on the feature set the devices have to offer. It

may be limited to superficial, skin-deep ones, like those related to physical appearance, or even simple animateness. However, it can go beyond them to include higher-order mental activity and emotions as the defining features of anthropomorphism (cf. Waytz, Cacioppo, & Epley, 2010).

The presence of the ability to sleep or wake implies that the object is regarded as being alive. This level of animacy has been present in computers for years now – a PC can be put to *sleep* or in *hibernation*, instead of being completely shut down. The same is possible in mobile devices whose sleep pattern is even more finely differentiated. They can enter *doze mode*, where a limited number of services stay active, like receiving call or SMS messages, while battery-intensive ones stay in *deep sleep*, unless there is a *wakelock* error which keeps the device metaphorically locked or stuck in the awake state, with its processor always running, draining the battery. While sleep-related terms apply to humans and machines alike, *hibernation* is a biological energy-conserving mechanism of certain animals, including bears and some squirrel and bird species. Computers in hibernation save their state and then turn off to resume it once turned on again, similar to *sleep mode* where a minimum of power is used to keep the computer state in RAM, so the machine is not completely turned off. When referring to Android phones, *hibernation* exhibits a somewhat different direction of semantic widening, as it describes an app-specific behaviour, that is the option allowing users to partly disable certain apps to save battery life, the feature incorporated in more recent versions of Android under the name of *app standby.*

The skin, the largest human organ covers the whole body − *skins*, or *themes*, by analogy are sets of custom wallpapers and icons, usually matching in colour and appearance that visually define the entire interface, because all its graphical elements fit a single theme. Thus, an analogy-based metaphor VISUAL IDENTITY IS SKIN could be formulated. Closer to pure analogy is the other metaphorical use of the same term to denote a very slim protective cover for the back of the phone or tablet or even notebook and desktop PCs. Sporting a variety of designs, they are clearly part of the above-mentioned trend towards "anesthetization of information tools" defined by Manovich (2007). There are times when one feels like jumping out of one's own skin or shedding it, only to get a new one. Impossible for humans, that's a property of snakes and apparently mobile applications, whose visual identity can be changed as part of *app*

reskinning, while the source code remains unchanged. This scheme used to be a popular way of making easy money by selling mainly games that look different, but have the same functionality as the original versions. With no value added, the changes were just cosmetic, still enough to trick the Apple's App Store or Google Play into allowing reskinned apps to be sold and people into buying them. For an application or an operating system to be *theme aware* means simply to allow changing themes or skins to make software more appealing to the eye. There is no implication of conscious (self-)awareness. Likewise, a *live wallpaper* is alive insomuch that it moves, the picture changes, as the frames that make up the animated image file follow one another in quick succession, being an application of the image schemas behind the primary metaphor CHANGES ARE MOTION. Here animateness equals animation. *Live tiles* get closer to life by flipping when displaying real time updates. Animation has become more than a purely aesthetic feature. It has acquired a metonymic function via the same primary metaphor as in the previous example. The flip of a tile stands for a change of information content, a new missed call, email or SMS notification or the status updates of friends on social media, for example. Using the term *tile* to refer to an animated rectangular homescreen icon is another instance of an image metaphor. Being resizable, *live tiles* allow the users to make those that they find to be more important bigger, which also makes them manifestations of the primary metaphor IMPORTANCE IS SIZE.

With *location awareness*, we move into the realm of consciousness, which includes functions of orientation in time and space. A standard feature in modern GPS chip-equipped phones, the ability to provide and broadcast the exact location of the device enhances innate our ability to orient ourselves. With the help of a maps app, we can get directions how to get from point A to point be B. Through such an app, it is also possible to obtain additional visual information about the surroundings, complete with a 2D and 3D representation of objects and data on their size and distance and anticipate the changes in space, all of which are the characteristics of the human cognitive ability of spatial perception. Location awareness is often implemented by websites too in order to provide targeted information. The fact that devices broadcast location data to a variety of third-party apps prompts associations with surveillance state, but it can also save lives and facilitate the daily routine and social interactions.

As pointed out by Waytz, Heafner & Epley (2014: 116)[38], the blurring of the line between human and non-human brought about by the advances of technology is significant because people are more likely to trust a machine to which they have attributed a mind. The authors stress the importance of such a finding, in the light of "the rapidly changing interface between the technological world and the social world, where "modern technology now taps human social skills directly". The recent swift deployment of conversational interfaces is one of the most vivid illustrations of that. This move is part of a wider shift from the desktop metaphor to a new paradigm of human-computer interaction defined by agents. Wonderfully combining literary references with the history of technology, Steven Johnson (1997: 175) notices that "the anxiety surrounding human-machine hybrids is more than just a literary device" and that such imaginative themes "lie at the epicenter of contemporary interface design", having been translated into the film medium in the likes of *Blade Runner* or *2001: A Space Odyssey*. Johnson traces the moment when the notion of a *digital agent* entered the vocabulary to the late 1980s and Apple's *Knowledge Navigator* video (cf. Mac History (2012) introducing the INFO-BUTLER metaphor and inaugurating the agent-as anthropomorph tradition that has finally given computers the opportunity to talk back at humans who have been talking to them ever since the personal computer era began (ibid. 177). Made for Apple CEO John Sculley's EDUCOM 1987 keynote, the video depicts Sculley's concept developed in the epilogue to his autobiography[39]. The concept shown in the video is clearly Inspired by Alan Kay's Dynabook and features a tablet-like product equipped with a natural language personal assistant, predicting Apple's Siri, introduced in 2011 along with iPhone 4s, and a bevy of other modern voice-based intelligent agents. Johnson (1997) further offers a classification of agents into personal, travelling and social – serving their respective purposes by staying inside the computer monitoring user behaviour and helping out when summoned, crawling the web in search for information or recommending tunes on the basis of matching the user's taste with the musical preferences of other users of the same music recommendation software. Not all of them are anthropomorphic, as they can be invisible and work mostly behind the scenes e.g. sorting the files on the computer's

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[38] The authors have conducted a series of experiments testing the attitude of respondents towards an autonomous vehicle with anthropomorphic features i.e. name, gender, and voice. They concluded that the performance of technology appears to be better when it seems to have a humanlike mind.

[39] Odyssey: Pepsi to Apple. (2016, January 17). In *Wikipedia, The Free Encyclopedia*. Retrieved June 2, 2016, from https://en.wikipedia.org/w/index.php?title=Odyssey:_Pepsi_to_Apple&oldid=700345675.

hard drive or pushing information from the Internet only when there is an important update of interest to the user. The transition of modern-day voice-based virtual assistants like Siri and Cortana from mobile to computer operating systems, MacOS and Windows 10 has already resulted in these agents (coming close to) being able to do perform all those tasks, effectively effacing the boundaries between said agent types. Returning to Johnson's (179-183) description, let us highlight the key paradigm change caused by agents – the shift from direct to indirect manipulation[40]. Agents allow us to delegate a variety of tasks to them. These automated tasks that can range from setting appointments to making a bid online at when the price is right, require us to willingly relinquish a measure of direct control of the system and direct manipulation becomes indirect. Regardless of the manipulation type, it must be kept in mind that the task-based view of human-computer interaction depends on the underlying metaphor HCI IS THE PERFORMANCE OF WORK and another general conceptualization of it, namely HCI IS A SEQUENCE OF ACTIONS derived from the derives from the SOURCE-PATH-GOAL image schema (cf. Imaz and Benyon, 2007: 121-122) that may eventually become dominated by their agent-oriented counterparts, HCI IS THE MANAGEMENT OF AGENTS and THE SYSTEM IS A COLLECTION OF AGENTS (ibid. 207). The key issues related to the use of agents remain much the same as when Johnson's book was published twenty years ago. Namely, graphical user interfaces have empowered users to take control of the computer and made them feel smarter than the machine. Are intelligent agents intelligent and intuitive enough to be trusted with decision-making on our part? The same dilemmas are present in relation to the use of autonomous cars which we might eventually trust with our lives (cf. Waytz, Heafner & Epley, 2014). Can we trust Alexa to buy a product from Amazon or the web at the lowest price, just by asking her nicely using her voice-based interface? Likely not (yet). To their credit, it must be said that today's intelligent assistants are evolving fast learning new third-party skills daily and getting frequent manufacturer software updates, opening the possibility for speakers to initiate a conversation and change the pitch of their voices in the near future, among other things. The current and constantly improving ability of Siri, for example, to be proactive i.e. take context into account and predict users' actions, based on their preferences regarding the use of their phones, their habits and current location fits, at least to a degree, one of the definitions of intelligence described as "the

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[40] Geyer, Jetter & Reiterer (2013) point out that "using commands and formal languages" also counts as indirect manipulation, as opposed to "direct manipulation of a view or object by physically touching, grabbing, and moving it".

ability to perceive information, and to retain it as knowledge to be applied towards adaptive behaviors within an environment or context"[41] . The fact the artificial intelligence software powering voice activated speakers, Amazon's Alexa and Google Home is migrating to smartphones, joining the existing mobile voice assistants like Siri, Cortana and the Samsung's Bixby and that Apple is rumoured to be developing a dedicated artificial intelligence chip for the iPhone and iPad to process AI-related tasks and launching a smart speaker to rival Amazon and Google (cf. Statt, 2017) gives ample proof that AI and intelligent agents are becoming a force to be reckoned with in the domain of mobile communications. Like agents, the AI that powers them can be categorized in broad groups. Horizontal AI aims to perform a wide range of tasks and be a general-purpose assistant, like Apple's Siri, Google Assistant, Microsoft's Cortana, Amazon's Alexa or less well-known competitors like Hound or Viv that can do all sorts of things from searching the web and setting reminders, timers and alarms to launching apps, placing voice calls, sending voice messages and more by answering to voice commands issued by users. On the other hand, vertical AI, focuses on niche services (cf. Sudheer, n.d.), like setting appointments or selling airline tickets online, and do these things exceedingly well using natural language to conduct auditory or textual conversations. AI applications handling specific tasks only are referred to as *chatbots* or *chatterbots* and they frequently get integrated into horizontal AI platforms. With voice recognition as the mainstream form of AI nowadays, we are set to be chatting much more with our machines in the future, as multimodal interfaces continue to develop and anthropomorphism deepens our bond with technology.

5.2 Yoke fellows – in sickness and in health. Till death do us part… vivere non necessse. Willing suspension of disbelief (see 4.1 above) is not the only thing people readily accept in order to communicate with machines better; we are all (becoming) cyborgs, for our mobile gadgets get increasingly perceived as extensions of our minds and bodies. We have formed a life-long bond with our intelligent machines that results in a significant interdependence, encoded in the words and phrases we use to refer to this relationship stronger than illnesses, the one for which we even put our lives at risk. For instance:

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[41] Intelligence. (2017, May 18). In *Wikipedia, The Free Encyclopedia*. Retrieved May 22, 2017 from https://en.wikipedia.org/w/index.php?title=Intelligence&oldid=781037001

- **Tech neck** - The name given to the soreness in one's neck from sitting in front of a computer all day or typing on a laptop. Similar to "Blackberry thumb" and "mouse hand" there are now specialized massages to treat workplace aches and pains. High-end spas are now offering these kinds of therapies in an effort to provide relief to e-collar workers. NL / The sagging skin and neck wrinkles resulting from constantly bending downward to look at a smartphone, which can also cause headaches and neck, shoulder and back pain. PCME

- **Text neck** - a painful condition caused by contorting the neck to view the screen of a mobile phone or portable electronic device. CED / Overuse syndrome involving the head, neck and shoulders, usually resulting from excessive strain on the spine from looking in a forward and downward position at any hand held mobile device, i.e., mobile phone, video game unit, computer, mp3 player, e-reader. This can cause headaches, neck pain, shoulder and arm pain, breathing compromise, and much more. Synonym: forward head posture. TTNI

- **Recovery Mode -** A software menu that can be access through Android's bootloader, which allows the user to perform actions such as executing a factory reset or full data wipe. Android's stock recovery menu can be replaced with a custom recovery to allow for additional actions such as flashing ZIPs and custom ROMs, or performing a NANDroid backup. GH

- **Daily twitamin** - Twitter slang that means a tweet that contains useful knowledge that is easy to take in and remember. It is a "daily vitamin" for Twitterers. WP TDG

- **Dead cell phones** - Old cell phones that people no longer want or use, primarily because the phones can't do half of the tricks that new cell phones can. But don't toss them into the trash-donate them to a battered woman's organization, for example, because someone can actually use them. Most low-tech cell phones can still be used to dial 911, even if they are not connected to a service. NL

- **Death by iPod** n. Death due to carelessness or inattentiveness created by listening to an iPod or similar device. WS

- **Health** - The Health app gathers your health and fitness information and provides a clear overview of your health. It shows data from other apps and devices, such as Apple Watch, all in one place. With Health, you can sign up to be an organ donor, save health records to iPhone, and share your data with family members and healthcare providers. And, Health can display important contacts and medical information on the iPhone Lock screen for emergency responders. iPhUG

- **Junk sleep** n. Low-quality sleep caused by disruptions from nearby electronic devices such as cell phones, computers, and TVs. WS

- **Mobile malware** - malicious software that is specifically built to attack mobile phone or smartphone systems. These types of malware rely on exploits of particular operating systems (OS) and mobile phone software technology, and represent a significant portion of malware attacks in today's computing world, where mobile phones are increasingly common. Within the general category of mobile malware, certain kinds of smartphones are targeted more often than others. TP

- **Phantom ring** a.k.a. phantom vibrations - The faulty sensation that an ambient sound (running water, a baby's cry) is a ringing cell phone. TV spots often induce this effect, leading to the suspicion that the ads are designed to trick consumers into paying attention. NL

- **Smartphone zombie** (or **smombie**) is a pedestrian who walks slowly and without attention to their surroundings because they are focused upon their smartphone. This has been reported as a significant safety hazard, as distracted pedestrians cause accidents. Cities such as Chongqing and Antwerp introduced special lanes for smartphone users in 2014 and 2015, to help direct and manage them. In 2014, China had over five hundred million smartphone users and more than half of them have a phone addiction. In Hong Kong, they are called dai tau juk ("the head-down tribe"). Texting pedestrians may trip over curbs, walk out in front of cars and

bump into other walkers. The field of vision of a smartphone user is estimated to be just 5% of that of an undistracted pedestrian. WIKI

- **Upgrade fever** - The uncontrollable, compulsive urge to upgrade one's hardware and/or software, with little or no consideration as to a real need for it. NL

- **White screen of death** - Abbreviated WSoD, the White Screen of Death or simply "White Death" refers to an error or issue with an operating system that causes the computer or device to stop working and display only a white screen. The White Screen of Death most often refers to an Apple iPod or iPhone that has locked up due to the device being severely dropped, a hardware component failing, or an attempted operating system or application upgrade that fails to successfully update. iPod, iPad or iPhone users with a WSoD will see either a completely blank white screen or a frozen display that shows only the Apple logo. WP

- **Zombie app$_1$** – refers to "apps can only be discovered [in an online store] by searching for a specific type of app, or by searching for the app's name directly" - in other words, those which do not appear in any category lists or ranks. This kind of zombie app is much more sinister. When a program is removed from an app store (say, because it's defunct or no longer supported or was revoked from the app store because of a security issue that was missed in the pre-release checks), it might still remain on user mobile devices but will no longer be updated. If it contains vulnerabilities it might be susceptible to exploitation by third parties, such as through an unrelated app which can take control of the vulnerable one. Worse, hackers and would-be thieves might offer fake app updates to take advantage of these bugs which can put user information and data at risk. (…) TRP

- **Zombie app$_2$** - Zombie apps are the applications that, at first glance, appear harmless. Developers usually create zombie apps as an app that is rarely used – like a flashlight app – but the app's software constantly works in the background, wreaking havoc on the device. Once the zombie app is unintentionally downloaded, the app will constantly run, even if the app is not physically opened by the device owner. Zombie apps can consume up to two gigabytes of data and drain the device's battery, with the device owner not knowing the cause. To make matters worse, the apps are invisible to malware detection programs, so the app will continue to run silently. Sounds scary? That's just the tip of the iceberg. Zombie apps mimic random clicks on the app and can open over 700 advertisements in an hour. (…). Zombie apps use bots to act as the artificial 'users' on the app, automatically clicking and opening advertisements. ADM

- **Zombie phone** - A zombie phone is a mobile device that you, as a corporation, believe is dead, but in reality is still alive, being billed by your carrier every month. There are two ways Zombie phones can manifest themselves. *The Walking Dead.* Many organizations have policies that allow an employee to keep their phone after they leave an organization. The policy usually involves a process to transfer the finanical liability from the corporate account to the employee. The employee gets to keep their phone and the company gets to transfer the monthly bill to the now ex-employee. Unfortunately, about 10% of the time, the transfer/termination of the device does not happen. The employee has the phone, oftentimes for months on end, the carrier keeps sending the invoice to the company, and the company keeps paying the bill, oblivious to the zombie device that is now draining money from their coffers. *Buried Alive.* Another method for a zombie phone to find its way into your organization is the buried alive method. The employee must turn over their phone, either to IT, HR, or Finance. A process is in place that then alerts billing to alert the carrier to terminate the phone. The phone is put into a drawer or box and forgotten. But about 10% of the time something happens in the process and the phone does not get terminated. And there it sits, buried out of sight, sucking resources from the company. AMTL

Benczes (2006: 156) analysed *phone neck*, an example analogous to *tech neck* stating that semantically the head is embedded in the Perception ICM. Likewise, *neck* in *tech neck* metonymically refers to the pain perceived in the neck. Besides, the

meaning of the first noun is also embedded in an ICM, the Action ICM – INSTRUMENT FOR ACTION. And the action in our case is the use of information and communication technology-related devices. The difference between the two is that *tech neck* has a much broader semantic potential to refer to the pain caused by using all sorts of computing gadgets, not just computers, but also phones and tablets. Other compounds in our sample that follow this pattern are *mouse hand* or *Blackberry thumb*, each describing pain in a specific region of the body caused by excessive interaction with phones or computers. *Text neck* represents a modification of this pattern where *texting* refers to the activity of using the (digital) object of the action, namely, the text messaging app. Therefore, in its primary meaning, this compound that has come to denote the ailment caused by any handheld device is a case of metonymy emerging from an Action ICM too, only this time of the OBJECT FOR ACTION kind. On a side note, the *Netlingo* definition of *tech neck* features another novel compound, *e-collar worker*. As Benczes (ibid. 6.) observes: "metaphor and metonymy is not exclusive to exocentric compounds; they can turn up in endocentric compounds as well", formations of the type *colour adjective + collar + worker* being one of the examples. Modelled on *white-collar worker* and *blue-collar worker*, where the modifier metonymically refers to the dress code at the workplace of office and factory workers respectively, *e-collar worker* is an example of the role of analogy in creative compounding. As for its formal characteristics, THE PART FOR THE WHOLE (collar for shirt) metonymy no longer applies and the modifier is a derived noun instead of a compound adjective. The same metonymy, now arising from the Reduction ICM, is however present in the prefix originating from the adjective *electronic* via shortening). The prefix *e-* stands for the industry, that is "all the people and companies that serve, support, or develop the Internet"[42], the youngest electronic medium which has already become significantly more popular than radio and TV. The salient property of being *electronic* represents both the medium of the Internet as a whole, and individual businesses and jobs that have sprung up in its wake. Back to the sickness and health related terms in our sample, stemming from attaching the property of animateness to inanimate mobile gadgets, *recovery mode* is a software menu allowing access to the option of restoring the device to factory settings – GOOD HEALTH or of tinkering further with its software. The users of electronic devices over-eager to upgrade their hardware or software

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[42] According to the Netlingo definition retrieved 16 September, 2014 from http://www.netlingo.com/word/the-industry.php.

irrespective of the real need for it are said to suffer from *upgrade fever*, a novel condition that expands the category of tech illnesses. Thus, A STRONG URGE IS A FEVER similar to the metaphor DESIRE IS HUNGER. *Mobile malware* is another example of expansion of a category (malicious software that may contain viruses) by adding new information to it, that is by making it mobile. The blend *daily twittamin* reveals the metaphor EASILY DIGESTIBLE, USEFUL INFORMATION IS VITAMIN. *Health* is a self-explanatory name for a health-oriented app, while *junk sleep* is based on the generic metaphor LOW QUALITY THINGS ARE JUNK. Interestingly, *dead cell phones* are not dead, but they are *as good as dead*, since the underlying metaphor could be phrased as GOING OUT OF USE IS DEATH. *Death by iPod* calls for quoting the remaining part of the Latin phrase, namely, *vivere non necesse*, only in the context of the behaviour related to modern gadget use, there is no trace of Roman contempt of possible contingencies or exaltation of lofty ideals instead[43]. Here navigating the interface of a handheld device is literally the cause of death due to carelessness, for example when drivers or pedestrians scroll through the content shown on the screens or their phones or music players or texting while driving or crossing the street. Death awaits us all, people and machines. iPhones can experience *white screen of death* (WSoD) after a software or hardware failure, when the screen goes white and blank and the device becomes completely unusable. The term is based on analogy with *blue screen of death*, a well-known manifestation of serious Windows computer errors. A comparable predicament affecting Android devices is known as *sleep of death* (SOD), where the device goes to sleep and never wakes up, which is the opposite of the above-mentioned *wakelock* error, preventing it from entering sleep mode. *Phantom ring*, an analogical formation modelled on *phantom limb* introduces the subject of existence after death. The modifier *phantom*[44] expanded its semantic range from the meaning "ghost", as in *phantom ship* to "something not real or illusory", such as *phantom pain*. It is the latter meaning that defines *phantom ring* as an illusion that our mobile phone is ringing when in reality it is not. *Smartphone zombie* or *smombie* for short, blending the compound into a single word is a striking image metaphor relying on an analogy with zombie behaviour used to describe people, walking phone in hand, mesmerized by their devices. It is limited, on the one hand, to the physical appearance of zombies, their

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[43] Navigare necesse est, vivere non est necesse. (22 ottobre 2016). Wikipedia, L'enciclopedia libera. Retrieved 19 November, 2016 from https://it.wikipedia.org/wiki/Navigare_necesse_est,_vivere_non_est_necesse.
[44] Oxford Dictionaries entry for *Phantom* retrieved June 21, 2015 from https://en.oxforddictionaries.com/definition/phantom.

signature slow walking and lack of responsiveness to the surroundings, because of people's sole focus on texting or other actions performed on their mobile devices. This makes pedestrians trip over curbs, walk out in front of traffic and bump into other people. Is it any wonder that they do, since apparently the field of vision of a smartphone user has been assessed to be a mere 5 percent of that of an attention paying pedestrian? The similarity to mindless walking corpses is obviously too great to escape notice. While *smartphone zombie* makes no reference to the evil monster nature of zombies, this implication is present to varying degrees in both meanings of *zombie app*. The apps that are abandoned by their developers and no longer updated are considered to be *as good as dead* and get removed from application listings in app stores. This brings to mind the metaphor GOING OUT OF USE IS DEATH proposed above. Yet they survive and can be found by searching for them directly, typing their exact name in the search box. They are *living dead*, hence part of the association with zombies. The other zombie-related facet of meaning comes from the fact that such apps present a security risk, due to the lack of regular updates, which makes them vulnerable to being exploited and becoming controlled by other apps or hackers via false updates. This is the sinister side of zombies, captured by the Longman Dictionary of Contemporary English definition "a dead person whose body is made to move by magic, according to some African and Caribbean religions"[45] − their being controlled by an external force. The other meaning of the polysemous compound noun *zombie app* places an even greater emphasis on the scary aspect of the zombie status, since it refers to an app that was deliberately designed from scratch to act as innocuous piece of software that sucks the life out our mobile devices by running in the background. The sole purpose of such an app is loading hundreds of advertisements via bots that act like fake users opening ads at the cost of consuming vast amounts of data and draining the battery and all that without any knowledge of the owner. Not unlike *zombie computer*, the creative compound described by Benczes (2006: 118), *zombie app* has the absence of powers of its own (typical of a dead person) and the fact that it is controlled by magic mapped onto the target domain, because the ad clicking bots are in control of the app, rather than the owner of the device who is left in the dark about the app's hidden side. *Zombie phone* has a pair of meanings too. The first could be paraphrased as *the walking dead* and the other as *buried alive*. What

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[45] The Longman Dictionary of Contemporary English definition for *Zombie* retrieved 25 September, 2014 from http://www.ldoceonline.com/dictionary/zombie.

the two have in common is that the zombie-like condition is due to clerical oversights that happen in around 10% of cases each. Namely, when after leaving the job, an ex-employee gets to keep his/her company issued phone and the bills keep getting paid by the former employer, the phone that should have been *dead*, as far as the company is concerned i.e. terminated, continues to be considered as the property of the company and therefore *walking*. In other words, walking (moving) has been picked out as one of the salient properties of the living. Moreover, the ex-employee has walked away with the phone, which may also be why *the walking dead* description applies. But, even if the employee turns over the phone, the danger of a device becoming a zombie is never far away, since the company might fail to alert the carrier to terminate the contract. So, the phone is put away – *buried* in a drawer together with properly terminated devices, but it is still gets billed i.e. controlled by an external force, the carrier, as if by magic. Because it has not been terminated, the phone is treated as a living, actively used device, whose bill is paid by the company. The conceptual metaphor BEING ACTIVELY USED IS BEING ALIVE guides our understanding of this problem that is out of sight and thus out of control of the company. All the characteristics of a zombie are there: the phone is an externally controlled *living dead* without control of its own actions, a monster harming company budget, feeding on its resources. As our union with hi-tech gadgets has been going strong despite illnesses and an occasional evil monster or two, we are rewarded with an ever more intimate relationship with technology, which is increasingly present all over our bodies, not just in our hands. The segment below shows how this enriches our existence in new ways.

5.3. **In our hands, on our heads and skin - augmented existence.** Hi-tech portable devices have become portals to new complex experiences that merge reality with additional layers of information superimposed on the world around us, or those that create completely immersive virtual world environments. In the words of Chen (2011: 4) who ascribes this change to the birth of the iPhone, "data has become so intimately woven into our lives that it's enhancing the way we engage with physical reality. Thus, the physical world and digital worlds are coalescing, turning us into the super-connected beings we've always dreamed of being" The world is changing fast, as part of the great push towards convergence in the digital domain, and so is our vocabulary, expanding to adapt to the changes.

- **Augmented reality (AR)** is similar to VR in that it is often delivered through a sensor-packed wearable device, such as Google Glass, the Daqri Smart Helmet or Epson's Moverio brand of smart glasses. That's not always true, though, and the similarities stop shortly after that. The key term for AR is utility. A typical augmented-reality experience will probably be a lot less exciting than meeting a dinosaur or riding a roller coaster, but analysts have argued that the potential market for AR applications is actually much larger than VR's. The whole point of that ugly word, augmented, is that AR takes your view of the real world and adds digital information and/or data on top of it. This might be as simple as numbers or text notifications, or as complex as a simulated screen, something ODG is experimenting with on its forthcoming consumer smart glasses. RC

- **Mixed reality (MR)** - The key term for mixed reality, or MR, is flexibility. It tries to combine the best aspects of both VR and AR, wrapped up in a marketable term that sounds marginally less geeky than its cousins. In theory, mixed reality lets the user see the real world (like AR) while also seeing believable, virtual objects (like VR). And then it anchors those virtual objects to a point in real space, making it possible to treat them as "real," at least from the perspective of the person who can see the MR experience. RC

- **Virtual reality** - An artificial environment created with computer hardware and software and presented to the user in such a way that it appears and feels like a real environment. To "enter" a virtual reality, a user dons special gloves, earphones, and goggles, all of which receive their input from the computer system. In this way, at least three of the five senses are controlled by the computer. In addition to feeding sensory input to the user, the devices also monitor the user's actions. The goggles, for example, track how the eyes move and respond accordingly by sending new video input. To date, virtual reality systems require extremely expensive hardware and software and are confined mostly to research laboratories. The term virtual reality is sometimes used more generally to refer to any virtual world represented in a computer, even if it's just a text-based or graphical representation. WCD

- **Google Glass** - the name for a type of wearable computer created by the Google's Project Glass. These futuristic glasses provide augmented reality for users by visually connecting them to an Android-run heads up display that offers many of the features of an Android smartphone and connects users to many of Google's key cloud features, such as maps, calendar, Gmail, Google+ and Google Places. In April 2012, Project Glass launched a Google+ page and revealed that Google researchers were testing the technology and hoped to have it on the market in the near future. Google expects the technology to cost about as a much as a smartphone. Google Glass provide an experience known as augmented reality, where images are superimposed over what the user sees in real life. With Google Glass, these images are generally icons that provide directions, alert users to messages from contacts or give weather updates. (…) TP

- **Glasshole** – n. A person who uses a Google Glass wearable computer in an obnoxious, pretentious, or creepy manner. Also Seen As: Glasshole. Example: Google has given some official advice on what to do and perhaps more importantly, what not to do, while wearing the company's Google Glass smartglasses to avoid being a "glasshole". —Samuel Gibbs, "Google Glass advice: how to avoid being a glasshole," The Guardian, February 19, 2014. WS

- **Google Cardboard** - A 3D virtual reality headset constructed of cardboard, introduced in 2015. Designed by Google and made by third parties, Cardboard holds an Android smartphone and uses the Cardboard app or a third-party app to display a stereoscopic view. The app is controlled by head movement and the smartphone's built-in accelerometer, as well as a magnet slider on the unit that interacts with the phone's magnetometer. PCME

- **Skinput** - In IT terminology, the term "skinput" refers to a new input technology that essentially uses the human body as an input device. Skinput is also known as bioacoustic sensing or bioacoustic transmission. New kinds of skinput interfaces involve technology that is able to locate and sense finger taps on the skin. In some cases, engineers use tools like projectors to present visual interfaces on the body. Users can then test these visual areas to produce results. Microsoft and other companies are pursuing research on these kinds of interfaces. In general, skinput technologies allow for the use of the body's natural properties to develop new kinds of interfaces. This is directly related to the development of wearable technology and other kinds of interfaces

that are body-interactive or that use the physical human body as a component of a greater setup. In a sense, skinput is a very modern take on the classical idea of input. From the very beginning of computer systems, from Charles Babbage's analytical engine and the first ENIAC mainframe in the middle of the 20th century, input/output was an essential component of how computing systems operated. With skinput, interfaces are moving from traditional designs like plastic key pads or computer keyboards, directly to the human body. Skinput may also have applications to other kinds of technologies like biometrics for personal identification. TP

As pointed out by Johnson (1997: 24) "even Vannaver Bush explicitly positioned his Memex device as a tool for 'augmenting' our intellect the way a pair of spectacles might augment our vision". Any system offering a substantial improvement in access to and management of information enhances our intellect, not unlike glasses that help our vision. Decades later, the technology has advanced enough to truly augment our reality by overlaying information on top of the real-world experience in our mobile devices and even in our glasses, adding new DEPTH to the surroundings. The most basic way of taking advantage of the additional information is to choose content-specific layers to be shown in real time as you look around your surroundings through the smartphone or tablet camera viewfinder – the device screen. For example, the augmented reality app *LayAR* is essentially a browser that offers a variety of predefined layers that are inherently metonymic, showing very short bits of entertainment, tourism or shopping related information by making use of the location and spatial awareness of the device. In other words, a number of in-built technologies, namely, accelerometer, camera, compass and GPS work together to pinpoint the location and the field of view of the user. As soon as the exact location has been identified, icons indicating entertainment venues, tourist attractions or shops start cropping up on the screen in the form of an additional level of the graphical user interface. The app is also able to enhance print media by using special QR codes that when read by the app's own QR reader, place virtual 3D objects on the pages of all sorts of printed publications. Interactive print is often integrated in flyers and magazines for advertising purposes, where extra layers of digital information added by AR make interactive elements come to life as real manipulable objects. Making an important point about mobile devices by saying that they "invert the spatial relationship between people and computers" (Laurel 2013: 187), because the position of the body is no longer dictated by the position of the device, Laurel rightly emphasizes the role of the camera as the most important smartphone sensor in general, but especially for augmented experiences that take the form of diverse software applications, including educational ones like Starlight showing a real-time interactive map of the sky, based

on user location and the constellations and a growing selection of games. The composite view of reality is a fertile field of research and development for the biggest technology companies today. Google has already launched its Tango platform[46] which relies on computer vision, instead of GPS or other external signal input to obtain detailed 3D information about the environment surrounding a mobile device, either phone or tablet, whose software integrates motion tracking, area learning (data about the environment that can be re-used later i.e. recognized as known) and depth perception (the ability to identify distances, sizes, and surfaces in the surroundings). With Apple joining the augmented reality race with its recently launched ARKit software for iPhones and iPads, this domain is set to become a dynamic source if new interaction patterns and metaphors. What is already obvious is that with AR, mobile devices are fast gaining sensorimotor knowledge that used to be the exclusive capability of human cognition. Being context-aware, mobile gadgets immediately translate contextual information into advanced functionality, which is one of the key reasons why we, humans regard them as smart. This brings to mind the correlation between sensorimotor experiences and subjective judgement in primary metaphors. Here, as is frequently the case in the field of technological development, with the notable exception of the drive towards miniaturization, MORE IS UP, namely, additional contextual information produces advanced functionality. The use of sensors and 3D environmental information is closely related to other major advances, neural network modelling and machine learning that both map the features defining human intelligence (the physical structure of the brain and the ability to learn) onto machines, making them more intelligent.

Examining five technology forces: mobile, social media, data, sensors and location services, Scoble and Israel (2013: 3) observe that instead of sticking with desktops and laptops for portability, people opt for mobile as "the aggregator of our other four forces" and that an average of seven sensors integrated in every modern smartphone, combined with Internet access and social media provide a wealth of data, the content that "allows technology to understand the context of who you are, what you are doing and what you are likely to do next" (ibid. 5). We surrender part of our privacy in the process and, at the same time, readily embrace devices which enable us to become

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[46] Tango (platform). (2017, May 31). In *Wikipedia, The Free Encyclopedia*. Retrieved June 6, 2017 from https://en.wikipedia.org/w/index.php?title=Tango_(platform)&oldid=783127837

omniscient, connected creatures, almost super human enjoying unprecedented access to information anytime and anywhere. At one point, *Google Glass*, the epitome of a contextual gadget looked like a device that would allow us to be just that. Google Glass is a wearable that has an additional eye-tracking sensor to understand where the user is looking and takes a hands-free approach to operating a system that responds mainly to voice commands and touch gestures. It is a computer that sees what the user sees and projects a small screen floating above the right eye. The screen can display text, photos and videos; it is where users can see the results of their voice searches of the web, read e-mails or their Twitter feed, for example, or accept or reject an incoming phone call, all without looking at the phone. It takes just uttering the wake word "OK Google" and a voice command to take a picture or a record a video, because the camera of the device is operated without the use of hands. The first widely known head mounted computing device was felt to be able improve people's productivity, provide a new form of access to information and change the way we communicate, among other things, by reducing the time people spend looking at their phones, so they can engage in more face-to-face interactions. Their potential to understand usage patterns over time makes such devices the most intimate intelligent personal assistants and the fact that they superimpose information directly over our right eye's field of vision qualifies them as AR gadgets, offering a very immersive and effortless AR experience thanks to natural language commands (cf. Scoble and Israel, 2013). But despite all these beguiling features and a catchy name relying on alliteration and metonymy (as the material that the part of the object, *lenses*, is made of stands for the entire object, in the well-established metonymy – *glasses,* further also metonymically shortened to Glass) to make it memorable, Google Glass[47] simply failed to catch on, even among *Explorers*, the first batch of early adopters of the experimental version of the device. Apparently, the reactions to people donning digital eyewear were rather negative. Glass owners constantly talking to their devices were perceived by other people as arrogant and creepy and got referred to as *Glassholes*. Ironically it was the novel word blending *asshole* and *Glass* that caught on, instead of the device itself, which has since carved a niche for itself in the enterprise setting though (cf. Metz, 2015). There is little doubt that face mounted computing devices in some visually less conspicuous form will become popular. The process of acceptance

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[47] The device name, in turn, inspired the metaphoric term *Glass Foundry*, the name of hackathon events intended for Glass Explorers / developers, where they could write code, test it on the device, and collaborate.

of certain technologies takes more time than usual, especially when what Scoble and Israel (cf. Scoble and Israel, 2013) term the "freak factor" is involved. What is known today is that other technology companies may have smart glasses in the pipeline (cf. Heisler, 2017). Some less ambitious versions of digital eyewear that have already proven to be popular will be mentioned below. What is important in the context of metaphors of mobile communications is that all these devices are mobile computers in their own right, providing new experiences and new metaphors. Still, they fundamentally depend on mobile phones for setting up and pairing via Bluetooth, in order to make use of the connection to the Internet, receive notifications etc. Smartphones equally remain the hub of mixed reality (MR) and virtual reality (VR) experiences as well. The massively popular mobile game Pokémon Go is often used is used by way of example to illustrate the difference between MR and AR. MR is meant to combine the best of AR and VR worlds by keeping the connection to the real world and making virtual objects appearing in it look as lifelike as possible. In the latest incarnations of the game, 3D pocket monsters pop up in and jump around the actual environment, interacting with it in increasingly believable ways. But as AR continues to develop, the already somewhat artificial distinction between AR and MR is likely disappear in favour of advanced augmented reality. Virtual reality, on the other hand, shuts out real reality altogether and is thus metaphoric, compared to AR and requires users to wear special expensive standalone headsets together with additional equipment like gloves or earphones or cheaper ones which depend on mobile phones inserted in them to do all the VR related processing and projection work through a mobile app like *Google Cardboard* available for Android and iOS that accompanies the simple VR holster made of cardboard and designed by Google that users can buy or make and assemble themselves. It can be used to play Cardboard demos or standalone mobile VR apps ranging from virtual tours of Mars, Arctic or the Moon, games to 3D films, like the gloriously animated VR version of *The Garden of Earthly Delights* by Dutch painter Hieronymus Bosch, created as part of the celebration of the 500th anniversary of the painter's life. The latest version of Google's mobile VR platform, *DayDream VR* requires its latest Pixel phones able to run the content developed for it. Like its predecessor, Google Cardboard, whose name results from the application of the Constitution ICM, namely, the metonymy MATERIAL CONSTITUTING AN OBJECT FOR THE OBJECT, Google Daydream VR mobile phone holster features no mechanical parts and is relatively affordable being made of felt. It does have a remote

control and apparently provides a convincing enough basic VR experience (cf. Orland, 2016). In conclusion, VR offers a more isolating or cinematic feeling restricting the natural field of vision (cf. Manovich, 2001: 79-82), while AR with its connection to the real world and wider application might be the winning combination for the majority of users today. Throughout this study, the development of technology from desktop to wearable can be traced, getting ever closer to our skin. The progress is expected to culminate in *skinput*, the ultimate move towards embodiment, when as the self-explanatory blend indicates, our skin will become input, in the interfaces of the future that might combine this method with touchscreens or dispense with them entirely. Another less radical application of skinput would be for personal identification biometrics, something that the contemporary use of fingerprint scanners in smartphones and tablets clearly points to. But, for now, it may be wise to leave speculations about the future aside and see just how smart the present has become.

5.4 From Jacquard Loom to Project Jacquard – smart things. Our phones have not only themselves gone from dumb to smart in a decade or so, they have also led to making many other things smarter.

- **Smartphone** - a category of mobile devices with computer-like functionality. These devices sport complete operating system and have a platform for application developers. GSMA

- **Smart messaging** or **enhanced messaging service (EMS)** - A mobile phone system which delivers text messages with a limited number of added features, such as business cards, or ringtone and profile downloads. TGD

- **Smart Stay** - This fixes one of the most common annoyances with a smartphone. You're doing something on the phone, but you haven't touched the screen for a while, so the screen turns off. Smart Stay fixes that. As long as you're looking at the phone, it stays on. (Smart Stay is the only feature that's not brand-new with the S4. It's been around since the S3, but it works better now.) GS4MM

- **Dumbphone** (also seen as **dumb phone**) is a mobile telephone that, unlike a smartphone, has little-to-no computing or internet capacity. Smartphones have become so sophisticated that they are for all intents and purposes miniature computers with the ability to make and receive voice calls -- which may be one of their less commonly-used features. Like the cell phones of decades ago, dumbphones are used mostly for calling. The devices typically enable texting, albeit through methods that don't require a full keyboard such as multi-tapping or text on nine keys (T9). Some dumbphones include features such as MP3 players and simple games, in which case they are sometimes called feature phones. Dumbphones don't require data plans and are typically much cheaper to own and operate than smartphones. Because they don't have many features, the devices have lower power requirements and can run for several weeks on a charge. With their limited connectivity, dumbphones also provide a security advantage over smartphones. Dumbphones initially targeted the senior demographic whose members often found smartphones too complicated to use. However, the simple devices are becoming more popular across all age groups for people who have tired of being constantly connected. In the United States, 24 million dumbphones were purchased in 2015, and the market continues to increase. WhatIs TT

- **Feature phone** - A mobile phone that is not smartphone. It has operating system firmware, but third party software support is limited to only Java or BREW applications. Recently feature phones have begun to offer similar features to those of smartphones, so the main difference between the two groups now is the third-party software support. GSMA

- **Smartifact** n. A smart artifact; a device sufficiently sophisticated that it can be considered intelligent and aware of its surroundings. Etymology: *smart + artifact*. WS

- **Smartglasses** or **smart glasses** are wearable computer glasses that add information alongside or to what the wearer sees. Typically this is achieved through an optical head-mounted display (OHMD) or embedded wireless glasses with transparent heads-up display (HUD) or augmented reality (AR) overlay that has the capability of reflecting projected digital images as well as allowing the user to see through it, or see better with it. While early models can perform basic tasks, such as just serve as a front end display for a remote system, as in the case of smartglasses utilizing cellular technology or Wi-Fi, modern smart glasses are effectively wearable computers which can run self-contained mobile apps. Some are handsfree that can communicate with the Internet via natural language voice commands, while other use touch buttons. Like other computers, smartglasses may collect information from internal or external sensors. It may control or retrieve data from other instruments or computers. It may support wireless technologies like Bluetooth, Wi-Fi, and GPS. While a smaller number of models run a mobile operating system and function as portable media players to send audio and video files to the user via a Bluetooth or WiFi headset. Some smartglasses models, also feature full lifelogging and activity tracker capability. Such smartglasses devices may also have all the features of a smartphone. Some also have activity tracker functionality features (also known as "fitness tracker") as seen in some GPS watches. WIKI

- **Snapchat Spectacles** - Sunglasses from Snap Inc. that let wearers take up to a hundred 10-second videos per charge. Introduced in 2016, the Spectacles became available in traveling "Snapbot" vending machines that show up in various locations around the country for a single day as well as in Snap's own New York storefront. See Snapchat. PCME

- **Smartwatch** - A wearable computing device worn on a user's wrist that offers functionality and capabilities similar to those of a smartphone. Smartwatches are designed to, either on their own or when paired with a smartphone, provide features like connecting to the internet, running mobile apps, making calls, messaging via text or video, checking caller ID, accessing stock and weather updates, providing fitness monitoring capabilities, offering GPS coordinates and location directions, and more. WP

- **Apple Watch** - A family of smartwatches from Apple that debuted in April 2015 with more than 40 models from USD $349 to $17,000. Compatible with iPhones starting with the iPhone 5, the screen's Force Touch feature senses the difference between a tap and a press to enable two modes of touch interaction. Available in small and large case sizes (38 and 42mm) and numerous band styles, the watch's Taptic Engine "taps" the wearer on the wrist for notifications. PCME

- **Glances** — scannable summaries of the information you view most frequently. Swipe up on the watch face to see glances, then swipe left or right to see different glances AWUG

- **Wrist-top** n. A computer or similar device worn and used on the wrist. Also Seen As: wristtop · wrist top · wristop. Other Forms: wrist-top adj. Etymology: cf. laptop. WS

- **Smart home** - a term that refers to modern homes that have appliances, lighting and/or electronic devices that can be controlled remotely by the owner, often via a mobile app. Smart home-enabled devices can also operate in conjunction with other devices in the home and communicate information to other smart devices. Smart home-enabled devices can include appliances like refrigerators, washing machines, dryers, and toaster ovens, as well as heating and air conditioning units and lighting devices. Some examples of smart home-enabled electronic devices are audio and video entertainment systems, camera and security systems, and computers, laptops and other electronics mobile devices. WP

- **Home₂** - Home provides a secure way to control and automate HomeKit-enabled accessories, such as lights, locks, thermostats, window shades, smart plugs, cameras, and more. With Home, you can control any "Works with Apple HomeKit" accessory using iPhone. After you set up your home and its rooms, you can control accessories individually, or use scenes to control multiple accessories with one command. For example, you might create a scene called "going to bed" that turns off the lights around the house, dims the lights in the room "master bedroom" to 30%, then locks the front door and lowers the thermostat. If you have an Apple TV (4th generation or later), or iPad that you leave at home, you can schedule scenes to run automatically at certain times, or when you activate a particular accessory (such as unlocking the front door). This also allows you, and others you invite, to securely control your home while you're away. iPhUG

- **Scene** – Scenes allow you to control multiple accessories at once. For example, you might define a "Reading" scene that adjusts the lights, closes the drapes, and adjusts the thermostat. Home has some typical scenes already defined for you, but you'll need to edit them before they'll work. iPhUG

- **Internet of Things (IoT)** - The Internet of Things (IoT) refers to the ever-growing network of physical objects that feature an IP address for internet connectivity, and the communication that occurs between these objects and other Internet-enabled devices and systems. The Internet of Things extends internet connectivity beyond traditional devices like desktop and laptop computers, smartphones and tablets to a diverse range of devices and everyday things that utilize embedded technology to communicate and interact with the external environment, all via the Internet. Examples of objects that can fall into the scope of Internet of Things include connected security systems, thermostats, cars, electronic appliances, lights in household and commercial environments, alarm clocks, speaker systems, vending machines and more. Businesses can leverage IoT applications to automate safety tasks (for example, notify authorities when a fire extinguisher in the building is blocked) to performing real-world A/B testing using networked cameras and sensors to detect how customers engage with products. WP

- **e-textile** n. - A textile that has electronic circuitry woven into the fabric. Also Seen As: eTextile. Etymology: electronic + textile. Notes: E-textile is also called smart fabric, smart yarn, or intelligent textile. It's used to make, among other things, smart clothes and wearable computers (or just wearables). WS

The thread that unifies all smart devices and features in the examples above is the metaphor THE PHONE IS A SMART PERSON, clearly incorporating anthropomorphization. Beyond that, a general metaphor could be phrased as HAVING ADVANCED FUNCTIONALITY IS BEING SMART. Conversely, THE PHONE IS A STUPID PERSON, namely, THE ABSENCE OF ADVANCED FUNCTIONALITY IS DUMBNESS. These two pairs of metaphors are at the heart of the fundamental difference between computer-like *smartphones* and their less advanced fellow phones, feature phones or *dumbphones*, limited to a non-expandable set of features provided out-of-the box by device manufacturers. To be fair, modern feature phones do support installing Java-based applications and themes or skins, so they are not that dumb after all. However, compared to the thousands upon thousands of apps in Apple and Google app stores, these are far less numerous and crucially offer much more limited functionality, constrained by modest hardware specifications of non-smartphone devices. Therefore, the term *feature phone* is an instance of the PART-WHOLE metonymic relation, since they highlight the limited preloaded set of

features, as the most salient aspect of these devices, unlike smartphones that offer an all-round smart experience with numerous available applications that make them *even smarter* and smart sensor-rich hardware. *Smart messaging* includes enhancements in the form of added features, the ability to transmit additional content such as business cards, ringtones or profiles as part of text messages. Smartness is frequently associated with taking advantage of sensors embedder in the device. Thus, *smart stay* is a Samsung Galaxy feature that uses eye tracking to determine where the screen of the phone should stay on, even if the owner is not touching it. The definition of *smartifact* approaches the issue along these lines, specifying that intelligence of *smart artifacts* also implies awareness of the surroundings that is more often than not achieved with the help of sensors. There are quite a few varieties of *smart glasses*, some more versatile than others, suitable either for basic tasks like being a front-end to remote systems to being wearable computers in their own right, running mobile apps, equipped with and responding to a variety of sensors, operated via touch or in a hands-free manner, using natural language commands and offering AR experiences. These features are present in Google Glass a wearable that failed to reach mass production stage because, at this point of technological development, such functionality comes at a cost of protruding parts that draw unwelcome attention to the wearer and contribute to the "freak factor", as mentioned above. The outstanding example of *Snapchat Spectacles* shows a different approach yields interesting results. For the first time ever, a company that makes a popular mobile app, managed to launch a successful head-mounted wearable. Snap Inc.'s take on smart glasses combines a more limited functionality, focused on producing content for their Snapchat mobile messaging app, enabling people to share photos and short videos that get automatically deleted a short time after being viewed. Stylish, colourful, normal-looking, affordable glasses, without any visible added hardware parts have a tiny camera embedded in the frame that can take photos and videos, much like Google Glass, capturing the unique perspective of the wearer. They are not as smart as the search giant's ill-fated offering, but are smart in what they don't freak the average users out with their somewhat outlandish looks and an exorbitant price. Belonging to the category of devices worn on the wrist, described by the term *wrist-top*, based on the analogy with *laptop*, *smartwatches* too are small computers that look and function like timepieces, but support standalone apps and mirror many of the features of smartphones, including receiving notifications from phone apps and placing and

receiving calls via a SIM card (supported by a small selection of devices running mostly Android Wear, Google's operating system for wearables) or more often via Bluetooth. This communication protocol keeps the watch wirelessly connected to the phone, allowing access to a large number of shared features, complementing a small selection of standalone ones that are available even when the wearable is disconnected from the phone. The interaction of users with their Apple Watches, which are currently on their second iteration, running version 3 of the Watch OS operating system, with the third generation of devices just around the corner is founded on some interesting metaphors. The following list that combines smartwatch features and the associated interface metaphors is not exhaustive:

- Force Touch – ADDITIONAL FORCE IS ADDITIONAL INFORMATION / OPTIONS

- Wrist Raise – RAISING THE WRIST IS WAKING UP

- Tap to wake – TAPPING THE DISPLAY IS WAKING UP

- Complications – ADDING FEATURES IS COMPLICATION

- Rotating dot – DOT ROTATION IS LOADING INFORMATION

- Passcode – ENTERING THE PASSCODE IS UNLOCKING

- Manual lock – SLIDER DRAGGING IS LOCKING

- Dismiss a notification – SWIPING DOWN IS DISMISSING A NOTIFICATION

- Glances – A SNIPPET OF INFORMATION IS A GLANCE

- Heart rate monitor – THE WEARABLE IS A HEART RATE MONITOR

- Apple Watch Activity app - CLOSING THE RINGS IS ACHIEVEMENT OF GOALS

- Goal statistics – MORE IS UP, LESS IS DOWN

- Music storage – THE WEARABLE IS A STANDALONE MUSIC PLAYER

- Remote – THE WEARABLE IS A REMOTE CONTROL (ITUNES, APPLE TV)

- Viewing photos – THE WEARABLE IS A STANDALONE PHOTO VIEWER

- Remote viewfinder and shutter – THE WEARABLE IS A CAMERA (VIEWFINDER AND SHUTTER)

- Bedside alarm clock – THE WEARABLE IS A NIGHTSTAND ALARM CLOCK

The list of potential metaphors is practically open-ended since the interface allows installing watch apps that accompany iPhone apps and allow the watch not only to mirror notifications from the phone, but also to become a scaled-down version of a

dictionary, translator, email and messaging client, relying on natural language voice input from the user, or a Twitter (or other social media apps) client, sound recorder, workout app, a gaming device or whatever else the owner chooses it to become, provided that there is an app for that. But the most practical feature of smartwatches, by far, remain notifications, which make taking the phone out of the pocket or the bag unnecessary and turn reading an incoming message into a gesture, as easy as glancing at the watch screen. It is much less distracting to take a quick look at the watch than to fish for one's phone, unlock it and perform multiple taps in order to get to the desired piece of information. Glanceability, the quality of a piece of information to be read or comprehended at just a glance is a much-appreciated feature of wearables and not just them. Apple has made *glances*, configurable summaries of the most frequently viewed information part of the Watch OS, enabling users to pick Apple Watch apps for which they want glances displayed e.g. calendar and tasks, to-do list, world clock, Twitter feed or stargazing conditions. Windows Phone and Windows 10 *Live tiles* are also glanceable − they flip to display the latest news or Facebook updates, eliminating the need to open the corresponding app. Moreover, the concept of hybrid watches, analogue watches with some smart functionality, like notifications and fitness features (step count, distance covered, calorie output, sleep monitor, etc.) that do not affect battery life is becoming embraced by mainstream and non-mainstream watchmakers alike, including Breitling, Fossil, Withings, Swatch or Garmin and it looks like the idea of connected watches is catching on, perhaps at a slower than expected, but still steady pace.

The Internet of Things has the potential to bring connectivity to all kinds of everyday things, in other words, connect the physical world to the web. The basic premise behind the idea is that the addition of sensors can make everyday objects smart after they are assigned unique identities in order to be able to communicate wirelessly and be controllable via a smartphone app, for instance, generating new interaction possibilities and vast amounts of new data. Thanks to cloud-based services and enhanced Internet Protocol Version 6 (IPv6), the number of unique addresses and by extension identities has become practically unlimited, paving the way for connected homes with smart household appliances, lights, heating, cars, toys, health monitors and what not, simultaneously raising privacy concerns and the fear of hacking. This calls for elaborating the metaphor defining the intelligence of objects. Namely, one of

the entailments of the conceptualization of SMARTNESS as HAVING ADVANCED FUNCTIONALITY is BEING CONNECTED TO THE WEB VIA SENSORS IS BEING SMART or put more simply ADVANCED CONNECTIVITY IS SMARTNESS. For example, *Home* is an iPhone and iPad app that provides wireless (remote) control and automation of smart home accessories like locks, thermostats, lights, cameras, etc. compatible with Apple's HomeKit software framework that allows mobile devices to communicate with them. You can even use Apple Watch as a universal remote that can open your garage door fitted with a smart lock and glance at the watch display to see who's taking the car thanks to a connected camera. Such forms of interaction that would have until recently been considered "actions impossible" spur the creation of new metaphors, such as, A GROUP OF SMART ACCESSORIES CONTROLLED BY A SINGLE REMOTE COMMAND IS A SCENE. Compared to Google's forays into making intelligent textile also known as *e-textile, smart fabric* or *smart yarn*, connected objects in the home may sound like old news.

Developed by Google's in-house experimental Advanced Technology and Projects (ATAP) group, Project Jacquard purposefully references an add-on mechanism fitted to power looms (see Section 3 above) that uses strings of punched cards forming a continuous sequence to automate the patterning and weaving process (see footnote 142). It is focused on making interactive clothing made of fabrics into which interactive threads have been sawn, making the material able to connect to the user's smartphone wirelessly and respond to touch gestures. Thus, the first smart garment expected to be launched later this year, in collaboration with Levi's is a denim jacket, aimed primarily at cyclists that lets the wearer tap and swipe across the surface of the part of the sleeve where regular threads of jeans have been replaced by conductive ones, to execute commands like changing songs in the smartphone music player, getting directions from Google maps or silencing incoming calls, all without taking the phone out of their pocket. It also features a touch sensitive, removable and rechargeable smart tag sensor, looking like a cuff button, which is part of a Bluetooth powered cuff attached to the jacket sleeve that connects to the phone, making interaction possible (cf. Penta Tech, 2016., Endgadget, 2017) Talk about mobile communications − the jacket becomes a wearable and wearers can move on foot or use a vehicle, such as a bicycle and interact with technology while on the move in a way that does not affect their field of vision. The key to this advancement is the fact that, as pointed out by Project Jacquard founder, Ivan Poupyrev "the structure of

textiles is the same as the structure of touch screens which we use in everyday mobile devices and tablets." (cf. Google ATAP, 2016), because once conductive threads are inserted in place of ordinary ones, the fabric acts like any touch panel and interactivity gets invisibly introduced into things. This gives us the metaphors A PATCH OF CONDUCTIVE FABRIC IS A TOUCHSCREEN and A TOUCH SENSOR IS A CUFF BUTTON. In this case, the Jacquard interface blends with clothing, resulting in more natural interactions. These are only the first steps towards reducing the role of screens that still very much dominate our lives and our attention now turns to their impact.

5.5 The synergy of screens. One screen to rule them all. There was a time when the world of media used to revolve around television. The viewers were hypnotized by the content shown on TV screens. In more recent times, the hypnotic power has been transferred to a different medium and a different screen, or rather screens. The rapid multiplication of screens is a product of the speed of technological change.

- **Second screen** - (1) A second monitor connected to a computer to expand the user's electronic desktop. (2) A tablet used to enhance the control of a TV set. For example, Sony's SideView app for tablets displays the TV provider's program guide along with related information about the shows. YD / A second screen is a second electronic device used by television viewers to connect to a program they're watching. A second screen is often a smartphone or tablet, where a special complementary app may allow the viewer to interact with a television program in a different way - the tablet or smartphone becomes a TV companion device. The second screen phenomenon represents an attempt to make TV more interactive for viewers, and help promote social buzz around specific programs. A second screen is also known as a companion device. The use of second screens or companion devices or applications is something that many are talking about in today's broadcasting industry, where new display options, such as tablets and smartphones, are revolutionizing the way businesses think about digital media. A second screen allows for viewer interaction. For example, some of these secondary displays could enable real-time chat about visual broadcasts, such as news or current event broadcasts. Second screens also can help shape how businesses reach customers, and how consumers use state-of-the-art technologies in an increasingly digital world. The use of second-screen broadcasts also coexists with the emergence of portable data delivery through cloud-based software systems, along with other ways of getting content over wireless platforms directly to a customer's device. TP / **Second screening** pp. - Using a mobile device to monitor and post social media comments about what you are watching on TV or at the movies. Other Forms: second screener n. WS

- **Third-screen** Noun (uncountable) (marketing, business) - The screen of a mobile device (as opposed to earlier television and computer screens), regarded as a means of transmitting advertisements etc. YD / Third screen n. A video screen, particularly the screen on a cell phone, that a person uses almost as often as their television and computer screens. Notes: The electronic notion of a third screen is clearly based on the real-world notion of a third place, which I defined last fall a "a place other than home or work where a person can go to relax and feel part of the community." WS

- **Fourth screen** - In advertising and marketing communication, fourth screen, or sometimes third screen, refers to a small portable video screen such as a mobile phone or portable media player. Today, people use mobile devices in ways that open new possibilities for documentary practice. The term fourth screen originates in reference to the actual historical sequence in the development of video screens. With the rapid proliferation of video networks in non-traditional

spots such as movie theaters, bars and restaurants, gas stations, health clubs, and other place-based venues a category entitled "fourth screen" was created. The first three screens are considered: TV, Internet, and Mobile. The fourth screen is mainly used in the advertising and media space with the explanation and use of digital signage. With the proliferation of technology, digital signage has expanded in this "fourth screen" section to include movie theaters, gas stations and health clubs. (…) The video screens again are: (1) the movie screen, also known as the silver screen, (2) television (TV) (3) personal computer (PC), (4) out of home digital signage. WIKI

- **nth screen** n. - Technology that displays video content on many different screens, particularly multiple, synchronized screens. Also Seen As: nth-screen. Example: *The 'nth screen' has been lingering around the tech world for several years, but is expected to hit the big time in 2014. It basically means devices that are able to connect and share content between multiple displays. Sharing is caring, apparently, and companies will let you connect their devices together for a greater user experience.* —"Top 5 tech buzzwords for CIOs in 2014," Computer Business Review, February 6, 2014 WS

- **Screen shift** v. - To send a video signal or file to another device; to begin watching video content on one device and then continue it on another. Also Seen As: screen-shift. Other Forms: screen shifting pp. · screen shifter n. Example: Mobile is all the rage at CES 2013 where technology developers and device manufacturers are furthering the evolution of a mobile and second-screen connected world. Within this world, the rapid adoption of Mobile Digital Television is allowing consumers to screen shift their TV viewing, in real time, from in-home HD TVs, to tablets, smartphones and in-vehicle infotainment systems thereby enabling their mobile lifestyles to synch with the broadcast TV news and content they desire. — "Statement by TVB EVP & Chief Marketing Officer, Abby Auerbach on CES Technology That Enables Screen Shifted TV Viewing," Television Bureau of Advertising, January 9, 2013. WS

- **Space shift** v. - To play media on a device other than the one on which it is stored. Also: space-shift, spaceshift. Also Seen As space-shift · space shift. Other Forms: space shifting pp. · space shifter n. Example: *Perhaps the court is implying here that owners of legitimate copies are entitled (as a matter of fair use?) to reproduce those works and access them through some other mechanism. If that is what the court meant, that would be a big deal, because it would legitimize space shifting.* —Mark P. McKenna, "The Limits of the Supreme Court's Technological Analogies," Slate, June 26, 2014. WS

- **Continuity** - Many of [iOS X] Yosemite's new features focus on the theme of continuity, increasing its integration with other Apple services and platforms such as iOS and iCloud. The Handoff functionality allows the operating system to integrate with iOS 8 devices over Bluetooth LE and Wi-Fi; users can place and answer phone calls using their iPhone as a conduit, send and receive text messages, activate personal hotspots, or load items being worked on in a mobile app (such as Mail drafts or Numbers spreadsheets) directly into their desktop equivalent. WIKI / Continuity lets you make calls on your other devices by relaying calls through your iPhone, which must be turned on and connected to a cellular network. Continuity connects iPhone with your iPad, iPod touch, and Mac so they work together. The following are some examples of what you can do with Continuity. Use Handoff to start an email or document on iPhone, then pick up where you left off on your iPad. Copy an image on iPhone, and use Universal Clipboard to paste it on your iPad. Make phone calls and send SMS and MMS text messages from your other iOS devices or Mac computer. Use Instant Hotspot to provide Internet access to your other iOS devices or Mac computer. Quickly pay on your iPhone if you shop on your Mac at a site that supports Apple Pay. iPhUG

- **Continuum** - A set of features that seamlessly adapt and optimize the user interface for different devices, modes of working, hardware, or platforms. MTC / Continuum is one of Microsoft's signature features in Windows 10 where the user interface can adapt automatically depending on the situation. For example, on a Surface Pro 3, Windows 10 will default to desktop mode with the keyboard attached and will then switch to tablet mode when you remove it. Continuum will also be present in Windows 10 Mobile allowing your smartphone to attach to a monitor, mouse and keyboard, wired through the use of accessories or wireless through

Bluetooth and Miracast. It will then project a desktop like app experience to the monitor using the apps on your phone. WC/ With Continuum, you can connect the phone to a nearby monitor, keyboard, and a mouse. With this PC-like combination, you can, for example: • Use Office apps and surf the net more conveniently • Play mobile games and watch movies on the big screen • Simultaneously run different apps on your phone and the second screen. If you want to connect to an external screen, use the Display Dock. The keyboard and mouse can also be connected through the Display Dock, or using Bluetooth. L950UG

- **Screenager** - From Douglas Rushkoff's 1997 book "Playing the Future," a screenager is a teenager who spends a lot of time at a computer screen. Screenager activities are sending e-mail and instant messages, downloading music and movies, gaming and Web surfing. PCME / A teenager who is fully conversant with and skilled in the use of computers and other electronic devices. CD

Nowadays, the increasingly interactive screens are everywhere. They are part of many more things than just computers, mobile devices or TVs. From ATMs and interactive displays in public spaces, such as airports and museums to our cars and homes, where more and more household items have touch-sensitive screens, including smart thermostats, fridges, ovens, largely thanks to the trend of embracing the move towards the Internet of Things, as described above. The tendency spotted by Manovich (2001) for the screen to become the main means of accessing information has grown to such a degree that it can be considered to be the standard of information consumption towards the end of the second decade of the 21st century, with no signs of slowing down – quite the contrary. So, the counting begins and the PART FOR WHOLE metonymy THE SCREEN FOR THE DEVICE dominates. Designers, architects and specialists in various other visual disciplines often need an additional, second computer screen to extend or mirror their work. Aside from the domain of productive work, multiple displays have a role to play in the context of media consumption as well. TV content consumption, as a one-way process, directed at the viewer is being transformed by the simultaneous use of mobile devices, i.e. phones or tablets to which the second (kind of) screen belongs, making the viewing experience an interactive, two-way exchange between the viewers and the broadcasters. A companion mobile app enables viewers to comment on live broadcasts on social media and often catch up on the shows they might have missed or watch live stream, TV on demand and enjoy a more personalized experience, including offline viewing and favourite content available through cloud-based services. The screen count differs, depending on what is chosen as the starting point of their mass adoption in the society and popular culture. Thus, the notion of *third screen* takes television as the point of departure of our collective screen-filled journey, in the course of which TV and computer screens are being succeeded by a third kind

of display, the one belonging to mobile devices. It is referred to as "third screen", not only in the context of advertising opportunities, but also the overall patterns of our use of technology. Namely, they may have been third to appear, but mobile screens seem to have already taken the lead in popularity and frequency of use. The counting and the analogical formations based on it continue with the advertising and marketing term *fourth screen* that encompasses a variety of public places where video networks and content have not been traditionally available, such as public transport, hotels, stadiums, shops, etc. where screens are used for displaying advertising content. The same term also denotes mobile devices when used for documentary content creation, that is using the cameras in our phones and tablets in ways that expand documentary practices, and we may add the creation of multimedia content in general. However, this number originally refers to the historical continuity of the presence of screens, beginning with cinema and the silver screen, followed by TV and PC and ultimately digital signage, which Goggin (2006) replaces with mobile that Goggin and Duarte (2017:89) notice has been called "the fourth screen". It must be added here that mobile devices themselves have become major advertising platforms, with ads of all shapes and sizes populating their screens. Thus, if digital signage is kept as part of the historical sequence, mobile would become the fifth screen (or even the fifth and sixth, if phones and tablets are viewed separately). The term *fifth screen* otherwise applies to the newest breed of screens, the wearables – smartwatches and smartglasses as the new mobile market (cf. Ballve, 2013). Given the existence of so many different screens, the fact that the word *nt^h screen* has been coined to continue the analogy potentially endlessly comes as no surprise. With all kinds of data, including streaming video, residing in the cloud, the idea of *screen shifting*, switching between multiple screens, while viewing video content in real time (on TV, smartphones, tablets and in-vehicle screens) and the related notion of *space shifting*, playing media wirelessly on a device that does not store the digital media being watched is an improvement of the experience for users who are always on the move, provided that they really need to watch things while on the move, but that is quite another matter. The same principle of cloud based continuity has been applied in providing the connection between PC and mobile OSs (see 4.1.4 above and the notion of *liquid computing*) like Apple's iCloud-dependent *Continuity* feature enabling fast switching between mobile devices and computers and using the Mac to continue the work on tasks started on the iPhone, iPad or iPod Touch. Similarly, Microsoft's *Continuum* automatically adapts the user

interface depending on the mode of use or the device, promising to eventually replace our laptops, since we will be able to connect our Windows Phone smartphones to any monitor and keyboard and get a desktop-like working environment. Moreover, the latest gaming console from Nintendo, the pioneering Nintendo Switch, allows gamers to start playing on their TV screens and continue on the console's tablet-sized screen. Our common reliance on numerous screens makes people of all ages, not just teenagers, skilled users of screens or *screenagers*, as entire societies go mobile and the mobile phone screen connects all others, big all small, to provide a relatively seamless, integrated multimedia experience. But it is useful to remember that the roots of modern screens take us back much farther in history than our modern times, namely, to the cultural conventions of the Renaissance, the period that saw the appearance of mobility in painting, as framed pictures, unlike immovable mosaics, frescoes and wall paintings became portable precursors to electronic screens that separated the physical space occupied by the viewer from the virtual space of visual representation. However, before the current level of interactivity characterizing both windowed PC interfaces and mostly single-window mobile ones could be reached, the image had to undergo a transformation, from static in painting to cinematic moving pictures and real-time signal broadcasts of television and surveillance systems, with computer interactivity following as the most advanced stage (cf. Manovich, 2001), only to be bettered by touchscreen where the frame and the glass screen themselves become areas of interaction with the multimedia material. Since the current and future synergy of screens would be almost impossible without the continuous access to data stored in the cloud via wireless networks, the metaphors related to these two crucial elements of the contemporary mobile and desktop computing are the next to come into focus.

5.6 Magic in the air and the cloud's digital lining. When the iPhone first appeared ten years ago, it was touted as a magical, revolutionary device by Apple and then hailed as such by many others. In retrospect, the inclusion of Wi-Fi and a number of sensors, such as an accelerometer, a proximity sensor and an ambient light sensor and GPS, enabling location services in a mobile phone surely qualified as revolutionary steps and essential features, although Wi-Fi was initially of little consequence to people not living in the US or a handful of other first-world countries where the device was officially available. A decade later, wireless Internet connectivity is a feature of all smartphones, basic and flagships alike and newer dumbphones too.

Wi-Fi, cloud storage and sensors are important ingredients of the powerful magic that the contemporary mobile devices weave, from high-speed Internet access and availability of features across devices and operating systems to augmented and virtual reality experiences. The functioning of these advanced technologies has been made understandable to the average users with the help of a range of nature-related metaphors, for example:

- **Apple AirDrop** - a native feature in iOS and OS X that lets users share data from one device to another on the same Wi-Fi network. AirDrop allows users to share photos, videos, websites and locations between devices that are up to about 30 feet apart. The feature can be activated through the Control Center on iPhone 5 or later, iPad 4 or later, iPad mini or iPod Touch fifth generation or later with the Wi-Fi and Bluetooth on. WhatIs TT

- **AirPods** - Apple's wireless headphones introduced with the iPhone 7 in 2016. Somewhat similar to the shape of the corded EarPods that have been included starting with the iPhone 5, the Bluetooth-based AirPods are more sophisticated. When placed in the ear, the AirPod's W1 processor provides the intelligence to connect automatically to the iPhone or Apple Watch, and double tapping the AirPods activates Siri. PCME

- **MacBook Air** - a thin, lightweight laptop from Apple. Because it is a full-sized notebook but only weighs three pounds, the laptop falls into a category that vendors are currently calling 'ultraportable.' The MacBook Air has an anodized aluminum casing that is 0.16 inches at its thinnest point and 0.76 inches at its thickest. Often described as the same size as a pad of paper, the laptop has just one USB port, an audio headphone jack and built-in speakers and microphone. MacBook Air comes with built-in Bluetooth wireless technology for connecting and synching the laptop to a PDA, cell phone or wireless headset. It has an embedded iSight camera capable of taking still photos as well as recording video. The MacBook Air does not come with a DVD/CD drive. To install software from a disc, the consumer has two options: he can use the Remote Disk feature to wirelessly connect to another computer's DVD/CD drive or purchase an external MacBook Air SuperDrive, which is sold separately. WhatIs TT

- **Air browse**. Move a hand to the right or the left across the sensor, and you can browse through things like photos, web pages, and songs. GS4MM

- **OTA (Over-The-Air)** - Over-the-air is any method of making data transfers or transactions wirelessly using the cellular network instead of a cable or other local connection. Most commonly, this term refers to downloading or uploading content or software (such as downloading ringtones, uploading images, etc.). If the term is used for updating a phone's firmware this is also known as FOTA (Firmware Over-The-Air). GSMA

- **Cord cutter** - A person who switches from a pay TV subscription (cable, satellite or telephone company) to an Internet-based streaming service such as Netflix. The purpose of cord cutting is to save a considerable amount of money each month. A "cord never" or "never-connected" is someone who never had such a subscription, while "cord shavers" are subscribers who have reduced their pay TV fees by eliminating certain channels. A "cord stacker" is someone who subscribes to both pay TV and one or more streaming services. PCME

- **Cloudbook -** A cloudbook is a thin client notebook computer with a browser operating system (OS) and interface. The devices rely upon cloud storage and cloud services: Files and applications are located remotely and accessed over the Internet. Cloudbooks offer a number of benefits over conventional notebooks. Keeping local resources to a minimum makes it possible to keep the price low while also increasing battery life. Another benefit is the portability of user data -- files and applications are connected to the user's account, so they can be accessed on any device, from anywhere with an Internet connection. Furthermore, because

data and settings are stored on remote servers, the user doesn't have to worry about backups, updates and synchronization. WhatIs TT

- **Human cloud** n. - The independent workers that a company, using online sites or apps, can hire temporarily to perform tasks as needed. Etymology cf. cloud computing: Example: *Employers are starting to see the human cloud as a new way to get work done. White-collar jobs are chopped into hundreds of discrete projects or tasks, then scattered into a virtual "cloud" of willing workers who could be anywhere in the world, so long as they have an internet connection.* —Sarah O'Connor, "The human cloud: A new world of work," Financial Times, October 8, 2015. WS

- **Fog computing** - Fog computing, also known as **fog networking** or **fogging**, is a decentralized computing infrastructure in which data, compute, storage and applications are distributed in the most logical, efficient place between the data source and the cloud. Fog computing essentially extends cloud computing and services to the edge of the network, bringing the advantages and power of the cloud closer to where data is created and acted upon. The goal of fogging is to improve efficiency and reduce the amount of data transported to the cloud for processing, analysis and storage. This is often done to improve efficiency, though it may also be used for security and compliance reasons. Popular fog computing applications include smart grid, smart city, smart buildings, vehicle networks and software-defined networks. The metaphor fog comes from the meteorological term for a cloud close to the ground, just as fog concentrates on the edge of the network. The term is often associated with Cisco; the company's product line manager, Ginny Nichols, is believed to have coined term. "Cisco Fog Computing" is a registered name; fog computing is open to the community at large. (…) Because cloud computing is not viable for many internet-of-things applications, fog computing is often used. Its distributed approach addresses the needs of IoT and industrial IoT, as well as the immense amount of data smart sensors and IoT devices generate, which would be costly and time-consuming to send to the cloud for processing and analysis. Fog computing reduces the bandwidth needed and reduces the back-and-forth communication between sensors and the cloud, which can negatively affect IoT performance. WhatIs TT

Air is a frequently used word in the Apple vernacular. It is part of the compounds referring to both software and hardware, core products and accessories. As a modifier, it describes the medium of information transfer, while the transfer itself is conceptualized via the CONDUIT metaphor. Since the transfer is wireless, there is no physical contact between the device receiving data and the modem. Instead, another device, the router (see 4.1.4 above), which is part of a larger TRANSPORTATION metaphor inherent to the Internet and the web (cf. Wilken, 2009), sends information through the air. Thus, in *AirDrop* and *AirPods*, air becomes the conduit. Lacking the qualities of visibility, palpability or even weight, it is the element of the equation that metaphorically brings the technical concept of the lack of a visible, palpable, wired connection closer to home by referring to a familiar natural phenomenon. Hence, the general metaphor THE ABSENCE OF PHYSICAL CONTACT IS AIR (see 4.5 above) applies both to *AirDrop* and *AirPods*. The former, as a method of wireless data sharing additionally implies that UNITS OF DATA ARE SUBSTANCES since they have WEIGHT. Something that has no weight does not drop and/or cannot be dropped, it floats in the air. The latter simply implies that the headphones feature no wires i.e. there is no

physical contact between the mobile device and the accessory. The initialism *OTA/FOTA*, while resulting from the influence of the Reduction ICM, in other words, metonymic shortening, in its full form *Over-The-Air* and *Firmware- Over-The-Air*, relies on the same conceptualization of wireless transfer as other coinages mentioned here. *Cord cutters,* the term referring to people who opt for (wireless) streaming, often on a mobile device, instead of cable TV services and all other compounds belonging to this small but interesting semantic field, namely, *cord never*, *cord shaver* and *cord stacker*, describing the varying degrees of separation from the cable TV model, metonymically highlight the other side of going wireless, not the aspect of enjoying the absence of wires, but the need to get rid of them by cutting them. The other interpretation would be that *cord cutters* have metaphorically decided to cut the cable, the umbilical cord binding them to their TV sets. In the case of the *Air browse* touchless gesture, the same metaphor is active, but here the modifier is additionally motivated by the metonym AIR FOR GESTURE that will be shown to apply to a number of emoji representing gestures. Apple's convention naming a model of computers *MacBook Air* and iPads *iPad Air* takes advantage of a different property of air. Both devices are the lightest (and smallest) in their class. Again, *air* is linked to the (near-)absence of a characteristic, this time weight. Accordingly, our general metaphor can be modified in the following way: THE ABSENCE OF WEIGHT IS AIR. Another atmospheric phenomenon, *cloud* has become a popular technology term. It is used in the context of cloud storage, which has already become a pillar of modern computing in general and mobile computing in particular. The blend *cloudbook*, fusing the words *cloud* and *notebook* describes a new kind of laptop computers that use the very light Chrome OS that runs a single piece of software locally – Google's Chrome web browser and requires much less resources than full featured operating systems in terms of processing power, disk storage or memory. For such a system to be light, the cloud has to be heavy with data, that is able to bear the brunt of storing all applications and documents online, reachable from any device. Reachability is the key to understanding the analogy-based CLOUD metaphor. Data follows the user. It is always present just like the sky above our heads and the clouds in it. With numerous free and paid cloud services available, Apple's iCloud, Microsoft OneDrive, Google Drive, Dropbox, Box, etc. everyone can have one or more private clouds. The names of these services reveal further metaphors linking the well-known computing term and concrete object, *(hard) drive*, the piece of hardware dedicated to data storage with the ethereal, invisible and

abstract data cloud. The CONTAINER metaphor is incorporated into the very notion of storage of any kind, hardly anywhere more clearly than in *Box* and *Dropbox*, which, in turn, rely on the universally known everyday object and prototype container, *box*. As in *Airdrop* above, dropping implies attributing weight to data as part of the metaphoric view of UNITS O OF DATA as SUBSTANCES. The analogy-driven CLOUD metaphor can branch in new directions, one of which yields a compound directly referring to humans and thus modifying the metaphor PEOPLE ARE MACHINES into PEOPLE ARE DATA (STORED ONLINE), as in *human cloud*, independent temporary workers completing tasks using websites and apps in the cloud and, people who can be hired from anywhere as needed, like the files stored in the cloud can be accessed from any location, whenever it suits the owner of the account registered with a cloud storage service. With a metaphor such as this one, potentially comes the effect of objectifying humans, treating them as expendable machines, in a nutshell like technology (cf. Waytz, Heafner & Epley, 2014). The other direction shows the great adaptability of metaphor. Namely, the more complex the context of use of a metaphor, the more complex it becomes. *Fog computing*, also seen as *fog networking* or *fogging* for short shows the CLOUD conveniently transforming into a related weather condition, FOG to reflect a different kind of decentralized computing infrastructure, brought about by the recent popularity of the novel phenomenon of the Internet of Things. Given hosts of connected objects, whose number is set to grow in the years to come, the pressure on the cloud is bound to increase, as far as storing data produced by them is concerned. Therefore, a more practical solution had to be devised, bringing the cloud closer to object themselves, closer to the ground, making the system more efficient and economical. What better metaphor than FOG, taking over the weight of data from the more centralized CLOUD and distributing it in a better way, bringing the power of the cloud closer to the edge of the network and the many objects in it? This method has the potential to make many of the latest Internet of Things and Industrial Internet of Things (IioT) solutions, leading to a more environmentally friendly living including smart buildings, smart grids and smart cities a reality. This is becoming possible largely thanks to taking advantage of huge amounts of data generated daily. The ways in which this abundance of information gets conceptualized will be examined below.

5.7 Time travel today − destination data. Time travel is still the stuff of science fiction, but new types of data generated daily by smart devices and stored in the cloud, make

the dream of moving back and forth through time a tad closer, at least figuratively speaking. In fact, this seems to be one of Apple's favourite metaphors, which is now highlighted, along with a selection of data types, for instance:

- **Time Capsule** - A device sold by Apple that combines a wireless router with a hard drive. Enables users to wirelessly backup Mac computers. AUD

- **Time Machine** - Backup software made by Apple - be sure to back up your documents and files so you're not caught out when tech disaster strikes. AUD

- **Time travel** - lets you see the past and future right on your wrist. You can check what the weather will be a few hours from now for your drive home, see if you've got any appointments later in the day, or just figure out what time the sun set yesterday to prove you were home before it got dark. COM

- **Big data** n. - Massive amounts of data that require special techniques to store, search, and analyze. Other Forms: big-data adj. WS

- **Long data** n. - A massive data set that extends back in time hundreds or thousands of years. Etymology: cf. big data. Example: *By "long" data, I mean datasets that have massive historical sweep — taking you from the dawn of civilization to the present day. The kinds of datasets you see in Michael Kremer's "Population growth and technological change: one million BC to 1990," which provides an economic model tied to the world's population data for a million years; or in Tertius Chandler's Four Thousand Years of Urban Growth, which contains an exhaustive dataset of city populations over millennia.* —Samuel Arbesman, "Stop Hyping Big Data and Start Paying Attention to 'Long Data'," Wired, January 29, 2013. WS

- **Thick data** n. - Data related to qualitative aspects of human experience and behavior, particularly when used as context for the analysis of a large data set. Etymology: cf. big data. Example: *The notion behind thick data is that you can't always depend on numerics and algorithms to summarize the 360-degree experience of a customer, or of any other human activity or relationship where unforeseeable factors can enter in.* —Mary Shacklett, "Thick data closes the gaps in big data analytics," TechRepublic, January 6, 2015. Notes: This term is a mashup of big data and thick description, an anthropological research methodology that documents not only human behavior, but also the context of that behavior. WS

- **Data fast** n. - The act of turning off your computer and other electronic equipment for an extended period of time. Also Seen As: information fast. WS

- **Data fracking** pp. - Using enhanced or hidden measures to extract or obtain data. Also Seen As: data-fracking. Example: Data is often referred to the new oil, but a lot of that data is in hard to get at. What did we do one all the easy coal deposits had been mined, and all the "easy oil" had been pumped? We went for the hard stuff. The oil in shale. We fracked it. We are moving from the age of data mining to the age of data fracking. —Justin Langseth, "Data Fracking," Data Metaphors, May 22, 2014. WS

- **Data mining** - Data mining requires a class of database applications that look for hidden patterns in a group of data that can be used to predict future behavior. For example, data mining software can help retail companies find customers with common interests. The phrase data mining is commonly misused to describe software that presents data in new ways. True data mining software doesn't just change the presentation, but actually discovers previously unknown relationships among the data. Data mining is popular in the science and mathematical fields but also is utilized increasingly by marketers trying to distill useful consumer data from Web sites. WP

- **Data shadow** - a slang term that refers to the sum of all small traces of information that an individual leaves behind through everyday activities. It is a minute piece of data created when

an individual sends an email, updates a social media profile, swipes a credit card, uses an ATM and so on. The data shadow concept has become a serious concern, as it is difficult to control who actually looks at an individual's data shadow, what conclusions they are drawing and what actions are taken based on those conclusions. (…) TP

- **Digital footprint** - a unique data trace of a user's activities, actions, communications or transactions in digital media. This data trace can be left on the internet, computers, mobile devices or other mediums. A digital footprint can be used to track the user's activities and devices. A user can leave digital footprint either actively or passively, but once shared, a digital footprint is almost permanent in nature. (…) TP

- **Digital tattoo** n. The difficult-to-remove digital imprint that a person creates by posting information online and by accessing online resources. WS

Data backups are a necessary precaution, a useful measure against the unwelcome event of data loss because there is, in fact, no travelling back in time. That is precisely why the people at Apple, marketing masterminds that they are, chose to invoke the this, as yet superhuman, fictional ability when naming both backupping hardware and software. In *Time Capsule,* a loose analogy motivates the metaphor relating a wireless backup device to a container with objects typical of the present period buried in the hope that they will be discovered by the posterity. The hopes of the user of the Time Capsule hardware are much more modest. They don't go beyond saving the current version of files for future use. The same applies to the *Time Machine* software, namely, we can journey back only as far as our backed up data allows. In other words, these are the partial correspondences with time travel that the pair of CONTAINER metaphors, BACKING UP FILES IS PUTTING THEM IN A TIME CAPSULE and a DATA BACKUPPING DEVICE IS A TIME CAPSULE or DATA BACKUPPING SOFTWARE IS A TIME MACHINE highlight. Sometimes, the development of technology literally makes metaphorical sci-fi activities easier. Backupping hardware is no longer strictly necessary and we have the CLOUD to thank for that. Also, our routine use of backup software like Dropbox to store data online and access files from all kinds of computing devices, including mobile ones would have looked decidedly sci-fi just a few years ago. Another thing that the data cloud makes possible is the use of the now sadly retired feature Time Travel feature on Apple Watch, allowing its owners to jump between past and future events and activities on their wrists. The data regarding our tasks, appointments and reminders or weather is stored online, reachable across our devices and accessible on the watch via the Bluetooth connection to the iPhone. All it takes to start travelling in digital time is to turn the watch's digital crown clockwise or counter-clockwise. This too may look like science fiction, but the most out-of-this-world fact of our digital life is the fascinating detail that

according to IBM "every day, we create 2.5 quintillion bytes of data — so much that 90% of the data in the world today has been created in the last two years alone" (cf. Bhambhri, 2012). This mind-boggling number which must have increased over the last five years includes data generated by our collective *digital footprint*, also known as *data shadow* or *digital tattoo*, hard or impossible to remove traces of our online activities, from social media posts to banking transactions, digital photos, videos, weather sensors, GPS signals emitted by mobile phones, etc. We consume and produce more data than ever before in human history. That is why to keep a healthy mind and body an occasional *data fast* is highly recommended. People around the world have embraced technology and use it daily, often with little awareness of the digital traces they leave behind, because these bits of information are not visible to lay users, and thus remain abstract or easily dismissed as unimportant, regardless of the threat to privacy and security that they may pose. Conceptualizations like DATA TRACES ARE A FOOTPRINT / SHADOW / TATTOO or TURNING OFF DATA GENERATING DEVICES IS FASTING serve to vividly bring the world of data closer to our everyday embodied experiences. Likewise, in other to fathom the sheer volume of big data, our mind falls back on the proven technique of sensorimotor structuring of experience, namely, our life-long knowledge of three-dimensional spaces and objects that have height, length and width. In view of the exceptional vastness of the amount of information, be it *big data, long data* or *thick data*, the role of the primary metaphor, MORE IS UP is essential, the difference being the particular aspect of data we concentrate on in a classification: size, time span or several criteria at once like human behaviour and its context respectively. Big data of all kinds is important because analytical methods like *data mining* and its successor *data fracking* are able to spot hidden patterns and predict people's future behaviour, the ability appreciated by numerous organizations like marketing, law enforcement or intelligence agencies to name a few. For them, data is valuable resource like gold, coal or oil, because it fuels their activities that rely on two data extraction approaches whose names reflect the metaphor DATA ANALYSIS IS ORE MINING and its analogical extension DATA ANALYSIS IS OIL FRACKING. By looking at the nature of data, we looked at the outcome of the use of technology globally, but this is just the tip of the iceberg. The causes of the massive production of data lay in its impact on the society, our next topic.

5.8 The MoJo of MoSoSo – the society and mobility. Widespread adoption of mobile devices has had a profound impact not only on the way we communicate, by taking computer-mediated communication to a whole new mobile level. It has also transformed our lifestyle as a whole, changed our workplaces and leisure pursuits, as these examples illustrate:

- **MoJo** n. - Journalism that is heavily dependent on mobile technologies to report, produce, and file stories; a person who practices such journalism. Also Seen As: MOJO · mojo. Etymology: *mobile + journalism* or *journalist.* WS

- **MoSoSo** n. - Programs that enable you to use your mobile phone to find and interact with people near you. Pronunciation: moh.SOH.soh. Etymology: mobile + social + software. WS

- **BYOD** - In the consumerization of IT, BYOD, or **Bring Your Own Device**, is a phrase that has become widely adopted to refer to employees who bring their own computing devices – such as smartphones, laptops and tablets – to the workplace for use and connectivity on the secure corporate network. WP

- **BYOA$_1$** - Short for **Bring Your Own Applications** as well as **Build Your Own Apps**, BYOA is an evolution of the term BYOD (Bring Your Own Device) in the consumerization of IT that refers to the growing use of personal apps by employees for increased productivity in their work environments. Examples of Bring Your Own Apps span the gamut of third-party cloud storage and sync applications such as Dropbox, collaboration apps like Skype and GoToMeeting, work productivity apps like Google Docs and Evernote and social networking apps like LinkedIn. WP

- **BYOC$_1$** - (1) (Bring Your Own Computer) An employee-owned computer used to access company data. See BYOD. (2) (Bring Your Own Computer) An announcement for a multiplayer game party (see LAN party). From "bring your own bottle" (BYOB), the notice in restaurants without a liquor license that allows customers to bring their own alcoholic beverages. PCME

- **BYOC$_2$** - A term similar to BYOD (Bring Your Own Device) in which corporate employees utilize their own personal clouds or a combination of public or private cloud services from third-party cloud providers instead of the company's own cloud services. (…) WP

- **Silent traveler** n. - A traveler who has almost no direct interaction with a destination's tourism industry, preferring instead to navigate, make arrangements, and find information using a mobile device. Also Seen As: silent traveller. WS

- **Social swarming** n. The rapid gathering of friends, family, or colleagues using technologies such as cell phones, pagers, and instant messaging. Other Forms: social swarm n. Notes: Social swarming is a special case of the larger idea of swarming, "the leaderless gathering and moving of like-minded people" (a so-called smart mob) using technologies such as cell phones. Swarming is also the hallmark of the Critical Mass smart mobs on bicycles that clog Washington streets the first Friday of most months, protesting the effects of the automobile. *"The people up front and the people in back are in constant communication, by cell phone and walkie-talkies and hand signals," says Eidinger. "Everything is played by ear. On the fly, we can change the direction of the swarm — 230 people, a giant bike mass. That's why the police have very little control. They have no idea where the group is going."* —Joel Garreau, "Cell Biology," The Washington Post, July 31, 2002. WS

- **SoLoMo** - short for social-local-mobile, refers to a more mobile-centric version of the addition of local entries to search engine results. SoLoMo emerged as a result of the growing popularity of smartphones, and provides greater local precision to search engine results than what's available via a PC. To understand SoLoMo, it is really necessary to understand several

developments that brought it about. The first is that SoLoMo arose as a result of the popularity of smartphones and tablets that integrate geo-location technology. The GPS technology integrated into these devices provides more accurate geo results than the "IP mapping" approach necessary for home or office PCs. Also, big search engines are recognizing that there is a large - and virtually untapped - market in local search. That's because there are a lot more "mom and pop" operations out there than firms with a national or international scope. When search engines started incorporating more and more local results in search engine results, they proved the size of the local market on the Internet. Finally, in order for search results to have accurate local results, they need accurate information about local businesses. Good local search results just aren't possible unless what "local" actually means is made clear. This has proved to be problematic for browser-based search requests. But as an increasing number of searches are being driven by apps, this problem has disappeared simply because most apps have a larger arsenal of tools that allow them to determine exactly where the user is. TP

- **Digital nomad** n. - A person who uses technology, particularly wireless networking, to work without requiring an office or other fixed address. Other Forms: digital nomadism n. WS

The formations such as MoJo combining two (*mobile + journalism* or *journalist*) or more words like *MoSoSo, mobile social software* or *SoLoMo*, *social local mobile* are the only ones of their kind in our sample. From the point of view of word-formation they would be classified as compound final clippings, with an orthographic twist, since capitals mark the surviving front element of each word and the repetition of the vocal makes them sound like they rely on assonance to facilitate pronunciation. As has been mentioned many times by now, in Kövecses & Radden (1998) and Radden & Kövecses's (1999) classification of metonymy producing ICMs, the Reduction ICM is regarded as responsible for all manner of word shortenings that represent THE PART FOR THE WHOLE relation. *MoSoSo*, the first social applications launched in the early 2000s enabling, among other things making informal contact between people near the user's location, such as *Lovegety* in Japan, *Dodgeball* in the US or *Playtxt* in the UK (cf. Goggin, 2011), certainly paved the way for modern social networks that have some powerful mojo, pun intended, since so many people use mobile social websites and apps like Instagram, Snapchat, Twitter or Facebook to publish sometimes multiple posts and comments per day. *SoLoMo* is an important contribution to the range and accuracy of search result thanks to GPS equipped mobile devices that are now served more precise results, based on their location, especially when search queries are made through a variety of local search apps. The modern workplace has been marked by the trend for bringing personal devices to work, instead of using company-owned equipment. The phrase shortened to *BYOD* refers to mobile devices: smartphones, tablets, laptops. It is an analogical formation modelled on *BYOC* (*Bring Your Own Computer*), which is the initial member of a cluster of words based on an analogy with

"bring your own bottle" (BYOB), the notice in restaurants where customers are welcome to bring their own alcoholic drinks, because the establishment does not have a liquor licence. Other, more recent, often homonymous initialisms belonging to this cluster that cropped up following the appearance of new technologies are *BYOA* (*Bring Your Own Apps* or *Build Your Own Apps*), the practice of allowing employees to use private apps like the online Microsoft Office replacement Google Docs, social networks like LinkedIn or cloud storage services like Dropbox in an effort to increase productivity. *BYOC* can also mean *Bring Your Own Cloud*, another indication of the consumerization of the work environment, since workers can combine personal with public and private clouds. Closely related to that is the use of private or non-corporate networks at work or when working remotely, for which the term *Bring Your Own Network*, or *Build Your Own Network* (BYON) is used. This is the MO (modus operandi) of *digital nomads*, people who choose to work from anywhere, taking advantage of wireless networks, instead of going to the office. Apart from the work-related changes, mobile technologies have also influenced the way people gather in public spaces and even topple regimes. *Social swarming* is an example of meaning extension of the term *swarm*, primarily referring to insects to apply to large numbers of people who quickly gather in public spaces without prior notice, but with a common goal, be it to ride bicycles as part of the Critical Mass Bike Rides, a political and social movements of cyclists aiming to reclaim the streets or protesters organizing rallies aiming to overthrow the government like the Arab Spring revolutionary wave of protests. The common trait of all social swarming or *smart mobs* is spreading the word about the event via mobile phones, text messages, social networking sites and apps, managing to remain undetected by the authorities who have no idea where the group is going or what it is going to do next. Similar avoidance of official communication channels characterizes *silent travellers*, people who travel for pleasure but rely on their mobile devices to find information about the place, rather than on visiting the local tourist information centre. Since these people are not silent in all situations, they simply do not communicate with tourism office workers, the modifier of this compound is marked by the PART-WHOLE metonymy.

Chat shorthand first became established as the preferred mode of synchronous computer-mediated communication happening in online chatrooms, where it fulfilled the need for speeding up the exchanges happening in real time. With the spread of

asynchronous messaging such as e-mail and especially mobile phone text messaging, chat abbreviations migrated there too, as a useful means of overcoming the lack of space imposed by the 160-character limit of an SMS message. Social media are another more recent communication channel, which grew even more popular after the appearance of social media apps for Facebook and Twitter and mobile-first social networks like Instagram or Snapchat where the shorthand is also used. Since Twitter is the microblogging platform that originally imposed a character limit even stricter than SMS messaging (140 characters), our sample features a selection of abbreviations and other words used as part of these two forms of asynchronous communication. Because the mania of taking selfies has exploded since social media have gone mobile, the following list of examples also includes assorted varieties of these photographs.

- **@** - at TGD

- **1daful** – wonderful TGD

- **2** - to, too, two TGD

- **a3** - anytime, anywhere, anyplace TGD

- **aam, aamof** - as a matter of fact TGD

- **fone** – phone TGD

- **h2cus** - hope to see you soon TGD

- **H9** - Really hate (H8+1) IS

- **mob** – mobile TGD

- **mbrsd** – embarrassed TGD

- **r** – are TGD

- **Sexting** pp. - Sending a salacious text message. Other Forms: sext v. · sext n. · sexter n. Etymology: *sex + texting.* WS

- **Neglexting** - Short for "neglecting to text" it is a text messaging slang term used to describe a person who fails to respond to a text message. WP

- **Beetweet** - Slang term used to describe a "hot tweet." Usually this is a popular, trending topic on Twitter and many users will retweet a beetweet. WP TDG / A buzzing tweet; a "hot" tweet. TWNRY

- **Bird-of-Mouth** (noun) - The spreading of news or information via Twitter. TWNRY

- **Egotwistical** - Slang term used to describe a user who talks about himself on Twitter. It is a combination of the words "egotistical and Twitter." WP TDG

- **Cutweet (CT)** - A retweeted tweet that had to be shortened in order to include all of the information from the original. Usually created by removing some of the RT users (the "@names") from it. TWNRY

- **Twalking** - Slang term used to describe someone who is walking while they tweet, using a mobile device. WP TDG

- **Tweeple** - Meaning Twitter people. It is used to refer to or describe Twitter users. WP TDG

- **Tweet hog** - Someone who excessively tweets, usually non-value add information, to ensure that they are always present on your Twitter feed. Example: If you have a generous amount of people you are following who tweet on a consistent basis, yet 15 of the 20 tweets are from a single person, he/she is a tweet hog. TWNRY

- **Tweet seats** n. - A section in a theater set aside for people who want to tweet during a performance. Also Seen As tweet seat · tweeting seating. Example: *More and more arts troupes across the nation are setting aside "tweet seats" where patrons are invited to dish out their 140-character missives during the performance. From the Cincinnati Symphony Orchestra to New York's Public Theater, Twitter is stealing the spotlight.* —Karen D'Souza, "The arts meet tweets," The San Jose Mercury News, January 31, 2012. WS

- **Tweet whore** - a male/female who tweets many times and may or may not get the wale fail. Example: Miley Cyrus is a Tweet Whore. TWNRY

- **Belfie** - a 'bottom selfie' - a photographic self-portrait featuring the buttocks, usually posted by female celebrities on social media networks. UD / A butt selfie. Historical perspective: According to The Daily Dot, the first ever belfie was taken on July 18, 2012. Jen Selter, a "fitness guru" is apparently the Queen of the Belfie, giving another celebrity belfie-enthusiast a run for her money. NL

- **Dronie** n. - A video self-portrait taken by a self-controlled drone. Etymology: *drone* + *selfie*. Example: *A dronie is a video selfie taken with a drone. I featured Amit Gupta's beautiful dronie yesterday…Other people have since taken dronies of their own and the idea seems like it's on the cusp of becoming a thing.* —Jason Kottke, "Dronies!", *Kottke.org*, April 16, 2014. WS

- **Selfeet** n. - A photo of one's shoes or one's bare feet. Etymology: selfie + feet. Example: Shoefies (sometimes also referred to as "selfeet") have become a growing form of downward selfie for the Instagram set among the shoe-gazing and footwear-obsessed — and perhaps those too shy for a full-on self-portrait. —Laura Neilson, "Shoefie Mania During New York Fashion Week," The New York Times, September 12, 2014. WS

- **Selfie** - a photograph that one has taken of oneself, typically one taken with a smartphone or webcam and uploaded to a social media website. *'occasional selfies are acceptable, but posting a new picture of yourself every day isn't necessary'* Origin Early 21st century: from self + -ie. OD

- **Usie** n. A group photograph taken by one of the members of the group. Also Seen As: ussie. Pronunciation: USS.ee. Etymology: us + selfie. Examples: What do you call a group selfie? An usie, of course! As in "us." Pronounced uss-ee, rhymes with fussy. "Usies are a growing trend that I think have far more social value than selfies," said Michal Ann Strahilevitz, a professor of marketing at Golden Gate University in San Francisco who studies consumer behavior. "It's magical capturing moments we share with other people." —"Remember that Ellen DeGeneres group 'selfie' at Oscars? That was really an 'usie'," The Times-Picayune, July 30, 2014 WS

This is a very small selection of instances of *textspeak* – the abbreviated language of text messaging and its distinctive spellings, which speed up things typing-wise, because the mobile phone keypad was designed with dialling numbers rather than language in mind (cf. Crystal, 2008). One of the novel strategies found in textisms is the use of logograms, namely orthographic symbols, numbers or single letters to represent whole words as in @ (*at*) or *r* (*are*), parts of words as in *1daful* (*wonderful*), creating juxtapositions previously seen in puzzles only (ibid. 53), or indeed sounds, such as *zzz*, mentioned in 8.5 below. It is always the pronunciation and not the form of logograms that must be taken into account when deciphering such creative combinations. The front clipping, *fone* (*telephone*) features an orthographic anomaly, phonological respelling, as does the previous example, *1daful*. Numbers functioning as logograms can replace homonymous words. Such is the case of *2* that can mean either *too* or *to*, (as in the combination with initials *h2cus*, *hope to see you soon*) in addition to its main meaning. *A3* is a rare case where a number is simply a number, indicating that the shortening is in fact a three-letter initialism featuring three As (*anytime, anywhere, anyplace*). An even more curious formation with numbers is *H9*, where the number is not what it seems to be. Namely, its meaning "really hate" has been arrived at via the basic mathematical operation of addition, *H8* (hate), where the number − logogram is not enough, for *really hate* is more than just *hate*, it is *H8+1*, which equals *H9*. Compared to this ingenious solution, all other instances of textspeak featured here are quite simple; *aam* is a shortened version of the initialism *aamof*, where each letter is the initial of the corresponding word in the phrase as *a matter of fact*. The remaining two examples, *mob* (*mobile*) and *mbrsd* (*embarrassed*) feature a back clipping and letter (vowel) omission, respectively. As it happens, all these unconventional characteristics are far from new, being part of the centuries old tradition of language play, puzzles and rebuses (cf. Crystal, 2008, 2004) Baron (2008a) rightfully emphasizes the fact that very few textisms are regularly used. Today, some of the most widely used ones, like the initialism, turned acronym *LOL* (*Laughing out Loud*) or another initialism *ROTFL* (*Rolling on the Floor Laughing*) enjoy added popularity, having been transformed into emoji and emoticons (see 8.4. below). They are used in both forms, as letter combinations and pictograms, on social media sites, even though modern touchscreen-equipped smartphones have software QUERTY keyboards fully adapted for text entry that often include quite advanced cloud based next word prediction capabilities, much better than the pre-smartphone T9 predictive

text solutions, as they actually save thousands of keystrokes and track individual users' typing habits in order to make more accurate word predictions.

The combination of the iPhone as the first successful computer that fits the hand and Twitter, a real-time short messaging service has been described as a peek into the future, when the goal of singularity will be attained. A piece of hardware equipped with a piece of software managed to outperform traditional media and institutions in providing timely information about an earthquake (cf. Balsamo, 2012). The only medium to cover the event as it unfolded was Twitter via short messages posted by *Tweeple*, the people who tweet, Twitter users. This is a small but significant sign that technology may develop faster than our human ability to apprehend it and that humans and machines will effectively merge for better or worse. Connected people toting smartphones did something seemingly simple, but with potentially huge consequences, if futurists are right. As an inherently dynamic medium, with deep links to mobility, Twitter has produced a jargon that is almost on a par with textspeak, as far as the number of examples in our sample is concerned. Twitterspeak is rich in blends, where *Twitter* or *tweet* are the first, middle or second constituents, with different degrees of overlap e.g. *twalking* (*tweeting while walking*), *egotwistical* (*egotistical Twitter user*) *cutweet* (*a retweet that had to be cut short*). Since they involve shortening by default, blends are instances of the PART − WHOLE metonymic relation. Most have a slangy, humorous feel to them, while some, like *cutweet* that is further reduced to the initialism *CT* seem to have been created for purely practical reasons. Textspeak has its own blends like *sexting* (*sex + texting*), "sending a lascivous text message", *neglexting* (*neglect + texting*) "neglecting to text", or *smexting* (*smoking + texting*) "texting while on a smoke break". The compound *beetweet*, in which the PRODUCER FOR PRODUCT metonymy is contained in the modifier: the insect *bee* stands for *buzz*, the sound it makes. It is analogically modelled on buzzword, a compound with variously identified semantic roots. According to the *Online Etymology Dictionary*, it was recorded in 1946 as "Harvard student slang for the key words in a lecture or reading. Perhaps from the use of buzz in the popular counting game" [48], while the *Dictionary of American Slang* traces its etymology to the same time and place, stating that it was "coined in the mid-1940s by students at the Harvard Business School and

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[48] buzzword. (n.d.). Online Etymology Dictionary. Retrieved May, 16, 2015 from Dictionary.com website http://www.dictionary.com/browse/buzzword.

meaning "a word used to describe the key to any course or situation" in their specialized and amusingly stilted vocabulary; hence buzz may be a shortening and repronouncing of business"[49]. *Beetweet* is a fully novel compound, while *tweet hog* and *tweet whore* feature head elements whose extended meaning is well-established. Based on the metaphor PEOPLE ARE ANIMALS, *hog* refers to "A person who behaves in a rude mannerless fashion without respect for the safety or convenience of others; esp. in *road hog* n." (cf. OED, 2009)[50]. Analysing the meaning of *bandwidth hog*, Crystal (2004) notes the analogy with *road hog* and offers a definition of the new use: "A person who keeps sending too much unwanted information, especially electronically" and that is exactly what *tweet hog* is doing by tweeting excessively. The category *whore* has been extended to include the reference to "A person who is regarded as willing to do anything to get a particular thing"[51]. Therefore, *tweet whore* joins the likes of *publicity whore* and *attention whore*, which seem to have provided the pattern for the analogy. Another social phenomenon which would not exist were it not for Twitter are *tweet seats* or *tweeting seating*, a number of seats in the theatre reserved for people who tweet during the performance. Here the Event ICM foregrounds the action of tweeting, while the whole event includes being at the theatre, watching the performance, etc. hence the metonymy. An added element of rhyme makes this compound especially effective. The phrase *bird-of-the mouth* analogically modelled on *word-of-the-mouth* is memorable for the same reason where the metonymy THE FACE FOR THE PERSON is mirrored by an analogous one related to organizations that could be formulated as THE LOGO FOR THE ORGANIZATION. The spreading of information via Twitter becomes *bird-of-the mouth* because the logo of Twitter is a blue bird.

One of the most conspicuous cultural mutations caused by the use of smartphones is the craze for snapping *selfies*, photographs of oneself. The trend has grown so much that it has generated numerous analogical formations based on *selfie*, from *belfie* (*bottom selfie*) pioneered and promoted by Kim Kardashian to *dronie*, a video selfie taken by a drone that follows and recognizes its owner. What's more, the category and potential of selfies has expanded to include a group of people, giving rise to *usie*.

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[49] buzzword. (n.d.). The Dictionary of American Slang. Retrieved May, 16, 2015 from Dictionary.com website http://www.dictionary.com/browse/buzzword.
[50] Oxford English Dictionary (2009).OED - 2nd Ed v4.0.
[51] Oxford Dictionaries entry for *Whore* retrieved June 24, 2015 from https://en.oxforddictionaries.com/definition/whore.

Morphologically, *selfeet* combining *selfie* and *feet* is the odd one out, unlike its counterpart *shoefie* (*shoe* + *selfie*). Driven by the phonological similarity between its constituents, *selfeet* reverses their order, which makes it look more like a product of blending than analogy. The story of selfies does not end here. The readers curious to discover the meanings of *shelfie, stelthie, telfie* or *welfie* are welcome to consult our sample or a search engine of their choice. But in order to take a selfie and be able to post it immediately on social networks, for example, one must have a smartphone and a good smartphone costs good money, even with carrier subsidies. Smart mobile devices not only make our pockets considerably lighter every couple of years or so, they are also changing the way we handle money and finances in general. We will now see that money moves in new, not so mysterious ways.

5.9. Wallet on the wrist – money on the move. The history of money is an eventful one. First there was barter, then came commodity money − commodities used as mediums of exchange, e.g. silver, gold, tea or shells[52] – followed by representative money[53], such as banknotes that represent something of value that has very little value on its own or indeed none at all, which is why they must have something valuable to back them up. The so called *plastic money*, debit and credit cards was the next evolution of payment methods. Enter the digital era and money has gone digital.[54]

- **Digital wallet** - (1) A smartphone app for making financial transactions in a retail store. See smartphone wallet and mobile payments service. (2) A desktop app for making credit card purchases online. It eliminates entering shipping, billing and credit card data when a purchase is made at a website. The data either reside in the cloud or are encrypted in the user's computer, and the wallet's digital certificate identifies the cardholder. A digital wallet may also store insurance and loyalty cards, drivers' licenses, ID cards and site passwords. Some wallet apps let users enter additional data. PCME

- **Digital tipping** - The ability for customers to tip someone for services rendered using handheld technology. Historical perspective: Introduced by Starbucks in early 2014, the coffee chain's app allows customers to pay with a swipe of their smartphone, a method which Starbucks says is used in about one in ten transactions. A new Starbucks app allows a customer to add on a tip for good service, ranging from 50 cents to $2. NL

- **App Store** - Part of iTunes on Windows and Mac and a built-in app on iPhone, iPod touch, and iPad, App Store is the only place to buy 3rd party apps and games for iOS. Introduced in 2008 alongside iOS 2 and iPhone 3G. iMG

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[52] Money. (2017, June 14). In *Wikipedia, The Free Encyclopedia*. Retrieved June 11, 2015 from https://en.wikipedia.org/w/index.php?title=Money&oldid=785602683.
[53] Representative money. (2017, March 22). In Wikipedia, The Free Encyclopedia. Retrieved March 24, 2017 from https://en.wikipedia.org/w/index.php?title=Representative_money&oldid=771530640.
[54] This shift has been followed by the introduction of disruptive financial innovations, cryptocurrencies like Bitcoin. It was not long before cryptocurrency mobile wallet and exchange or payment apps appeared in Google's and Apple's app stores.

- **Apple Passbook** - A digital storage service available on Apple iOS devices like the iPhone and iPod touch that helps store, organize and manage information such as coupons and gift cards, boarding passes, movie tickets and more. Although sometimes confused as being a type of digital wallet like Google Wallet, Apple Passbook doesn't offer digital payment capabilities via NFC (near-field communication) at this time as does Google Wallet. Apple Passbook debuted in iOS 6, and one of the key benefits of Apple Passbook is that it's time- and location-based, so your coupons, passes, tickets and similar Passbook information will automatically appear on the device's Lock screen at the time and place the user needs them. (…) WhatIs TT

- **Apple Pay** - Apple's mobile payment system, based on the Touch ID fingerprint scanner and NFC wireless antennae built into the iPhone 6 and iPhone 6 Plus (although the iPad Air 2 and iPad mini 3 can also use a more basic version of Apple Pay). Launched initially in the US only, but has since come to the UK. AUD / Apple Pay is a mobile payments service and digital wallet app that utilizes Near Field Communication (NFC) to initiate secure payment transactions between contactless payment terminals and Apple iOS devices like the iPhone 6, iPhone 6 Plus and Apple Watch. Owners of Apple devices that support Apple Pay can use the service by first adding one or more credit or debit cards to their device. The device can use its iSight camera to capture the card's information and add it to the Passbook app, or the card information can be entered manually. WP

- **Google Wallet** - A smartphone app from Google that enables users to pay for merchandise at retail outlets with their mobile phones. Launched in 2011 with support for MasterCard's PayPass system, Visa and Discover were added a year later. Google Wallet also supports loyalty and gift cards as well as payments between individuals via Gmail (see P2P payments). Near Field Communication Was a Prerequisite. Requiring an NFC-equipped Android phone to make a payment by placing it near a terminal, that prerequisite was dropped in 2013 when Google Wallet became available for non-NFC iPhones (Apple later added NFC). See smartphone wallet and NFC. Android Pay. In 2015, Google introduced a new mobile payments system built into Version 6 of the Android OS (Android M). PCME

- **App economy** - App economy refers to the range of economic activity surrounding mobile applications. Mobile apps created new fortunes for entrepreneurs and changed the way business is done. The app economy encompasses the sale of apps, ad revenue or public relations generated by free apps, and the hardware devices on which apps are designed to run. Apps are also effecting a shift for online businesses, which are often accessed through an app on a mobile device, rather than over the Web. As a result, websites that get most of their revenue through online ads have had to consider what apps mean to their business model. TP

- **In-app purchase** - Specific Apple term for items/upgrades bought while in the app instead of the App Store. ALTG

- **Freemium** - An amalgamation of the words "free" and "premium" that refers to services, software programs or mobile apps that are offered to users free of charge, but typically with limited functionality, advertiser support or additional features that are only available for a premium charge. The freemium software business model originated with shareware software, where users are able to download software and try it free of charge but only for a limited time or with a restricted feature-set. The freemium software model has become extremely popular recently with the debut of freemium apps and in-app purchases in the Apple App Store following the release of iOS 3.0. Freemium mobile apps such as Temple Run and Dragonvale are available for download on iOS-powered devices like the iPad and iPhone without charge, but users typically have the option to pay for additional features like power-ups, virtual money, restricted levels, special characters, boosts, etc. via in-app purchases. (…) WP

Discussing the central conceptualization of graphical user interfaces, the DESKTOP metaphor, Johnson (1997: 45) remarks that "because the computer was by definition so malleable, capable of shape-shifting from one visual metaphor to another, it was

theoretically possible for the interface to look like practically anything: a house, a factory, a movie, a diary". Eventually, DESKTOP was chosen having been simple and easy to represent, fitting into the technical standards of the 1970s technology. The development of software and apps over the last half a century or so has made both desktop and mobile computing devices exponentially more flexible, allowing them have virtually any functionality we might need, including becoming wallets. As the examples show, all contemporary computing devices, from desktop and handheld ones to wearables can share a feature, a clear sign of widespread convergence. Thus, THE COMPUTER IS A WALLET, THE SMARTPHONE IS A WALLET and as mentioned above, THE SMARTWATCH IS A WALLET. The related, less general conceptualizations see these devices as PASSBOOKS and CREDIT/DEBIT CARDS. The information about coupons loyalty and gift cards, boarding passes, movie tickets, drivers' licenses and ID cards is stored in the digital form, securely encrypted, hence the names of the features *digital wallet, Google Wallet* and *Passbook*. *Apple Pay* is a digital payment system with advanced security features available across Apple devices, thanks to which Macs, iPhones and iPads replace multiple credit or debit cards. After setting up Apple Pay, payment becomes as easy as holding the iPhone near a contactless terminal and pressing the Touch ID fingerprint scanner embedded into the home button for identification. With Apple Watch it's even easier to use the wallet on your wrist. When the card is selected on the watch screen, holding the watch near the contactless card reader is all it takes to pay for something. The Android-based *Samsung Pay* system works in much the same way, with Samsung's Galaxy smartphones and smartwatches. It's also worth mentioning that individual apps for smart devices, issued by all mayor banks worldwide, that make it possible for customers to track their purchases, pay bills and send or exchange money on the move, coexist with these advanced payment systems which will soon allow sending money from the built-in Messages app on the smartphone, the feature Chinese chat app WeChat has had for the last couple of years. The digitalization of payment systems has also changed tipping that is now possible via apps. Tips qualify as micropayments and so do *in-app purchases*, the term based on the CONTAINER metaphor, AN APP IS A CONTAINER referring to a new and addictive way on spending money on digital goods, such as game items or app upgrades, interpretable as OBJECTS in the CONTAINER that can be purchased via *Google Play*, Apple *App Store* or *Microsoft Store*. The process of permanent category extension reflects evolutionary changes of phenomena from computer viruses (see 2.4 above)

to business models like *freemium*, fusing *free* and *premium* that once applied to computer shareware and now includes apps for mobile devices that can be downloaded for free but sell premium content through in-app purchases. The unprecedented popularity of mobile devices worldwide changes societies and people's behaviour. It even does more than that, it changes the economy, since apps have become a source of considerable revenue. The data from Statista on the projected worldwide mobile app revenues indicates that global mobile app revenues, which amounted to 69.7 billion U.S. dollars in 2015 are expected to reach 188.9 billion U.S. dollars in 2020 via app stores and in-app advertising (cf. App Annie, 2016). Moreover, the software for PC and Mac is now referred to as apps too and MAC OS and Windows 8 and 10 now incorporate Mac Store and Windows Store respectively, obviously emulating the mobile app ecosystem, as mobile apps are becoming an important segment of the global economy. However, new cultural practices and economic models are not the only outcome of the advances of technology. The process of technological change inevitably has some dangerous consequences that must be mentioned.

5.10 Cybercrimes in cyber times. Our phones have become our most prized possessions, not necessarily because they are pricey, although some of them certainly are, but because they hold the key to our lives. They contain not only our contacts, but also give access to our e-mails, browsing habits, social networks, photos, videos, music, books, games and much more. In short, they are targeted by criminals both as objects of value and treasure troves of personal information. In the world gone digital, online identity theft (e.g. credit card information) and massive personal account breaches result from hacking databases of major providers of online services including email, like Yahoo, Hotmail or Gmail and cloud service providers like Dropbox or social networks like LinkedIn. Cybercrime is always on the rise and what follows are but a few forms it can take that involve mobile communications:

- **Digital pickpocketing** n. - The theft of data from a mobile device, particularly one that contains a radio frequency identification (RFID) chip for transmitting information wirelessly. Also Seen As: electronic pickpocketing. Other Forms: digital pickpocket n. Examples: The trousers are intended to stop thieves hacking into radio frequency identification (RFID) tagged passports or contactless payment cards. —"Jeans made that will prevent 'digital pickpocketing'," BBC News, December 17, 2014. WS

- **iCrime** n. The theft of a personal media device, particularly an iPod or iPhone. WS

- **Mug me earphones** n. The distinctive white cord and earbuds associated with the Apple's often-stolen iPhone and iPod digital music player. Also Seen As: mug-me earphones: Example: *Police suggest people make themselves "less attractive" targets by being discreet when using the devices in public, swapping out Apple's identifiable white earbuds (sometimes coined "mug me" earphones) for generic black ones, having the serial number on hand in case of theft, and personalizing the device in some way.* —Misty Harris, "iPod kerfuffle," Canwest News Service, November 18, 2008. Notes: The distinctive white cord that connects the earbuds to the device is why iPhone/iPod users as a whole have been called the white-cord subculture. New York writer Izzy Grinspan says that these devices have "L-train sex appeal," meaning that their easily recognized design allows anyone to "identify a user at 30 yards, so that it's possible to scan a subway car and instantly know who's in the club." The members of that club greet each other with the "iPod nod" (or, I guess, the "iPhone nod", although doesn't have quite the same ring to it). WS

- **Pod slurping** n. The theft of corporate data by installing special software on an iPod or similar device and then connecting that device to a computer or network. Also Seen A: podslurping. Other Forms: pod slurp v. · pod slurper n. Example*: 'Pod slurping' refers to the use of MP3 players such as iPods and other USB storage devices to steal sensitive corporate data. Usher demonstrated the vulnerability of corporate security by developing a 'proof of concept' software application that can automatically search corporate networks and copy (or 'slurp') business critical data on to an iPod. According to the white paper, "this software applications runs directly from an iPod and when connected to a computer it can slurp (copy) large volumes of corporate data on to an iPod within minutes." And, according to the GFI white paper, slurping is not limited to iPods and MP3 players. All portable storage devices can be used to slurp information, including digital cameras, PDAs, thumb drives, mobile phones and other plug-and-play devices which have storage capabilities. —"GFI white paper warns of data theft dangers through 'pod slurping',"* Al-Bawaba, November 15, 2006. Notes: The unauthorized use of any portable device to search for, copy, and store data corporate data is more generally known as data slurping or often just slurping. WS

- **Juice jacking** pp. - Stealing data from a portable device that is plugged into a hacked public charging station. Also Seen As: juice-jacking. Other Forms: juice-jacking adj. · juice jack v. · juice jacker n. WS

- **Gadget worship** - A trend that started in the mid 2000's with the introduction of the Iphone and other similar all inclusive functional gadgets. It consists of each individual in society being entirely dependent on said gadget for day to day survival. This in turn causes these individuals to esteem their gadgets higher than anything else. Kate: *I would rather murder an innocent person than not be able use my Iphone. John: Wow Kate, you have a serious case of gadget worship: the disease of the information age.* UD

Ours connection to our mobile gadgets deepens by the day, as we store more and more personal information on them and install useful apps that enrich our daily activities. As our dependence on them grows, it can easily turn to worship. But we, the owners of often multiple portable devices and smart accessories are not the only ones to recognize their value. Thieves are after them too, and regrettably, the smarter the device, the bigger the risk of its security getting compromised via some communication channel that it needs to function properly. So, even pickpocketing has become electronic, namely, this category has joined the long list of others that have been permanently extended to the digital realm. As it turns out, it is now possible to exploit the vulnerabilities of RFID chips embedded in passports and credit cards that enable

them to transmit information wirelessly. *iCrime* is a logical analogical formation describing the kind of crime involving theft of iPhones, iPads or iPods. As this term can be applied to any personal media device, iCrime is also an example of the underlying influence of the Categorization ICM and the metonymy A MEMBER OF A CATEGORY FOR THE CATEGORY, where iDevices made by Apple, because of their popularity and resale value come to represent the entire category of personal media devices as its most salient members. The case of *mug me earphones* is particularly interesting, because the imperative is used attributively to refer to a model of earphones, easily distinguishable from others by being white. Since the colour used to be exclusive to Apple, the coveted devices made by this company became instantly identifiable by the earphones their owners wore, and thus people wearing white earbuds were practically extending an invitation to muggers to rob them of their gadgets. Hence the imperative. Moreover, here we have a case of double PART-WHOLE metonymy. First, the colour stands for the earphones, as their most distinctive feature, which also allows the owners of iDevices to spot each other and exchange nods of recognition, a gesture that became known as *iPod nod* (it is the iPod now that enters in A MEMBER OF A CATEGORY FOR THE CATEGORY metonymic relationship with other Apple devices, so as to create the rhyming effect) strengthening their supposed sense of belonging to the so-called *white-cord subculture*. Second, the earphones stand for Apple devices and eventually for the entire subculture typical of their owners. *Pod slurping* shows that the people who use portable gadgets are not just victims of crimes. They can commit crimes by using their devices as data storage media where to copy corporate data without permission. The use of the verb *slurp*, meaning "drink liquid noisily" signals that DATA itself is conceptualized as LIQUID. This is a special instance of use of this metaphor that otherwise applies to any unauthorized form of access to corporate data. In *juice jacking*, the same target is applied to a different source. The modifier of the compound referring to the theft of data from a portable device plugged into a hacked public charging station is *juice* the well-known and frequently used slang term for petrol, electricity and by extension battery power, while its head is another slang word, *jack* (originating the shortened form of *hi-jack*) meaning *steal*. Conveniently, the metaphor BATTERY POWER IS JUICE ends the section on the impact of mobile devices on modern societies, illustrated via a hopefully juicy selection of examples from our sample of words created and used in the context of mobile communications. What remains to be explored is the possibility that the metaphors

that shape the ways in which people interact with their devices are in fact products of conceptual blending, rather than one-way projection of inferences from the source to the target.

VI DIGITAL AND COGNITIVE CONVERGENCE. Will it blend?

6. Yes, it blends. Integrated interaction everywhere. While the main focus on individual metaphors of mobile communications is obvious, a study without a more detailed, if due to the limitations of space, incomplete look into the overarching influence of conceptual integration would lead to an impoverished account of the phenomenon of our interaction with digital technology. The question we will attempt to answer is "Will it blend?" the one that made the online viral marketing campaign of the same name[55] famous. We may even posit (with tongue in cheek) that our aim is to find out which is more powerful, the cognitive mechanism of conceptual blending or the ultra-high-speed motor of the Blendtech household appliance that has earned considerable notoriety for reducing unusual items, most notably, hi-tech gadgets, from the latest brand new mobile phones and tablets to wearables (despite Siri's eloquent protests and arguments against it[56]) to grey dust and smoke.

Section II, providing the theoretical background of this dissertation, contains some illustrations of the role of analogy, metaphor and metonymy in conceptual blending in language and graphical user interfaces, for instance, the blend allowing the permanent category extension of the notion of *viruses*, from the realm of biology to computing and an integration network resulting in a joke, where the computer virus is one of the inputs and crucially a discussion of the principles governing blending that showed that the COMPUTER DESKTOP is a complex blend and not a simple metaphor (see 2.4 above). In view of that, some additional early examples of conceptual integration networks related to our topic, with an emphasis on their contemporary expansion will be briefly mentioned before attempting to illustrate the decisive effect of this conceptual mechanism on touch-based interaction as a defining feature of modern mobile devices.

The now obsolete conceptualization of the INTERNET IS AN INFORMATION HIGHWAY (cf. Osenga, 2013) whose implications were analysed by Rohrer 1997, 1998 originates from the phrase "information superhighway" that was very popular towards the end of the 20th century, to the point of becoming synonymous with the Internet. The mapping between the source domain – *interstate highway network in the U.S.* and the target –

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[55] Will It Blend? (2017, June 7). In *Wikipedia, The Free Encyclopedia*. Retrieved June 8, 2017 from https://en.wikipedia.org/w/index.php?title=Will_It_Blend%3F&oldid=784373903.
[56] Blendtec (Apr 27, 2015) Will it Blend? - Apple Watch. Retrieved May 18, 2015 from https://youtu.be/E8sxwK2pJI4.

information infrastructure development strategy is the source of the many parallels between road and data traffic in the public discourse. As a complex blend, INFORMATION SUPERHIGHWAY branches off in different directions, inputs spaces in the blend, one of which is embodied in the CYBERSPACE metaphor that sees the idea of data transferred along the sometimes *bumpy info-highway* or *infobahn* getting applied to web users, referred to as *cybertourists* visiting websites i.e. various online locations. The other direction leads to CYBERFUTURE that is being built and lived in the course of the journey, stemming from the conventional conceptualization of TIME as SPACE (cf. Lakoff and Johnson, 2003). These two input spaces contribute to a blend that makes it possible for the movement along the infobahn to result both in building the lanes of the information highway's (enlarging CYBERSPACE) and travelling in the direction of the future (CYBERFUTURE) (cf. Rohrer 1997). This blend once fed optimistic visions of the future where access to information would improve the economy, education system and empower working people in all walks of life. All that is happening, but the pace of change is uneven and slower than expected and with today's *roadblocks* in the development of the Internet in the form of the more than likely repeal of the net neutrality rules in the U.S. and threats to online privacy and widespread surveillance of online activities, using (cyber)terrorism as a standard excuse, our common cyberfuture looks quite uncertain. Although the dominant perception of the web among novices and experienced users alike remains closely linked to the notion of movement from place to place (cf. Maglio and Matlock 1998), it was possible almost a decade ago to provide strong arguments that the projections from the same input spaces, namely, CYBERSPACE and CYBERFUTURE yielded another blend – the notion of CYBERMARKETPLACE, signalling that information has commercial value and is viewed as goods travelling on the *information superhighway*, aimed at web and computer users (cf. Rohrer 1998). The author uses instances of advertising, quite innocuous by the contemporary standards, to prove his point. One of the examples is the long-discontinued Microsoft Windows Active Desktop feature that showed web content directly on the desktop without the need to start the browser. The blend, featuring the elements DESKTOP and INFORMATION HIGHWAY created a passive TV-like experience, where users were served information, instead of actively searching for it. The blend was further strengthened by the fact that web content was sorted into CHANNELS, such as news headlines, stocks, weather etc. This feature was replaced by Windows Desktop Gadgets in Windows Vista and Windows 7 and today live updates are an

even more integral part of the Windows 8 and Windows 10 interface having become part of the start screen. This one example from Rohrer (1998) will suffice. It takes advantage of the power of analogy and people's familiarity with TV which was still the most popular mass medium in the 1990s. Cybermarketing ploys are varied, today more than ever, in the era often described as

- **Participatory panopticon** n. - An all-encompassing system of surveillance created by the people being watched through their use of mobile technologies and trackable transactions. Notes: The phrase *voluntary panopticon* dates to 1998, although that usage is slightly different than the one featured here. Here's the earliest use of this phrase as a synonym for participatory panopticon: With every casual swipe, tomorrow's democratic citizens are being conditioned to live in tomorrow's voluntary panopticon. —David Shenk, "Watching You," National Geographic, November 1, 2003. WS

There we willingly trade our location broadcast via our phones' GPS chip for information about our surroundings or share our personal information which is used to provide personalized offers and experiences. Advertising is much more widespread than before. It is part of every free mobile app, desktop operating systems and free software, but especially the web browsing experience. Ads fill the news feeds on social networks, showing that in the years that followed Rohrer's investigation of the CYBERMARKETPLACE blend, it has continued to expand via ever more aggressive or covert tactics, because sometimes sensitive user information gets accessed without the knowledge of users. Ebay, Amazon and other cybermarketplaces have smartphone apps, making online shopping on the go a reality. The changes to the DESKTOP blend, the web and user habits brought about by technological advances occur at an accelerated rate. Mobile has gone mainstream and become the driver of development because the strategy of developing software and even the web (cf. Wroblewski, 2011) for mobile first is becoming widely adopted. As predicted by Wainewright (2011), mobile user interfaces will be the standard for all other UIs to follow. One of the strongest indications of the supremacy of mobile could be the fact mobile devices equipped with Internet access have become Apple Inc.'s core business, pushing the Mac to the sidelines, contrary to Snickars' (2012: 165) doubts. We have already seen in Section IV how the requirements of miniaturization, mobility and the form factor of handhelds led to modifications of the DESKTOP to suit a new generation of gadgets and transformed the manipulation of interfaces after the introduction of the new interaction modality of touch gestures. In what follows, successive blending characterizing direct manipulation in touch-based mobile interfaces will be discussed

relying on the interpretation of blending in the WIMP setting proposed by Imaz and Benyon, (2007) and Fauconnier's take on the blends defining the nature and movement of interface objects, as well as the mouse and the pointer and the notion of containment in interfaces. More recent observations made by Geyer, Jetter & Reiterer (2013) regarding HCI in the post-WIMP environment will also be taken into account. However, before we begin, it's useful to remember the reasons why we employ metaphor when it comes to the description of phenomena from the areas of software engineering and human-computer interaction alike. According to Gibbs (1994: 124-125), the qualities recommending metaphoric language are added *expressiveness*, i.e. the ability to convey concepts that are beyond the expressive range of literal language; *compactness* – providing a great deal of information in a succinct manner and *vividness*, ensuring that the information given is richer and more detailed than in the case of a literal description. All these attributes make metaphor a desirable means of explaining abstract and complex technical notions like, for example the organization of software. With blends, these powers of metaphor are further increased and put to good use in the conceptualization of software as architecture (see 4.1 above). In the LAYERED ARCHITECTURE blend the input spaces are ARCHITECTURE (projecting layered structure to the blend) and SOFTWARE viewed as SPATIAL STRUCTURE, while the generic space contains elements ordered in such a way that each carries the weight of the one that follows, supporting it. Over time the link between the two inputs solidifies and the perception and use of different pieces of software as layers generalizes. Consequently, "it is the connections between the generic space and the software space that is directly established" (cf. Imaz and Benyon, 2007: 70) and the generic ARCHITECTURAL STRUCTURES space gains independence, as a newly established conceptual domain that can become an input space in a particular construction adding layers to software architecture. The blended approach lends overall "consistency and uniformity to the structure independently of the input spaces" (ibid. 71) despite the fact that the relationship between the successive layers may change. The following example from our sample is perhaps even more vivid:

- **Application sandboxing** - also called **application containerization,** is an approach to software development and mobile application management (MAM) that limits the environments in which certain code can execute. The goal of sandboxing is to improve security by isolating an application to prevent outside malware, intruders, system resources or other applications from interacting with the protected app. The term sandboxing comes from the idea of a child's sandbox, in which the sand and toys are kept inside a small container or walled area.

Developers that don't want an application to be touched by outside influences can wrap security policies around an app (see app wrapping) or isolate each application in its own virtual machine (VM), an approach known as micro-virtualization. Application sandboxing is controversial because its complexity can cause more security problems than the sandbox was originally designed to prevent. The sandbox has to contain all the files the application needs to execute, which can also create problems between applications that need to interact with one another. For example, if a developer builds an application that needs to interact with a device's contacts list, sandboxing would cause that application to lose important functionality. WhatIs TT

The source input features children playing in the safe space of a sand-filled container. In the target input space, there is a mobile application. There is also the generic, abstract ACTIVITY PERFORMANCE space. The source structures the target via an analogy between children playing safely in a secure area and executing software code in limited environments. In the blend, a connection is established between the potential danger to the children outside the limits of the sandbox and executing a mobile application outside the predefined limits, potentially compromising the security of the system as a whole. The reference to the sandbox gives coherence to this mobile application management approach. However, this approach can, in turn, do more harm than good if applications need to interact. A similar integration network could be proposed for another metaphoric concept belonging to the domain of mobile communications, *walled garden*. The general principle remains that the more figurative language is used, the quicker it becomes entrenched to the point where "there is not even an intermediate period when such new expressions are considered as figurative; they are immediately associated with the "objective" world of software and so considered as literal" (cf. Imaz and Benyon, 2007: 76). Thus, the blend becomes "second nature" (see 2.4 above), which also happens as part of the experience of achieving integrated action necessary for the manipulation of computer interface elements. Fauconnier (2001: 265) points out that the computer interface shows

the user's ability to operate simultaneously in mental spaces constructed for the purpose of maximizing the efficiency and familiarity of the interface without being confused or deluded about what is going on. It is offered to show how automatic and cognitively effortless the integration of successive blends can be, and how they can lead to novel, creative integrated action that goes far beyond a simple juxtaposition of partial similarities.

There is little doubt, as we shall see, that massive blending is at work even (or perhaps especially) in what looks at first glance like the most straightforward component of human-computer interface.

Conceptual integration is shown to be present at all levels, from perceiving individual objects on the screen, operating the mouse and controlling the arrow cursor in the

process, to grasping and moving on-screen objects, putting the objects – containers one into the other and taking them out (ibid. 265-277). The interpretation of the use of the mouse to perform actions in the graphical user interface as resulting from blending has been elaborated by Imaz and Benyon (2007). We will now adopt the same approach to explain the functioning of touch gestures in mobile interfaces. The most striking change brought about by the contemporary touch-based interaction is the absence of peripherals. The mouse or a touch-sensitive trackpad have become redundant. Direct manipulation no longer requires an intermediary to represent the user in dataspace, since both the mouse and the arrow pointer have been replaced by direct contact between the finger and the screen, namely, the embodiment of direct manipulation is taken to a whole new level. Let's consider the differences between the arrow and mouse blend, as described by Fauconnier (2001) and finger gesture-based interaction the mobile interface environment. The inputs of the network are the screen showing an arrow moving in a vertical plane and the movement of the mouse, the three-dimensional object that the user holds in his/her hand on a horizontal plane i.e. on the table. There is a correspondence between the motion of the mouse and that of the arrow and a cross-space mapping between the virtual object (arrow) and the real one (mouse) and their motions. The everyday experience is visual and tactile i.e. the change in position of an object in space corresponds to the movement performed by the person performing the action of moving it while looking at it (cf. Fauconnier, 2001: 268). The experience of moving an object shown on the touchscreen of a mobile device is visual and tactile too. The user selects an object by tapping and holding it and swipes his/her finger across the screen until the place where the virtual object (e.g. an application or a document) should be moved is reached, after which the finger is lifted and the object is thereby placed in the desired location. There is no need for the phase consisting of projecting the mechanics of the user's body from the mouse input as well as of projecting the object that is being moved and the arrow and its movement from the screen input. In the blend, the attention is focused on "the arrow as the object being moved". The manipulation of the mouse and the movement of the arrow become integrated and we feel that we are moving the arrow by moving the mouse. Such integration results in a genuine new activity, not an analogy between the existing ones. The correspondence between the inputs may be imperfect, but as soon the goal of integration is achieved the imperfections are quickly disregarded by the consciousness, as the emergent notion of moving an on-screen object is developed by performing

physical movements of the hand holding the mouse (ibid. 269). By doing away with the mouse and arrow stage, the integration achieved while manipulating digital objects on a touchscreen by making emergent physical actions in the form of finger gestures can be thought of as being less imperfect. Touchscreen gestures are the latest evolution of the basic actions enabling interaction with computing devices. All such essential actions throughout the history of human-computer interactions can be viewed as blends between the space referring to features of input devices and the basic manual actions as the other space. The blend assigns meaning to the actions that tend to recur in more complex blends (Imaz and Benyon (2007: 114). Figure 6 based on Imaz and Benyon's illustration of the blend yielding the commands performed using the mouse shows an analogous conceptual integration network powering the basic commands executed via touchscreen gestures.
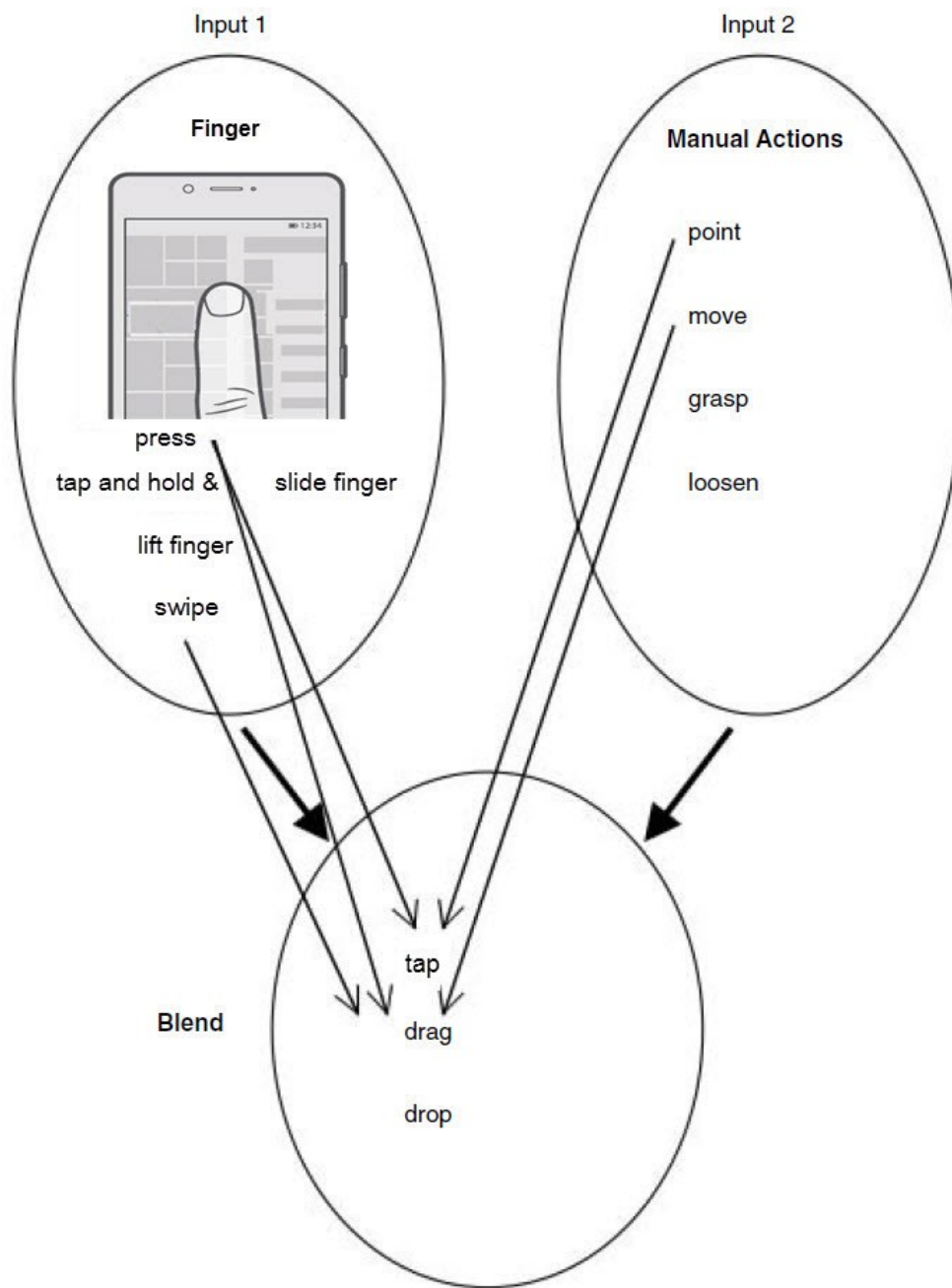
Figure 6. The blend producing direct manipulation commands via touchscreen gestures.

The blending mechanism is the same for all kinds of devices regardless of the interaction modality. Hardware buttons on a non-touchscreen feature phones, for example, are input methods that get blended with actions valid in a certain domain to produce new interactions, such as pressing the volume buttons to zoom the camera or photos in or out. Early smartphones equipped with resistive touchscreens and

styluses were an intermediate step in the progress towards fully touch-based input, as shown by the description of navigation in the Sony Ericsson M600i manual that reads: "To navigate menus and select items, you can use the Jog Dial, Back button, stylus, keyboard navigation keys, touch options, and _even your fingers_" [emphasis added] (cf. Sony Ericsson, 2006: 8). The experience of using fingers is not a particularly satisfactory one because resistive touchscreens require physical pressure to be exerted in order to register touch and are not very accurate at it. That is why pointed styluses are used to navigate the interface and select items i.e. hit small touch targets on small screens not quite adapted to finger touch input.

Returning to the basic one-finger gestures performed on capacitive touchscreens, since the introduction of the iPhone, the blend also produces composite ones, consisting of the basic three actions. Namely, just like _single mouse click_ (_press + release_) also means _select_, so does _tap_, to which it is analogous. While _double mouse click_ means _open_, _double tap_ has different meanings, depending on the operating system and/or device manufacturer. Thus, this gesture in iOS zooms in or out and centres a block of content or an image. In Windows Phone 10, it wakes the screen in standby mode, or locks/unlocks LG Android devices. _Tap and hold_ is a gesture that usually opens up a menu containing further options related to an item. _Dragging_ combines tapping and holding an item with a _finger_ while _sliding the finger across the screen_, namely, _moving an item to a desired location_ and _dropping it_ involves _lifting the finger after dragging_, that is _placing an item to a new location_. Moreover, the blend may become an input space in another conceptual integration network in a recursive way. Such is the case of the above basic touchscreen gesture manipulation blend, which provides an input space in a network whose other input space is a classic computer folder that is itself the result of blending basic computer GUI actions with real-world office folders, as shown in Figure 3 providing a side by side view of the graphical representation of the computer folder blend, adapted from Imaz and Benyon (2007) and its evolution in mobile touchscreen interfaces.
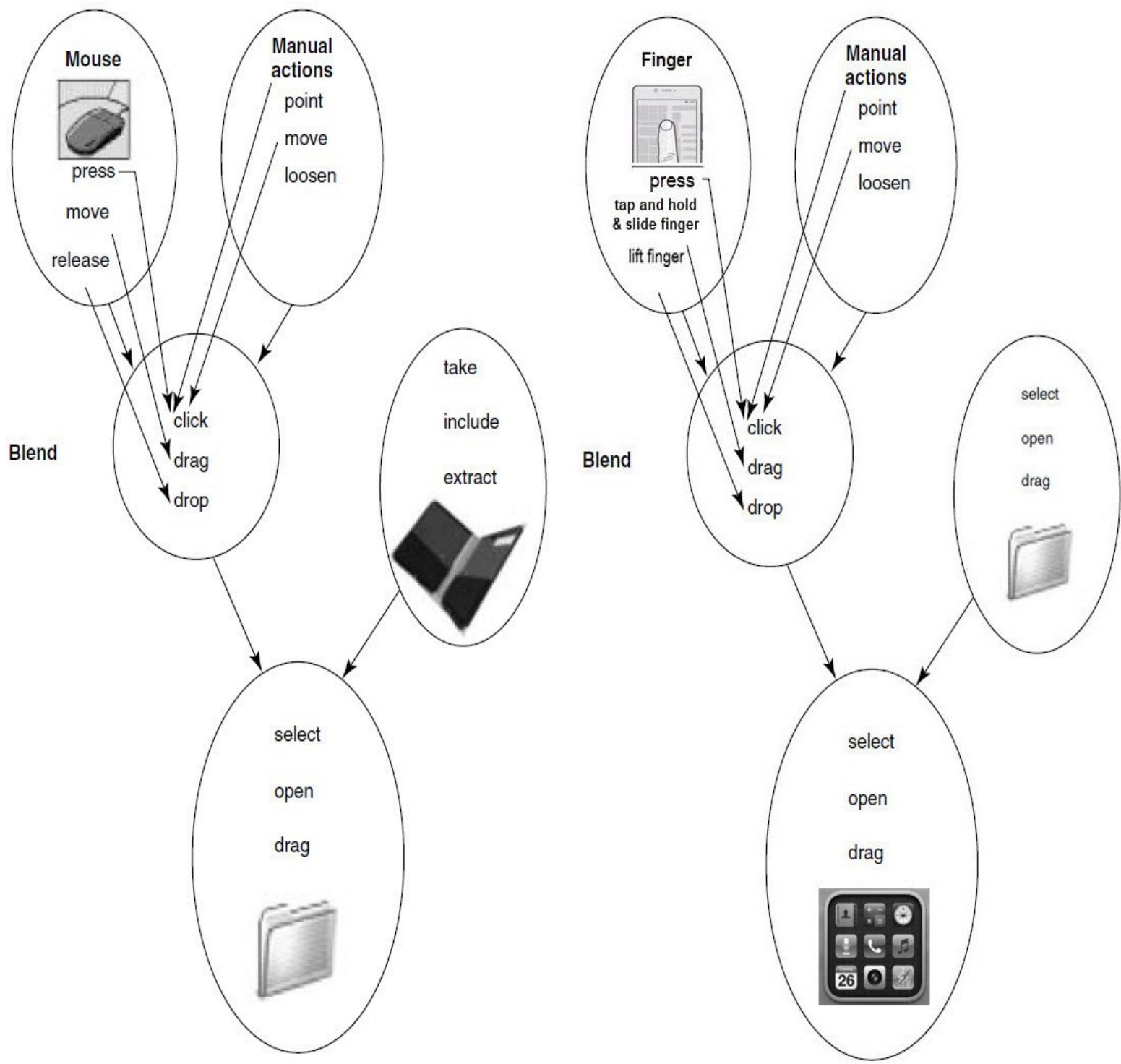
Figure 7. A side by side view of the computer folder blend and its mobile interface counterpart.

The modifications that the DESKTOP blend had to undergo to fit the smartphone user interface setting have been discussed in some detail in Section IV above. There we proposed a metaphor describing the user action of making a folder: DRAGGING ONE APP (ICON) OVER ANOTHER ON THE HOME SCREEN IS MAKING A FOLDER. This is just one of the points of difference between computer and mobile user interfaces and user experience as a whole. A folder cannot be made in that way on a PC, where a new empty folder has to be made first, after which it can be filled by dragging and dropping or copying/cutting and pasting items into it. The biggest mobile operating systems, Android and iOS have dispensed with the new empty folder step. Dragging one app over another on the home screen is enough. Moreover, the folder icon changes dynamically, as soon as a new app is placed inside, a tiny thumbnail image of the app icon is added into a 3x3 grid in iOS or partially superimposed over other app thumbnails, indicating the state of the folder in Android. This is not an accurate indication of folder state since only the thumbnails of the first nine apps can be shown in this way or even fewer in stock Android. This makes their role more aesthetic than functional. In Windows Phone folders, miniature versions of Live Tiles, representing the apps put in the folder on the start screen do not go static, but display live updates despite their much-reduced size. Regardless of their behaviour, thumbnails function metonymically, as they do in computer operating systems, namely, the smaller image stands for its larger counterpart, representing THE PART FOR THE WHOLE relation. If a folder, which when open takes the form of a small window, is emptied it automatically disappears. Neither of the three surviving major mobile OSs supports empty folders, unlike the latest versions of the now discontinued Symbian and MeeGo systems, for instance, where folders are created just like in Windows and remain on the homescreen even when empty. Mobile folders can be selected by tapping and holding, dragged to a new location and items can be dragged and dropped into them. These actions mirror the interaction possibilities available on desktop and laptop computers. Further full or partial analogues with computers become available as phones and tablets get more computing power to support them. The upcoming version of Apple's mobile operating system, iOS 11 on the iPad tablet allows split screen multitasking with more than two apps shown simultaneously on the screen, like windows and dragging and dropping images, text or links between open apps. The new Files app that brings desktop-like file management, complete with folders to the tablet is among the features which make it feel more like an ultra-light, simple to use computer than a

mobile device. The crucial element contributing to the ease of use remain touch gestures that once again provide an input to another conceptual integration network as improved or new interaction methods are blended from the existing input spaces. Thus, thanks to the move from resistive to the more responsive capacitive touchscreens, single touch gestures become multitouch ones that acquire new meanings that can go well beyond the iconic, yet counter intuitive, pinch-to-zoom (see 4.4 above), using from one to all five fingers to pinch, spread, slide or swipe in all directions. In some contexts (e.g. on jailbroken Apple devices) multitouch gestures are user definable i.e. meanings can be assigned to them in relation to specific actions, events or apps. When defined via the Activator app, touchscreen gestures can be used in combination with hardware buttons and their meaning can be changed at will.

The comparison of the two blends in Figure 7 proves an important point raised by Geyer, Jetter & Reiterer (2013), namely that the contemporary reality can no longer be regarded as free from digital influences, since embodied cognition implies that our cognitive abilities are shaped not only by the physical characteristics of our bodies and brains, but also by our previous experiences acquired in a society and marked by its culture. To wit, by virtue of having been using computers and various other product of digital technologies for a number of generations now, people have internalized a range of concepts from the realm of computing, such as direct manipulation actions and notions like digital folders or trashcans. This pre-existing influence of the elements of the direct manipulation and desktop blends significantly speeds up the adoption of subsequent technologies that necessarily build on the achievements of their predecessors while introducing new advanced solutions. Let us reiterate, the principles defining interaction modalities and interfaces are stable. What changes are input methods and design solutions constrained by the technical specifications of devices and design trends. Therefore, the whole process of technological development and the changes it brings can be viewed as a continuous process of blending and reblending (e.g. Google's *Project Jacquard,* taking its cue from an much older technology in the same field) as integration networks expand with the inclusion of new functionalities or sometimes constrict as unnecessary technological bells and whistles are rejected in favour of minimalist solutions. The key reason why the advancements of technology get internalized faster and easier than ever before is that interacting with devices gets more and more natural. It is more natural to use one's

fingers than the mouse to navigate digital spaces. Using natural language to converse with smart speakers that control connected devices in our home is the present and likely near the future. Scoble and Israel (2013) speculate that in twenty years' time contextual technology will develop to a point where tiny visual computers will be connected directly to users' optic nerves, making communication by brainwaves possible. This is about as far as embodiment and blending can get, at least in our current imagination. So, it is far from surprizing that both Wainewright (2011) and Geyer, Jetter & Reiterer (2013) note that people have come to assume that modern screens are or should be touchscreens, both in their personal computers, as they automatically reach for old laptops and desktops to tap, scroll or zoom using fingers and in the public kiosk systems and museum exhibitions, for example. Needless to say, in the last couple of years this has become less of a problem because many screens are now touchscreens and PC/tablet combos with a touchscreen and detachable keyboards like Microsoft's Surface or those belonging to the Transformer Book series produced by Asus (like Transformer Book T100 in our device sample) running Windows 8 or 10 which look a lot like Microsoft's own mobile phone operating system are proving to be quite popular. Even Apple has sort of succumbed to the touchy-feely trend in personal computing, having opted for an unusual solution of integrating a highly customizable touch bar below the screen in its latest MacBook laptops. The fascinating thing is that this transformational shift in our expectations and the way we think about technology and our environment, as well as the way in which technology changes us, has its roots in the domain of mobile communications and that its first big public impact can be traced back to the launch of a single device, the iPhone, just a decade ago. What better illustration of the profundity of this change than the viral video titled *A Magazine Is an Ipad That Does Not Work* (cf. UserExperiencesWorks, 2011) in which a one-year-old tries to tap on and pinch images and text in glossy magazines, wondering why it does not work, when on the iPad it does. There is no doubt that for her generation multitouch interaction is the new normal. But we did not get there overnight. As remarked by Dourish (2004: 161), "the broader idea of embodied interaction points out that action and meaning arise in specific settings − physical, social, organizational, cultural, and so forth". Before haptic feedback came to be expected by default, thanks to the popularity of mobile devices, previous generations internalized concepts like *folder* or *cutting and pasting*, thanks to the DESKTOP blend, where selective projection of the semantic structure of the input

spaces of a real-world office space with a desk, files, folders, documents, etc. on the one hand, and computer commands and file system on the other, gives rise to digital objects like *folders, trashcans* or actions like *cut and paste, undo or* redo, that appear as novel constructs, emergent structure in the blend with new meaning not found in any of the inputs. These and other concepts subsequently became part of the user experience on mobile devices. But before pinching-to-zoom became the most natural way to zoom in pictures or text, people had to do it by repeatedly pressing the + - buttons on the computer screen or moving a slider using the mouse. When mice with scroll wheels appeared, zooming by simply scrolling back and forth using the mouse wheel felt like magic. So much quicker and *natural*. Today's children may not know what an actual office folder looks like or what press clipping is, but they know perfectly well how these things function in the digital environment. For digital natives, digital comes first and that increasingly means mobile first. They do not consciously run the blend, not for a moment in their lives, they were born into it. Therefore, the conclusion drawn by Geyer, Jetter & Reiterer (2013) that post-WIMP modes of interaction extend our perception of what is natural in human-computer interaction, because certain elements of user interfaces are applied "almost as effortlessly as if it were basic-level sensorimotor experiences" is not an exaggeration, because such is the power of conceptual integration. Naturally, today's children and their children will have their own blends to make as tangible computing promises to change our physical environment into interactive spaces and allow whole body interaction and physical embodiment of data, creating new experiences, activities, tasks and constraints. Still, we are likely to make some blends together with them, especially in the context of mobile augmented and virtual reality that fuses the physical and the digital in new ways. We can have fun playing the world's favourite mobile augmented reality game, hunting Pokémon perfectly blended in the setting of our local park. And no, it is not too early to declare the winner. Conceptual blending wins hands down, the Blendtec blender bites the dust to which it reduces gadgets[57]. But before we get carried away, marvelling at the level of integration achieved by digital technology, including the ability of Apple's intelligent assistant Siri[58] to tell jokes, we should not lose sight of the fact the

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[57] The above-cited Wikipedia entry on the *Will It Blend* viral marketing campaign provides an interesting trivia titbit. It so happens that a Pikachu figure is one of the rare things to have emerged from the blender intact.
[58] When asked the present author asked her a question about her own intelligence and that of one of her rival virtual assistants saying: "Do you think Cortana is cleverer than you?" Siri replied "I think, therefore I am. But let's not put Descartes before the horse". Blending comes natural to her too.

convergence of physical features in devices (e.g. a Walkman radio cassette recorder bundled with a clip-on microphone) that predates the digital age and is as old as mankind drives conceptual blending and so does embodied interaction exemplified in a seemingly simple action of using a tool like a hammer to hammer a nail, when the object is felt to be an extension of our arm, as we build a relationship with it in order to incorporate it into our own action as part of the process known as *coupling* that makes the object "invisible" as an extension of the human limb, but "visible" as the centre of focus and attention, given the task of hammering that has to be completed (cf. Dourich, 2004: 138-139). Moving from there to considering the iPhone, the ultimate digital multifunctional device, to be an extension of one's corporeal being (see. 4.4 above) or feel the same about smartwatch on our wrist or a smart speaker in our home is just a matter of extension via conceptual blending, because the whole multimodal experience and novel forms of digital interaction it brings requires background functioning of double scope networks. The current discussion of conceptual integration started with a repeated statement that the COMPUTER DESKTOP is more than a metaphor. It is perhaps fitting that it should end in mentioning a case where this conceptualization is used as a powerful analogy on a much wider scale than human-computer interaction. Hoffman (2011, 2015), Hoffman and Prakash (2014) and Hoffman, Singh & Prakash (2015) employ it to explain the functioning of human perception and consciousness. The fact that we experience visual illusions, namely, that our vision plays tricks on us, for example, in the form of easily demonstrable optical illusions, such as the Necker cube has led cognitive scientists to ask themselves a question as to why our perceptions are fallible. The answer can be found if it is understood that visual perception is a biological system shaped by evolutionary natural selection, whose aim is to ensure fitness that guarantees survival. However, the assumption that the more accurate the perception the fitter it is, meaning that those of our ancestors who saw the world more truly were more likely to survive and reproduce can be shown to be false. The findings of neuroscience reveal that vision constructs everything that we see as reality in a fraction of second and that the sheer speed of that process makes us believe that no construction takes place, which, in turn, is generally thought to imply that a snapshot of the objective world that exists even if unperceived is taken in a camera-like fashion. Moreover, the construction process is regarded as unavoidable, because it is driven by the physical limitations of our visual system (the number of photoreceptors in our eyes), but the more accurately

we are able to reconstruct the objectively true properties of the world around us, the better our chances for survival. Namely, a correlation is established between the truth and utility of perception. There is a different view that utility depends on the type of organism and the world in which it exists e.g. what is useful for people is not useful for fish (cf. Hoffman, 2011). Since evolution is a mathematically precise theory, cognitive scientists and mathematicians were able to put these assumptions to the test by using evolutionary game theory (cf. Maynard Smith, 1974) that explains evolutionary behaviour of biological populations. They did so by developing computer simulations based on this theory. Various objective worlds, where evolutionary games and genetic algorithms serve the purpose of testing the effects of natural selection on perception are created. In these worlds and games, organisms whose evolution is guided by different fitness functions compete with each other. Thus, the perceptual system of some is tuned to see the whole truth, that is the true structure of the world, others can see part of the truth, while the third group sees no truth at all and is tuned to utility instead of the objective structure of the world. It turns out that the organisms that are tuned to utility, in other words, fitness dominate the other two groups, driving them to extinction and that this scenario is routinely repeated in most cases i.e. simulated worlds, one reason being that evolution favours quick and energy-efficient perception. The more details are perceived, the more time and energy is used. For perception it is usually utility, rather than truth that is relevant, because its purpose is to guide adaptive behaviour. As such, it hides the truth and for that reason perception can be said to function like the windows interface and not like a window on the truth, which has led to the development of the Interface Theory of Perception. The theory claims that spacetime is the desktop and physical objects are icons. The interface is not there to show how computer hardware and software actually work, but to allow us to efficiently perform tasks including composing emails, writing documents, editing photos, etc. freeing us from having to know all the complex technical details about the functioning of the machine. It guides useful interactions with the computer via a representation whose elements are not in the least bit veridical, as far the true representation of data is concerned. The information stored on the hard drive does not take the form of yellow folders, pages of documents, pictures or videos placed on our desktop. Similarly, perception is useful, partly, precisely because it obscures the intricate details about the objective reality that are not necessary for us to survive and thrive. Everything that we perceive, space, time, objects, shapes colours, movement

is a species-specific adaptation, an evolutionary hack allowing humans to live long enough to reproduce. So even though our perception is not an approximation of the true nature of the objective world, we must take the things that we perceive seriously if we are to survive. We know better than to jump in front of a speeding car hoping that we won't get hit, just because the car cannot be taken literally. We ourselves are part of the perceptual interface designed for us in the course of natural selection. If we do not take the perceptual symbols around us seriously we will be in danger of losing our lives, just as we will lose a file forever if we delete it from our computer, phone or tablet. The fact that we all see the same things, vehicles, files, other animals, etc. means that we as humans share the same perceptual system. We all construct reality in much the same way, which does not make that reality necessarily literally true. Practical examples of the claim that perceptual systems hide reality are mimicry and camouflage, the strategies employed by different species to avoid predators or reproduce successfully (cf. Hoffman, 2011, 2015, Hoffman, Singh & Prakash (2015). If the sweeping assumptions that nothing exists as such when unperceived, that perception is a real-time reality engine or that having perceptual experiences means, in fact, that we are interacting with reality that looks nothing like our perceptual experiences, be they objects, animals or brains are correct, that has one radical consequence. Namely, it follows that brains or any other conscious experiences are not the source of cause and effect in the world, they are all symbols, just like desktop icons. The source of cause and effect is the unknown reality, whose true nature we may hope to discover with the help of science and technology, which are currently being used to create a mathematical model of reality as a network of interacting conscious agents of different complexity (Hoffman and Prakash 2014, Deception Epidemic 2015, Hoffman, 2015). A theory such as this one might be scary, because it makes it look like we are living in the Matrix, a simulation, virtual reality, but the arguments complement the thesis of embodied cognition that has defined cognitive linguistics. It also shows the utility of the now widely familiar desktop blend to facilitate explaining the mystery of the biological foundations of consciousness. In other words, the formulation of the multimode user interfaces hypothesis stating that "conscious perceptual experiences of an agent are a multimodal user interface between that agent and an objective world" (cf. Hoffman, 2008: 96) that forms the basis of the interface theory of perception which uses the analogy with the DESKTOP makes it possible to view perceptual experiences as an emergent structure of the blend between the

perception system and the objective world, whose characteristics are not found in the inputs. The knowledge that experiences of reality may well be thought of as icons in the vast interface of life, makes the following concise consideration of the characteristics of icons in mobile interfaces all the more intriguing.

VII IMAGES AND (RE)COGNITION – from interface icons to emoji

7. Closing the window on windows, or keeping it ajar? The ascension of apps.

Interfaces are all around us, most of them taken for granted and overlooked, so much so that we only become aware of them when something goes wrong with our car, TV, radio, washing machine, oven or the local ATM, etc. Interestingly, all of them are, nowadays, likely to come equipped with a touchscreen. Nadin's (1988: 273) sobering remark that they all "require interfacing in order to be optimally used. Each requires a certain sequence of actions that allows for the pragmatics of using it" shows just how far we've come as far as interacting with interfaces is concerned. The computer interface is more conspicuous because, compared to cars, radios or home appliances they are a new addition to our everyday lives and interactions are infinitely more complex when it comes to the range of functions they offer. We hope to have shown that this diversity of everyday uses has been raised to the power of ten with the introduction of mobile devices, which are less complicated to use and thus able to reach a much wider audience of people of all ages, from babies to seniors, who can conveniently use them anywhere, not just sitting at desks. Convenience is what makes accepting changes easier. Many will not notice the changes at all, as for them one mobile gadget or other will be the first computing device they encounter. Still, our aim here has been to highlight the changes to the computer interface and the society that the shift from desktop to mobile has brought about. It is absolutely amazing that all seven dimensions of moving beyond the desktop metaphor (personal information in the cloud, new forms of data representation on new devices, multiplication of computing devices, new interaction modalities, software as a service, interaction via social media and activity-centric computing) defined by Moran and Zhai (2007) are fast becoming part of our everyday life largely thanks to the widespread adoption of mobility. In the post-PC world and the post-WIMP environment, windows are no longer the most noticeable feature of the current generation of interfaces, having been reduced from many to mostly just one and replaced by sequences of home screens. Computer mice and pointers are pointless[59] in the mobile setting. In fact, there are apps that make smartphones double as mice. What remains of the old establishment of personal computing are icons, the feature primarily responsible for the graphical i.e.

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[59] A rare scenario in which a cursor appears are some gimmicky implementations of touch interaction like Glove Mode in the Sony Xperia Sola Android phone which registers touch even if all kinds of gloves are worn. A cursor ring is used as a visual cue in the interface, indicating that a gloved touch has indeed been registered.

visual nature of graphical user interfaces. They have successfully filled the void left by the departure of other pillars of the WIMP era by multiplying and diversifying maybe beyond expectation. We are witnessing a sustained and remarkably rapid rise in the number of mobile apps and every app has its icon. Despite the introduction of new modes of interaction, the purpose of icons remains the same. As graphical representations providing visual cues as to the purpose of interface features and actions by, they greatly facilitate the use of operating systems by reducing the cognitive load placed on the user. In that respect, not much has changed since Johnson's (1997: 15) observation that "the word *interface* itself conjures up cartoon images of colourful icons and animated trash cans, as well as the inevitable saccharine platitudes of 'user friendliness'" He finds that the fact that these are the things that first come to mind testifies to the enormous success of GUIs. However, it would be wrong to think that the development of technology has not left its mark in the domain of icons. Namely, the features that make blends of these icons too (they are selectable, tappable and draggable using fingers instead of a mouse) have been retained and new ones, like force touching, without a counterpart in real-world offices that inspired the DESKTOP blend, or in the original DESKTOP blend itself have been added as a result of the advances in touchscreen production (see 4.4 above). Icons have sure proliferated, but one of them is conspicuously missing. In mobile interfaces, there is no trashcan on the homescreen and files are not kept in it before it is emptied. Instead, along with a number of other icons, it has developed dynamic properties unique to the mobile setting. Namely, it appears only when needed (e.g. in the photo gallery app as users scroll through pictures, since there is a possibility that they might like to delete some. As far as app deletion is concerned, operating systems behave differently, the common characteristic being that long pressing an icon brings the deletion option in different forms. In iOS, this finger gesture activates Jiggly Mode (see 4.4above) and all apps, not their shortcuts, which are placed directly on the homescreen start to shake and get an x in the top left corner. Unlike the DESKTOP interface, where x stand for closing a window, in the mobile context (not only in iOS, but also in Blackberry OS, MeeGo and Firefox OS) it stands for deleting an app for good. Hence the metonymy X FOR DELETION, the action that has to be additionally confirmed by answering a question in the dialogue box that pops up when x is pressed. The question is aimed at confirming the readiness of the user to take that definitive step. Alternatively, there is a red delete button inside specific apps, representing a variation of the culturally

entrenched metonymic relation RED FOR DANGER. The little red notification badge (exemplifying an analogy-based image metaphor, since the little round indicator resembles a BADGE that the icon is wearing, showing the missed calls or unread messages count) is another visual element of the iOS and Android that appears as part of app icons (in their top right corner). Like the just mentioned *x*, this is another example of blending, since the smaller icon gets dynamically and contextually incorporated into the bigger one. It is also an instance of another metonymy RED FOR IMPORTANCE, which together with the previous one, featuring the same colour could be subsumed into a general one RED FOR ALERT. In Android, this colour is integral to the deletion process in a different way. When an app shortcut on the home screen is long pressed, the trashcan icon appears in the upper right corner of the device screen. When the shortcut it is dragged over the trashcan icon, it turns red, signalling the danger of the step to be taken (dropping equals deleting), the same visual effect appears when apps are deleted from the app drawer, with an additional dialogue box asking for a confirmation of the action, which is standard across all OSs. Other operating systems, like Symbian, or Windows Phone handle deletion via text menus appearing after long pressing app icons, while Blackberry OS employs a menu of options with icons and text, popping up in a small window. The last iteration of Symbian uses a combination of techniques: Xs for deleting shortcuts and the menu for deleting apps themselves. These interface and/or icon elements could therefore be said to be part of the general metonymy VISUAL EFFECTS FOR SELECTION proposed in 4.1.2 above, where the main relationships of that kind, describing the referential function of icons were also mentioned. To repeat, as specified by Barr, Biddle and Noble (2002), these are THE ICON FOR THE FUNCTION and THE ICON FOR THE OBJECT. Moreover, as will be shown shortly, they are not the only ones. It is becoming clear that metonymy is the conceptual mechanism that defines the use of icons, both those referring to individual third party or interface apps, as well as commands. A closer look at the evolution of their meaning and appearance tells a story about the vibrant existence of icons in mobile interfaces.

Let's begin our short overview with the icons of the apps whose existence is a proof that the concept of the "personal information cloud", which is perhaps the most far reaching aspect of computing freed from the DESKTOP (cf. Moran and Zhai, 2007) is taking shape.

Figure 8. Cloud service app icons

The first cloud storage solution to enjoy popularity, *Dropbox*, relies on the CONTAINER metaphor both in its name (see 5.3 above) and its icon which looks like an open cardboard box, ready to hold digital objects that will be dropped in it. Its collaboration oriented competitor, *Box* has opted for a textual solution, displaying its full name on a plain blue rectangular background whose shape may evoke a box-like container. The previous version of the icon had an added element of a portion of a white cloud superimposed against the blue background allowing easy association with the app's function. Google Drive's choice looks abstract enough, but it is not unreasonable to suppose that the triangle is the Greek letter Δ (*delta*) standing for *D* in Drive. Icons displaying initials of the names of different services, whose apps they represent are not rare, the most famous example being *Facebook* with its white *f* on the blue background, with other similar examples like VoIP software *Skype* or *Instapaper*, the app for saving web pages to be read later. They too illustrate the influence of the Reduction ICM yielding shortened forms of words including initial(ism)s that stand in the PART-WHOLE relation to the source word(s). The icon of Microsoft's online storage offering, OneDrive shows two clouds, an instance of THE ICON FOR THE FUNCTION metonymy possibly calling to mind the former name of the service SkyDrive, in which case this would also be the CONTENTS FOR CONTAINER relation, as the clouds fill the sky. Apple's iCloud has a self-explanatory icon with a simple and maybe not single cloud.

A reference to cartoons used to be an inevitable part of the description of the look of icons (cf. Johnson, 1997 cited above) or Saraceni, (2003: 88) for whom they are "rather cartoony", which was certainly the case in the early days of GUIs when the graphics in computers, PDAs (such as the PalmOne Zire Z2 in our device sample) and mobiles were severely limited, compared to modern standards. As will be shown below, today's icons look much different, but one cartoony feature is going nowhere. It is systematically present across mobile operating systems and apps. For example:
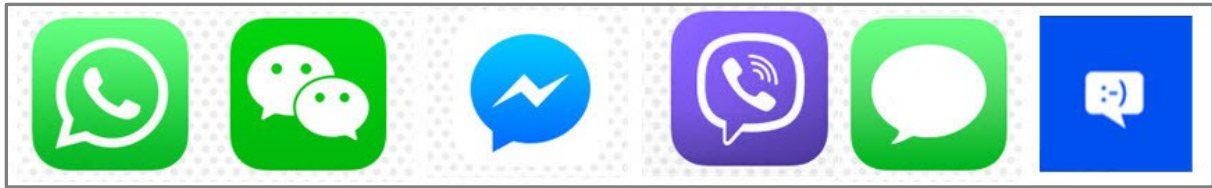
Figure 9. Chat app icons

Chat bubbles are a must on the icons of all major mobile social chat apps, namely, WhatsApp, WeChat, Facebook Messenger or Viber and on many text messaging apps that are part of mobile operating systems, such as Apple's iOS Messages app, whose white bubble on a green background icon is shown here. All exemplify the metonymy THE SPEECH BUBBLE FOR SPEECH/TEXT of the CONTAINER FOR CONTENTS kind. WhatsApp and Viber icons have a landline telephone headset inside the bubble, showing that the apps provide Internet telephony too, (which is also offered by Facebook messenger, but not featured in the icon) where the INSTRUMENT (*headset* which is also PART of the WHOLE instrument, *telephone*) is metonymically linked to the ACTION of phoning someone. The Windows Phone 10 Messages app icon combines another cartoon bubble with a smiley emoticon, the prototypical member of its category of pictograms, which are the topic of our next and closing section. It follows that an emoticon, as a conspicuous feature of text messaging stands for the whole activity of texting. On a side note, with the spread of threaded messages in stock messaging apps in different mobile OSs, individual messages in conversations, grouped by sender, typically appear in chat bubbles too.

Figure 10. Sony Ericsson Walkman phone themes

There was a time when mobile phone users had no choice but to rely on the single set of icons built in their phones, depicting a small selection of device functions e.g. the bell for alarm or curved arrow for a missed call. Then with the introduction of colour screens around 2003, the theme phenomenon exploded. A few themes came preloaded in phones, like the ones in Figure 10 found in the Sony Ericssson W850i Walkman phone. Using rudimentary mobile WAP sites and slow Internet connections

users could also download themes that changed the visual appearance of their devices or sideload them via computers and a multitude of colourful icons and designs started appearing on feature phone screens. They could be found via the official channels launched by device manufacturers or elsewhere since many were user-generated. The parts of the two themes shown above depict main menu icons organized in a 3x3 grid, navigated via the directional pad or the joystick. The first menu shows colourful photorealistic icons, the one in the top left corner being the logo of the company's *PlayNow* service through which media like music, ringtones, games, wallpapers or themes could be downloaded. Like the icons of Google Play Store, or YouTube that came after it, this one features, the most popular of the standard media controls, the play triangle, which stands for playable multimedia content. The other logo in the menus above is W-shaped. The initial is used metonymically to indicate that the phone incorporates *Walkman* software and hardware functionality (including a dedicated Walkman button, improved audio playback functionality, additional music player themes, etc.). The Walkman branding is the digital evolution of Sony's iconic Walkman devices, an example of convergence. Both logos represent a variation of the metonymy THE LOGO FOR THE ORGANIZATION proposed in 5.8 above, namely, THE LOGO FOR THE SERVICE/BRAND. The rest of the icons are fairly standard representations of the applications built in the phone manufacturer-specific operating systems of feature phones a decade or so ago. The globe, always a partial representation of the world, as in the non-animated pictures it shows only one side of the planet, stands for the web browser, i.e. access to the worldwide web. Some frequent and well-established phone icons like the envelope standing for text messaging and e-mail or game console controller for games have also become emoji, which is why their meaning will be explained in the pertinent section. Elsewhere, address book stands for contacts in another instance of the CONTAINER FOR CONTENTS relation, radio links the INSTRUMENT to the ACTION of listening to radio stations and, as always, arrows stand for direction, this time of incoming and outgoing calls represented by the telephone headset. In keeping with the standard convention in the mobile operating systems that provide some form of file system access to users, a single computer-like folder with or without a file in it, stands for the file manager software i.e. the whole of the hierarchical file system. The bell and the calendar page stand for alarm and calendar functionalities, salient parts of the organizer in feature phones that also includes task manager and a note-taking option. The photorealistic and the much more graphically reduced theme

differ in the settings menu icon, which typically shows tool(s) or part of the mechanism of a machine, such as a simple or complex clog ✿, the now almost default option on smartphones. The first Sony Ericsson theme displays the wrench icon, also present in Blackberry OS, while the other combines the wrench with the screwdriver icon, all variants evoking the metaphor SOFTWARE COMMANDS/OPTIONS ARE TOOLS. The two themes also have different visual effects indicating that an icon has been selected. In the colourful one, the messaging icon pops out as conspicuously bigger than the other ones which is an instantiation of the primary metaphor IMPORTANCE IS BIG. The almost black and white menu of the other theme favours colour as the distinguishing feature of selected icons. Thus, COLOUR FOR SELECTION becomes a modification of the already mentioned general-purpose speculative metonym VISUAL EFFECTS FOR SELECTION. What this side-by-side look shows is a clear move from a lifelike to an iconic form of representation. The wide variety of themes gave a glimpse into the future where downloadable launchers for Android would provide innumerable options for changing the look and complexity of the visual aspects of the operating system and every manufacturer of Android devices would be free to provide their own signature themes, such as Samsung's *TouchWiz*, with features not found in the pure version of the OS released by Google. This trend is known as fragmentation, the main consequence of which is that the vast majority of Android phones and tablets do not get regular software and security updates. It is the polar opposite of Apple's constant ambition towards synthesis in their devices, which is also felt in the company's approach to interface visuals, which consistently look the same across the whole mobile product range. That is not to say that Apple's take on things visual does not attract criticism or change with the times. The sea change in interface design that occurred with the launch of iOS 7 revolved around one notion, *skeuomorphism*.

- **Skeuomorphism** - Skeuomorphism refers to a design principle in which design cues are taken from the physical world. This term is most frequently applied to user interfaces (UIs), where much of the design has traditionally aimed to recall the real world - such as the use of folder and files images for computer filing systems, or a letter symbol for email - probably to make computers feel more familiar to users. However, this approach is increasingly being criticized for its lack of ingenuity and its failure to pioneer designs that truly harness a computer's superior capabilities, rather than forcing it to merely mimic the behavior of a physical object. The term skeuomorphism is derived from the Greek words "skeuos," which means vessel or tool, and "morphe," which means "shape." Skeuomorphism has famously been one of Apple's key design principles, and part of its Human Interface Guidelines. However, the form of skeuomorphism Apple espouses has largely been a subtle form that suggests something real, but doesn't necessarily attempt to replicate it. However, in 2011, Apple came under fire from users when some of its iOS applications took on a decidedly country-western flavor. Overall, skeuomorphism has increasingly come under fire, largely because many of the nostalgic

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elements it attempts to portray - such as calendars, day planners, address books, etc. - are almost entirely foreign to younger generations of users. In addition, critics of skeuomorphism point to this reliance of physical objects in design as an impediment to making more useful designs. For example, many digital calendars look and behave much like a regular paper wall calendar; dismissing this structure could make them a lot more intuitive for users. In other words, design can be constrained by being bound to physical objects, even though computers are not subject to those constraints. TP

The reliance on the real-world look of interface icons has been illustrated in the default Sony Ericsson theme from a feature phone released in 2006 and even at that time it was just one of the available options for dumbphone users. The first iPhone appeared in 2007 and it's no wonder it applied the same approach to visual representation. The criticism of its interface design has to do with the previously discussed phenomenon of user interfaces being conceptual blends. That is, in 2011, Apple was visually stuck in the past, because its everyday object nostalgia showed that it had not fully taken into account that calendars, planners and address books in the digital form do more than paper ones, as a result of the emergent structure of blends between commands present in computing devices and everyday office objects that may even be completely unfamiliar to younger users, for example a late 1970s legal pad with lines and margins, the look emulated by the Notes app and its icon prior to iOS 7. Speaking purely of looks, the same arguments were used against the choice of faux leather-stitching in the otherwise very much modern *Find My Friends* app allowing people to follow their friends based on location and share their own location with them. Figure 11 shows another example, the bookshelf in the iBooks app in iOS 6 and iOS 7 onwards.
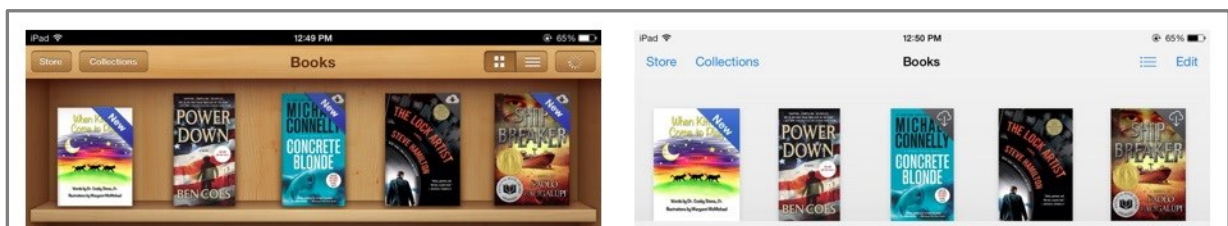
Figure 11. Partial view of the bookshelf in iOS 6 and iOS 7

The wooden bookshelf was felt to have been decidedly out of place on futuristic devices like the iPad and the iPhone. The new approach to software design defined by Apple's hardware design guru, Sir Jonathan Ive was rightly perceived as the flattening of the interface that other device manufacturers soon followed. To be fair, this design strategy had been consistently adopted in Windows Phone 8 and Windows 8 by Microsoft first with their tile-based interface, but it did not take on as a trend before Apple had a go at it. The logic behind this move that yielded a very different design

boils down to a combination of social and technical factors as explained by Ive, Apple's Chief Design Officer and Craig Federighi, the company's Senior Vice President of Software Engineering. Namely, the duo decided to embrace the change on account of the fact that people became accustomed to touchscreens and the absence of physical buttons, which is why there was a new-found freedom to "create an environment that was less specific". This was made possible also thanks to the improved display quality, which allowed dispensing with shadows that were applied to mask the limitations of previous generations of displays (cf. della Cava, 2013). What that meant in practice was that people no longer needed the 3D effect on buttons that made them look clickable or tappable. Simple text on a flat surface sufficed and the bookshelf disappeared completely and was succeeded by a clear white background. This brings to mind the deliberate flattening out and simplification of windows and the hierarchical structure of directories in mobile operating systems mentioned in 4.1.3 above. As computers disappear from view, becoming replaced by smaller portable devices and wearables, design seems to be disappearing as well. All this proves the validity of the claims made by Norman (1990) that the computer is disappearing and that it is invisible. This trend echoes the phenomenon explainable by the blending and reblending process, namely the dynamic nature of conceptual integration networks (see Section VI above). The fact that people have long become accustomed to interface conventions enabled designers to clear the unnecessary skeuomorphic details and focus on clarity, which is believed to contribute to greater efficiency. These conventions have become familiar by virtue of decades of use of computing devices (cf. Moran and Zhai, 2007). A useful analogy can be made with regard to this. If the abandoning of skeuomorphism means the death of the visual metaphor as we knew it (cf. Interaction Design Foundation, 2017), then the rise of the flat design is further proof that the efficiency of interfaces stems from conceptual blending. To be clear, skeuomorphism, which can be visual or auditory (e.g. the old classic phone ringtone on mobile phones, the phone camera shutter sound or keyboard clicks) and is said to have been the preferred design strategy of Steve Jobs has some clear advantages and is and it will always be present in some degree, even in the flattest of interfaces, because skeuomorphic details, like classic watch faces on Apple Watch or sliders toggling options in the phone Settings app that are part of any modern phone interface

are more than clutter, they are clues as to the use of things[60] or the behaviour expected from users in order to complete tasks, in other words, they are perceived affordances (cf. Norman 2013, n.d.). The purpose of icons is similar, since they ensure quick and efficient recognition of operating system features and numerous apps that users download. However, their recognition potential varies greatly, depending on whether they are photorealistic, iconic or symbolic. The icons representing the Photos app in a several operating systems illustrate that evolution.
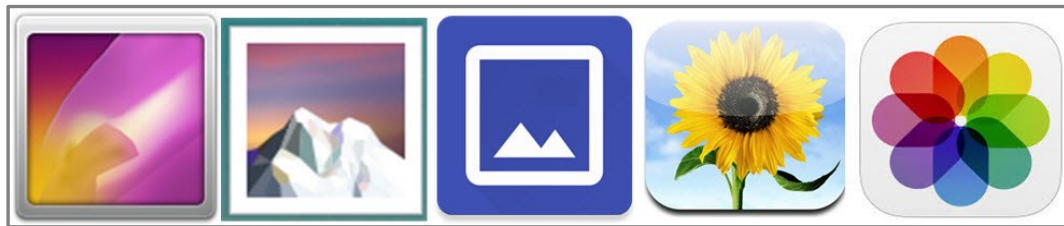
Figure 12. Photos / Gallery app icons in Android, Windows Phone and iOS

The first icon represents the Gallery app storing photos on Google's stock Android 4.4 KitKat. The grey frame indicates that what is shown is an abstract picture. The next one is a custom icon for the same app provided by provided by LG on its devices running Android 5 Lollipop. It is a slightly stylized depiction of a mountain peak, but still largely realistic. As pioneers of the trend towards the flattening of the interface, Microsoft's designers introduced an iconic modification of the mountain pattern, with simple geometric shapes, in Windows Phone OS. Apple, however, decided on a fully photorealistic sunflower in its operating system versions prior to iOS 7, veering sharply away from it since. The new flower is abstract, multicoloured and on a white background, which is the hallmark feature of the new flattened interface. The mode of representation is still iconic. As Nadin (1988: 284) puts it "understanding what an icon represents, as opposed to what it pictures, is essential for designing user interface language". That understanding happens most often via metonymy, in this case, again under the influence of the Containment ICM, producing the relation between the CONTENTS and the CONTAINER, as pictures hang in galleries. Some find that the strategy that "got design out of the way" (cf. della Cava, 2013) can go too far. The fate of the iOS Game Center app is the case in point.

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[60] The camera icon in iOS 7 and onwards is a rare example of an icon that is more skeuomorphic than its predecessor. It shows an iconic image of the whole camera, while the version present in iOS 6 and before features just the camera lens standing for the entire device. Moreover, the relation between iconic images and their photorealistic counterparts is metonymic, as their lack of detail compared to the opposite approach of photorealism signals the presence of THE PART FOR THE WHOLE pattern.

Figure 13. Game Center icon in iOS 6 and iOS 7

The old-school Game Center icon is very much based on the resemblance to the actual games, each presumably representing a different category: board games (chess), field / outdoor games (baseball), electronic games (space adventure − rocket flying) and indoor games (darts). Each square contains an object i.e. the INSTRUMENT that is used as part of the ACTION of playing the corresponding game to which it is metonymically linked. The link is additionally strengthened by the respective backgrounds of the objects. The chess piece, knight is on the chessboard, baseball bat and ball are on green grass, rocket is in the sky that is blue and dartboard and darts are on the wall perhaps a wooden one. Hence, the recognition of the icon's function poses no problems, while the opposite can be said of the current version of the same visual. Four differently coloured round shapes could represent almost anything circular (or not) depending on the context. The sign can be regarded as symbolic, that is a matter of convention, at least until the existing users of Apple's devices have read the text label below the icon and remembered or in the case of new users discovered that tapping the icon opens *Game Center*, the app through which people can challenge their friends when playing online multiplayer games on their iPhones, iPod Touches or iPads. Although it is quite possible that some users may have immediately interpreted the circular shapes as balls, the prototypical toys used in many games, which exemplify the metonymic principle TYPICAL OVER LESS TYPICAL and the resulting relation A MEMBER OF THE CATEGORY FOR THE CATEGORY. On all smartphone platforms, except BlackBerry OS, icons are always accompanied by text labels with the names of apps. They have been removed here, so as to place additional focus on the metonymic character of the images in the course of the discussion. Text and text labels have been shown to facilitate the use of mobile devices, especially for older novice users, unlike young ones who prefer icons (cf. Gatsou, Politis and Zevgolis, 2011). The occasional ambiguity of icons i.e. the possibility of different interpretations, together with the need to pay due attention to cultural differences that might affect mobile metaphor and icon comprehension has been noted by Gatsou,

(2015), while their survey of mobile phone users' recognition of a selection of predominantly dumbphone icons led Gatsou, Politis and Zevgolis (2012) to conclude that the use of complex graphics or ambiguous design solutions decreases the ease and accuracy of icon comprehension. In other words, a degree of schematicity and abstraction makes signs more generic and therefore more recognizable and understandable, a stance also taken by Nadin (1998). Judging by the examples shown here, the designers of modern smartphone operating systems have successfully implemented these design recommendations.

There is one more interesting, even entertaining aspect of the diversity of mobile icons that has been shown to increase for a number of reasons. First there are user-initiated changes − Android users can freely change the look and feel of the interface by installing multiple launchers and similar freedom is enjoyed by users of jailbroken Apple devices. Second, operating system manufacturers tweak the look and content of icons, sometimes ever so slightly (e.g. by adding or removing shadows) and sometimes more or less radically (e.g. Apple's design change or the fact that Google's latest launcher, appearing on its flagship Pixel phones has round instead of square icons) with every major iteration of their OSs. As pointed out above, manufacturers of mobile hardware running Android are free to design the majority of icons as they see fit and lastly, the example of the Box app icon analysed here shows that app developers sometimes change icons as part of major app functionality updates. Sometimes, however, the reasons are more trivial. Take for example the icon of the mobile game *Guess the Emoji*:

Figure 14. Regular Guess the Emoji app icon and its Easter version

The icon of this app, where the letter O is normally replaced by a smiling emoji, the prototypical representative of its kind pictograms is yet another case demonstrating the metonymy A MEMBER OF THE CATEGORY FOR THE CATEGORY. Around Easter, the smiley was pushed out by a smiling cartoonish Easter bunny and the whole icon got a

spring look, which lasted for a couple of days, and then with another update to the app, things went back to normal. The practice of changing app icons with seasons and holidays which does not seem to be present in apps other than games has been popularized and quite possibly established by Angry Birds Seasons, one of the massively popular Angry Birds games that gets an icon facelift with every season and major international holiday, from Christmas to Halloween.

The variety of icons may be considerable, but it hardly compares to that of emoji and emoticons, the protagonists of the next section. To summarize, whatever, their shape, size or content, icons as visual elements, necessarily highlight some aspects of the phenomena to which they refer, Thus, they are predominantly metonymic, mnemonic devices, speeding and greatly facilitating the interaction of humans and computing devices, based on direct manipulation. They gloss the surface of computing, adding a visual layer that makes navigating both PC and mobile interfaces and performing basic tasks a breeze for the vast majority of people, even novice users of the contemporary communication gadgets, in particular mobile phones, which, in turn, increases their popularity that has a lot to do with the fact that mobile phones have evolved from machines for speaking to machines for writing too (cf. Ferraris, 2014). What people are writing on the move are mostly short messages interspersed with pictograms, a strange, but uncommonly effective, blend of text and images. There is no point in keeping the readers guessing any longer about the colourful realm of emoji, which we now enter with a smile(y).

VIII A SHORTHAND'S PROGRESS – the invasion of images

8.1 Origins and omnipresence. Emoji are an ever-expanding phenomenon sharing roots with chat shorthand and emoticons that came before them and with which they coexist, having taken the world by storm in the space of a few short years. The meteoric rise in the popularity of this system of communication that helps fill the gap left by the absence of face-to-face contact in our digitally-mediated exchanges coincides with the rapid pace of adoption of mobile devices in general and feature phones and smartphones in particular. Its origins can be traced to the late 20th century Japan, home of the loanword that has since become a household term. Explaining its etymology as coming "from e 'picture' + moji 'letter, character'", the Oxford University Press blog entry dedicated to the Oxford Dictionaries Word of the Year 2015[61] (the coveted title that in an unprecedented fashion, went to none other than, you guessed it, an emoji) also warns against confusing it "with emoticon, a facial expression composed of keyboard characters — such as ;) — rather than a stylized image". Defined by Evans as an iconic, visual representation of an idea, entity, feeling, status or event, that is used alongside or instead of words in digital messaging and social media" (Evans 2016a) and "single character glyphs found in the digital keyboards of internet-capable mobile computing devices such as smartphones" (Evans 2016b) emoji[62] have been readily embraced by the global connected population. However, the sheer frequency of their use has also sparked considerable outrage, not unlike the "moral panic" described by Thurlow (2006) in connection with the use of language in instant and text messaging a decade ago.

The popularity of emoji goes hand in hand with their mushrooming diversity documented and approved by the Unicode Consortium, namely the Unicode Emoji

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[61] Oxford Dictionaries Word of the Year 2015 is… 😂 Retrieved July 22, 2016 from http://blog.oxforddictionaries.com/2015/11/word-of-the-year-2015-emoji/.
[62] Being a loanword from Japanese, the term "emoji" has no plural in the majority of instances of its use in the West either.

Subcommittee[63]. Their number reached almost 2000 in late 2016[64], increasing with every new iteration of all major contemporary mobile and computer operating systems.

Given the fact that smartphones and other contemporary portable devices are the main driving force behind the proliferation and the growing use of emoji worldwide, as well as their crucial role as *bona fide* substitutes of the elements of language missing in the predominantly text-based online communication, namely, intonation and other prosodic elements, as well its non-verbal facets – gesture and facial expressions (cf. Evans 2016a), emoji and their variants, as well as their still actively used predecessors – emoticons form part of a separate sample of terms related to mobile communications analysed here within the framework of cognitive linguistics. The exploration of the nuances of their semantic features, which in the case of typical emoji and emoticons stem from their close relation to the bodily aspects of communication, enhancing language-based interaction should prove to be fruitful in the light of the significance attached to the embodiment of meaning in general in the cognitivist enterprise (e.g. Johnson 1987).

8.2 Emoji and emoticon sample structure. The sample consists of 288 emoji from the largest online resource of Unicode-approved glyphs, Emojipedia, 20 animated emoticons and shortcodes used in the cross-platform Voice over IP (VoIP) application Skype, as well as emojis/stickers available in the mobile applications launched by the reality TV star, Kim Kardashian (Kimoji) and the singer, Justin Bieber (Justmoji) – 20 each. It also includes 282 text-based emoticons taken from the comprehensive list provided by PC.net, as well as 30 specific body-part text emoticons listed by Netlingo The Internet Dictionary. The total number of items in the sample is thus 660. The two main resources have been selected because they provide explicit semantic information about each entry (along with additional details such as emoji/emoticon variants and names thereof, Unicode versions, update dates and platform-specific variations) facilitating the analysis aimed at highlighting the ramifications of their

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[63] The Unicode Emoji Subcommittee is responsible for the following:
- Updating, revising, and extending emoji documents such as UTR #51, Unicode Emoji and Unicode Emoji Charts.
- Taking input from various sources and reviewing requests for new emoji characters.
- Creating proposals for the Unicode Technical Committee regarding additional emoji characters and new emoji-related mechanisms.
- Investigating longer-term mechanisms for supporting emoji as images (stickers).
The Unicode Emoji Subcommittee is a subcommittee of the Unicode Technical Committee operating under the Technical Committee Procedures. Current co-chairs are Mark Davis (Google) and Peter Edberg (Apple). Cited from: http://www.unicode.org/emoji/.
[64] Emoji Versions, v4.0 available at http://unicode.org/emoji/charts/emoji-versions.html.

meaning and the directions of its extension. This main aim guided the process of selection of emoji in particular, since only those that exhibited expansion and/or variation of meaning have been included in the sample, complemented with a few pictograms that represent instances of cultural variation.

The emoji featured in Emojipedia that this website grouped into the following broad thematic categories: *Smileys & People*, *Animals & Nature*, *Food & Drink*, *Activity*, *Travel & Places*, *Objects*, *Symbols and Flags* have been further subdivided for present purposes. Namely, the first category, *Smileys & People*, which naturally has the richest semantic structure, required the introduction of additional categories mirroring the role of emoji as aids to expressing emotions and providers of non-verbal cues. Thus, *Faces and Cat Variants*; *Gestures*, *Body Parts and Body-Related Emoji*; *Clothing and Accessories*; *Occupations and Cat Variants*; and *Relationships* were added to the mix. Every entry in the sample is accompanied with one or more images of each emoji and its variants (wherever visual differences are related to the shades of meaning or otherwise interesting) and a textual description followed by the section *Also Known As* listing alternative names of emoji that often reveal the development of their meaning.

A small selection of emoji developed as part of the trend - pioneered by Kim Kardashian and continued by Justin Bieber, among others - of celebrities launching apps in the form of standalone keyboards for mobile operating systems (Apple's iOS and Google's Android letting users paste emoji-as-images i.e. "stickers" in any applications allowing standard text input) has been included to illustrate one of the ways in which these glyphs are quickly evolving.

One of the most widely used VoIP platforms, Skype that provides desktop software and applications on all current and several now defunct mobile platforms has an integrated chat functionality and with animated emoticons and as of late short video clips called Moji. Since animated gifs, unlike images cannot be inserted into a document, several frames of each featured gif are included to show what the animation consists. The gifs are followed by the short textual codes and text-based emoticons that can also be used to insert the respective gifs instead of choosing the desired one in a pop-up window. The coexisting insertion options show that these gifs straddle the eras of the colourful emoji and their predecessors created by using the limited resources offered by keyboard characters.

Emoticons are the largest group of entries in the sample classified mostly according to the same criteria as the emoji from Emojipedia, with a slightly different subclassification of the category *Smileys & People* into *Occupations & Lifestyle* with others unchanged, i.e. *Animals & Nature*; *Activity*; *Travel & Places*; *Food & Drink*; and *Objects*. The PC.net list provides information about the meaning of each emoticon as a whole, as well as its constituent parts, the sometimes numerous variants, the platforms on which they are used, the frequency of use ("Common", "Average" and "Uncommon"), as well as about viewing direction ("Horizontal (tilted 90° to the left)", "Horizontal (tilted 90° to the right)"), "Vertical (not tilted sideways)", "Overhead (viewed from above)" and "Text (used as a shortcut)") and the date of the last update. The vast majority of entries belong to the categories "Common" and "Average", with "Uncommon" emoticons represented only sporadically. While the multiplication / modification of meaning predictably takes place mainly in the first category, subdivided into *Professions & Lifestyle*, the decision was made to include quite a few of additional items in the sample, populating other categories without the same potential for semantic expansion. This was done in order to showcase a fuller gamut of emoticons displaying different structural patterns, weaving intricate patterns emerging from visual analogies. Invented thirty-five years ago by Scott Fahlman, a computer scientist at Carnegie Mellon University, faced with the need to signal the tone of the text-only electronic communication on the university bulletin boards, the original smiley :-), the first-ever emoticon and its opposite :-(were proposed to distinguish jokes and sarcasm from the remarks that were to be taken seriously. At the time, it was an "elegant solution" aimed at preventing "flame wars" (cf. Fahlman, S.E. (n.d.)), exchanges of belligerent messages started by those who misinterpreted the communicative intent. From there, the number of emoticons quickly grew to include a staggering variety of character sequences compatible with the ASCII character encoding standard, present in early computers and other telecommunications devices, which was subsequently incorporated into Unicode that nowadays includes standardized emoji. Having opted to focus predominantly on the emoji incorporated into the Unicode standard, we have followed a similar course with emoticons, stopping short from including the examples created by using non-Latin characters (i.e. based on the Arabic, Japanese or Korean scripts) or the complex variations that take up several lines of text or special characters not found on keyboards, thus bordering on or belonging to ASCII art.

Overall, it seems that a parallel could be drawn between the command-line interfaces requiring users to type complex text-based commands and bare-bones, stark-looking emoticons (consisting sometimes of many keyboard characters) at the one end of the spectrum and modern graphical (even touch-based) interfaces and colourful, more fleshy and muscular, increasingly photorealistic emoji on the other, with animated gifs set somewhere towards the middle of the continuum.

With the final observation that chat acronyms selected from Crystal (2008) belong to the main sample of terms pertaining to the world of mobile devices, we now turn to the issue of the analytical approach applied to the emoji and emoticon sample entries.

8.3 An analytical approach to managing multiple metonymies and metaphors.
Of all the dominant mechanisms of thought and language investigated by cognitive linguists, metonymy reigns supreme in the emoji and emoticon sample. Therefore, the fine-grained classification proposed in Kövecses & Radden (1998) and Radden & Kövecses (1999) based on the notion of Idealized Cognitive Models (ICMs) (cf. Lakoff 1987) may offer a fitting benchmark against which to stack up the many metonymies behind the pictorial and text-based glyphs, some of which serve as input for metaphors. The aim is therefore to pinpoint the ICMs, metonymies and metaphors and the related phenomena that structure the knowledge contained in the verbal descriptions of the meaning of the non-verbal shorthand that increasingly appears in computer-mediated communication today. The shared origins, but different media in which emoticons and emoji are created, namely, text and image, define their respective domains of diversity, with the former distinguishing themselves by colours and images, while the latter exhibit a high degree of structural variations. Emoji and (animated) picture emoticons are individual images resulting from coding the cognitive content into pictures, whose expressive potential and complexity has recently been increased by the introduction of two types of ligatures allowing emoji to become more open to diversity when it comes to race, gender and occupation choices, in keeping with today's social norms. These are skin tone modifiers and emoji sequences using zero width joiners [65] to merge two picture characters into a new semantically related one (e.g. the *Female Judge* emoji is a sequence of three emoji 👤 Woman, ⚖ Scales and Variation Selector-

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[65] According to the Wikipedia entry (retrieved 27 September, 2016 from https://en.wikipedia.org/wiki/Zero-width_joiner), "the zero-width joiner (ZWJ) is a non-printing character used in the computerized typesetting of some complex scripts such as the Arabic script or any Indic script. When placed between two characters that would otherwise not be connected, a ZWJ causes them to be printed in their connected forms."

16 that determines a specific glyph variant). As such, these picture characters (whose very names are largely unknown to users[66], unless they download an emoji-listing mobile app or turn to the Internet and the resources like Emojipedia for help) had to be analysed relying solely on the semantic information provided in their descriptions and in the two surveys of their online usage, *SwiftKey Emoji Report*[67] published by SwiftKey, the maker of a popular keyboard for mobile devices and 2015 Emoji Report[68] by Emogy. Emoticons, however, provided an additional path to decoding their meanings, namely, the deconstruction of text-based glyphs into constitutive parts, which revealed their multiple roles in different combinations, thus bringing into view both the points of ambiguity and the multiple meanings, naturally present in emoji as well, and showing that virtually all letters and typographic symbols available on a Latin keyboard take part in their construction. Further possibilities for creating new meaning and creating or avoiding ambiguity arise from free combinations of characters that users make when messaging each other that are dependent on the context and communicative needs, which led to attempts at translating literary works (notably *Alice in the Wonderland* and *Moby Dick*, conveniently renamed *Emoji Dick*) into emoji. Exploring these and possibly other translation efforts is well beyond our current purpose, but the following outline of meaning construction devices applied to emoticons and emoji will include examples of ambiguity and expansion of meaning in different directions. The two types of glyphs will be analysed side by side wherever possible, while factoring in cultural differences, which should provide a comprehensive insight into the cognitive strategies behind the use of pictograms online and also, no longer surprisingly, offline, especially in advertising and in the media.

8.4 From smiling faces to smiling faeces. The glyphs are not all smiles. Multifarious metonymies and other meaning-making methods. One look at a typical emoticon or emoji is enough. The round faces representing emotions carry a clear and universally understandable message that remains etched in our mind. They also offer a natural starting point for the discussion of the semantic significance of picture characters, with the obvious choice of THE FACE FOR THE PERSON as the basic relation that provides the foundation for further branching of the meaning and shape

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[66] In order to discover the official names of emoji, the users of Apple devices have to resort to a workaround and enable the VoiceOver accessibility option in the interface that converts text to speech allowing them to hear the name of each glyph as they select it on the built-in iOS Emoji keyboard.
[67] Retrieved July, 12, 2016 from: https://www.scribd.com/doc/262594751/SwiftKey-Emoji-Report.
[68] Retrieved July, 12, 2016 from https://emogi.com/documents/Emoji_Report_2015.pdf.

of text and picture glyphs alike. This metonymic pattern intimately interacts with others i.e. THE PHYSIOLOGICAL AND EXPRESSIVE RESPONSES OF AN EMOTION STAND FOR THE EMOTION derived from a more general principle stating that EFFECTS OF A STATE STAND FOR A STATE (cf. Lakoff 1987, Kövecses, 1986, 2005, 2010 and 2015) which, in turn, stems from the conceptualization EFFECT FOR CAUSE and the Causation ICM (cf. Kövecses and Radden (1998)). They explain the physiological aspects of human emotions whose visual representation as facial expressions was the original *raison d'étre* of emoticons and subsequently emoji and has remained their main distinguishing feature. Firstly, the prototypical picture smiley is represented as a round face with dots for eyes and the right parenthesis for a smile. Likewise, in the original emoji, there are no other facial features, no nose, ears or hair. The head is a circle, since the typical shape of the face and the head is round. Until recently, their default colour was yellow, chosen when emoji first appeared for its non-human quality, presumably to ensure a kind of equality and prevent any negative references to race. In a way, this amounts to a reversal of the cognitive principle HUMAN OVER NON-HUMAN (cf. Kövecses & Radden (1998, 64). Here are some examples of the best-known glyphs to begin with:

- **Happy =) :-) :) ^-^ (: !_!** = This is popular happy face that uses an equal sign for the eyes. It is also a Gmail emoticon shortcut. One of the most common emoticons. Can represent happiness or may be inserted after a sentence to show good feelings about something or someone. A quick way to write happy. A common IM shortcut. Direction: horizontal (tilted 90° to the left). The caret symbols represent eyes looking upward, and the underscore is a smile. Direction: vertical (not tilted sideways). A happy face from right to left. Direction: horizontal (tilted 90° to the left). The exclamation points represent eyes with stretched eyebrows, indicating this person is extremely happy. Direction: vertical (not tilted sideways). PN

- **Winking ;-) ;) ~_^ (-!** = This popular winking emoticon is often used after a friendly or sarcastic statement. The winking emoticon is common used after a light-hearted or sarcastic remark. It is also a popular IM and e-mail emoticon shortcut. Direction: horizontal (tilted 90° to the left). A vertical version of a person winking with his/her right eye. Direction: vertical (not tilted sideways). In this reversed winking emoticon, the person is winking with his right eye. Direction: horizontal (tilted 90° to the right). PN

- **Laughing Out Loud =D X-D** = This laughing emoticon is an alternative to the common "LOL" abbreviation. The "D" is a big smile and the "X" represents eyes that are nearly closed because the person is laughing so hard. Direction: horizontal (tilted 90° to the left).

- **Laughing Tears :.-)** = A happy kind of crying. Direction: horizontal (tilted 90° to the left).

- **Rolling on the Floor Laughing =))** = Used when something is really funny. Can be written as an acronym - "ROTFL." Direction: horizontal (tilted 90° to the left). PN

- **Sad =(:-(:(** = A common emoticon used to represent sad or upset; may be inserted after a sentence to say, "Too bad." A common emoticon used to show sadness. Often used for saying,

"That's too bad." A quick way to write sad. A common IM shortcut. Direction: horizontal (tilted 90° to the left). PN

- **Awkward :S** = The "S" represents an embarrassed expression that indicates a person is uncomfortable or self-conscious. Direction: horizontal (tilted 90° to the left). PN

- **Worried :-S >w<** = The "S" represents wavy lips, which is used in animation to show worry. Direction: horizontal (tilted 90° to the left). The ">" and "<" symbols represent concerned eyes, while the "w" has a double-meaning. It represents a trouble expression and also stands for "worried." Direction: vertical (not tilted sideways). PN

- **Crying :_(:'(:"-(T_T QQ i_i** = The underscore represents a teardrop. The apostrophe represents a tear. Typing this emoticon shortcut in the AOL or MSN instant messaging programs inserts a graphical emoticon into the chat session. The double quotes symbol (") represents tears and the "(" is a frown, indicating the person is sad. Direction: horizontal (tilted 90° to the left). The T's represent crying eyes and the underscore is a sad mouth. The two Q's represent two eyes with tears, implying the person is crying. It may be used either seriously or sarcastically. The i's represent eyes with tears streaming down and the underscore (_) represents a melancholy expression. Direction: vertical (not tilted sideways). PN

- **Smiling Face** - This smiling face predates emoji, and works in all manner of older browsers and operating systems. The modern version of this emoji has a smiling mouth, happy eyes, rosy red cheeks and eyebrows in the Apple artwork. Differs slightly from the Smiling Face With Smiling Eyes emoji which does not include eyebrows, and has a different style of smiling eyes. When viewed on Android, no eyebrows are present in the Google artwork. See the glossary for information on the term white in Unicode character names. Also Known As: Grinning Face Emoji, Happy Face Emoji, Smiley Face Emoji, Smiling Emoji. EP

- **Winking Face** - A classic winky emoji; winking and smiling. Used to imply humor in written form, or may alternatively be used suggestively, as a form of flirtation. Also Known As: Wink Emoji: Wink Face Emoji, Winky Face Emoji EP

- **Face With Tears of Joy** - A laughing emoji which at small sizes is often mistaken for being tears of sadness. This emoji is laughing so much that it is crying tears of joy. This emoji has been in the top 10 most popular emojis on Emojipedia for all of 2015, and was deemed the 2015 word of the year by the Oxford English Dictionary. Also Known As: Laughing Emoji, Laughing Crying Emoji, Laughing Tears. EP

- **Rolling On The Floor Laughing** - A character lying on the floor due to an extreme amount of laughter. Face is laughing, possibly with one hand hitting the floor. An emoji version of the phrase ROFL. Also Known As: ROFL Emoji EP

- **Slightly Frowning Face** - A face that is a little bit sad, with a slight frown and neutral eyes. Also Known As: Slightly Sad Emoji. EP

- **Worried Face** – A face with a sad mouth, and worried-looking eyebrows. Also Known As: Sad Emoji, Sadface Emoji EP

- **Loudly Crying Face** - A sad face with tears streaming down both cheeks. This face is distraught and inconsolable. Not to be confused with the tears of joy emoji. Also Known As: Bawling Emoji, Crying Emoji, Sad Tears Emoji, Sobbing Emoji. EP

- **Crying Face -** KA

- **LOL -** JA

In the beginning, things appear simple, on the face of it. The iconic nature of text emoticons and emoji is obvious: a smile is a smile, a wink is a wink and tears happy or sad are obviously there, even on Kim Kardashian's face. The parallels between old emoticons and modern emoji are transparent and remind us that the face crying happy tears quietly existed for decades before it got the emoji treatment, was everywhere and became the word of the year. The progress towards "emojification" is evident in the transformation of chat abbreviations like *Rolling on The Floor Laughing* (*ROTFL*, *ROFL*) and *Laughing Out Loud* (*LOL*), which is featured on a Justmoji sticker alongside the laughing cartoonish likeness of Justin Bieber. While the number of visual variations resulting from the combinations of keyboard letters and characters gaining iconic qualities is predictably higher in text emoticons, partly because no attempt was made at their standardization, a degree of differences is present among the Unicode emoji across mobile and other device platforms. Namely, the look and range of emoji depend not only on the artwork-related decisions of the operating system (OS) manufacturers, but also on the specific iterations of the individual OS that users happen to have installed on their devices – unless they update regularly to the latest version, they do not have access to all the available emoji. Since the differences between the emoji provided by main competitors Apple and Google are noticeable even in *the* most basic emoji, the readers can easily imagine the hectic situation affecting its more complex brethren. Add to this the practically identical appearance of the text glyphs meaning *awkward* and *worried* on the one hand and the *Slightly Frowning Face* and *Worried Face* emoji (also reflected in their alternative names) on the other and reasons for concern begin to appear. Some strategies of visual expression, however, have similar and comparable effects. Text based emoticons often use repetition of elements to reflect an increase in intensity of a feature. Therefore, two parentheses indicating a smile are used side by side to show that something that makes one roll on the floor laughing is really funny and in the *Loudly Crying Face* emoji the deliberately exaggerated streams of tears and the little puddle they make stand for the intensity of the sound of crying. Both strategies are at the same time representative of the prototypical case of the conceptual metaphor MORE IS

UP as is indeed the smiling face :), since the corners of the lips are facing up, representing the metaphorical variation HAPPINESS IS UP. Conversely, the features of the sad / worried face :(emoticon and its fellow emoji with downward pointing eyebrows and droopy mouth are typical of the conceptualization SADNESS IS DOWN. These also reflect the general principle THE BEHAVIOURAL REACTIONS OF AN EMOTION STAND FOR THE EMOTION (cf. Kövecses (1986, 41) that applies to all facial expressions accompanying emotions (even the *Pile of Poo* emoji has one – it sports a friendly smile). The frequent multiplicity of meaning made explicit in the textual descriptions of picture characters is another cause for concern of future emoji translators, as for example *Winking Face* may be used to show that a remark is light-hearted or to lighten a sarcastic one, while it could also be a sign of humour or flirtation; even crying can be taken seriously or with a dose of sarcasm. Still we would do well to always keep in mind that glyphs are better not interpreted strictly in isolation, because they are highly context dependent, being essentially paralinguistic elements of communication. To end this section on a slightly lighter note, let's point to the fact that celebrities are not new to glyphs and it's not just them. Take for example:

- **Abraham Lincoln ==(:-)=** = The first equal signs represent a tall hat, while the last equal sign represents a beard. Direction: horizontal (tilted 90° to the left). PN

- **John Lennon //o-o\\ ((*J*))** = The circular glasses John Lennon made popular and his long hair. The parentheses represent the Beatles guitarist's long hair and the asterisks (*) are his glasses. Direction: vertical (not tilted sideways). PN

- **Madonna :-.)** = The famous pop singer. Direction: horizontal (tilted 90° to the left). PN

- **Marge Simpson @@@@:-)** = The "at" symbols represent Marge's tall blue hairdo. Direction: horizontal (tilted 90° to the left). PN

- **Yoda <(-_-)> <(-.-)>** = The wise Jedi Master of short stature from the Star Wars movies. The green Jedi character from the Star Wars movies. Direction: vertical (not tilted sideways). PN

Abraham Lincoln had a text glyph before anyone could dream of Trump (who inevitably has an emoji sticker in his likeness) and John Lennon and Madonna were there well before Justin Bieber and Kim Kardashian. The world of cartoons and Hollywood could not fail to have their own worthy representatives in the likes of Marge Simpson and of course Yoda. These complex picture characters combine the metonymy THE FACE FOR THE PERSON with another facet of the general PART – WHOLE schema. Namely, our ability to recognize the glyphs as the above-mentioned people and cartoon and film

characters is dependent on the relation POSSESSED FOR POSSESSOR that is part of the Possession ICM. Here the tall hat and beard are trademark features of Lincoln, hairstyle is what we notice first about Marge Simpson and Lennon is remembered by his long hair and round glasses. At the time when her text emoticon was made, Madonna had her signature mole and master Yoda still has his pointed ears.

Stepping up the level of analysis a notch, let us introduce some more complex instances of physiological responses to emotions that stand for emotions and inform metonymy-based metaphors, e.g.:

- **Angry X-(:-@ >:(-_-+** = The X represents squinted eyes and a tensed face. The frown indicates the person is unhappy. The "at symbol" (@) represents a puckered face. The ">" represents slanted eyebrows and the frown indicates the person is upset. Direction: horizontal (tilted 90° to the left). The dashes (-) represent angry eyes and the plus symbol (+) is a popped vein caused by anger. Direction: vertical (not tilted sideways). PN

- **Baring Teeth 8o| :-E** = An angry or determined expression with teeth clenched together. Shows a person with clenched teeth. Can also mean "angry." Direction: horizontal (tilted 90° to the left). PN

- **Barfing :-C~** = This "barfing" emoticon might be used as another way of saying, "That makes me sick." PN Direction: horizontal (tilted 90° to the left). PN

- **Drooling :)_ =P~** = The underscore (_) represents drool from the person's mouth. It means the person is drooling over something. Expresses wanting something very much. Direction: horizontal (tilted 90° to the left). PN

- **Jealous 8(>_<)8** = The ">_<" represents a jealous expression and the 8's on the side of the head represent steam coming out of the person's ears. Direction: vertical (not tilted sideways). PN

- **Mad =/ >=(>=[:U :! ~:(** = Can also mean frustrated. The > represents eyebrows angled inward, which apparently is what people do when they are mad. Shows angled eyebrows and a grimacing face. Means the person is upset or angry. The "U" indicates the person is shouting something. The exclamation point (!) represents the person's mouth and also indicates the person is upset. Means "steaming mad." The tilde (~) represents steam coming out of the person's head. Direction: horizontal (tilted 90° to the left). PN

- **Unsure >->'** = This person is cautiously looking to the side and has a bead of sweat on his face. It can also mean "untrusting" or "sceptical." Direction: vertical (not tilted sideways). PN

- **Vomit :O=** = The "O" represents the person's mouth, and the equal sign (=) implies the person is barfing. It may be used to show an intense distaste for something. Direction: horizontal (tilted 90° to the left). PN

- **Angry Face** - An angry looking face. Has inward-facing eyebrows, and a frowning mouth. Expresses anger, grumpiness or annoyance at a situation. Also Known As: Angry Emoji, Grumpy Face Emoji. EP

- **Flushed Face** - An embarrassed face with flushed red cheeks. This face is blushing due to a mistake, or other embarrassing situation. In the Apple artwork this face has

wide open (alarmed) eyes; while other platforms may look more resigned. The Google emoji had a bashful appearance and looked down with closed eyes. This now looks straight ahead. Also Known As: :$ Emoji, Blushing Face Emoji, Embarrassed Emoji, Shame Emoji. EP

- **Pouting Face** - A pouting face outwardly showing displeasure with a person or situation. Displayed with a furrowed brow on most platforms, this emoji is commonly used for mad or angry emotions. Samsung's version of this emoji includes a red anger symbol on the forehead. Also Known As: Angry Face Emoji, Grumpy Face Emoji, Mad Face Emoji, Red Face Emoji. EP

- **Angry** - :@ :-@ :=@ x(x-(x=(X(X- (X=(SK

- **Face With Look of Triumph** - A face with air coming out of its nose, in a proud yet disdainful way. Commonly used for representing frustration at a situation, or a being "in a huff". Also Known As: Airing of Grievances Emoji, Frustrated Emoji, Mad Face Emoji, Steaming Emoji EP

- **Breathing Fire** - JA

- **Drooling Face** - A face shown with drool dripping from one side of the mouth. May be used as a display of desire in a person, object or concept. Also Known As: Drool Emoji. EP

- **Nauseated Face** - A green face, shown with pursed lips as though it may be about to vomit. Used literally for sickness, or as a display of disgust. Differs from the face with thermometer, which is for a common cold or illness and the face with head-bandage which has a head injury. Also Known As: Disgust Emoji, Green Face Emoji, Vomit Emoji. EP

- **Fearful Face** - A face with wide open eyes and raised eyebrows. Appears to be shocked by a scary event. Also Known As: Scared Emoji, Surprised Emoji. EP

- **Face With Cold Sweat** - A face with a sad or neutral mouth, with a single drop of sweat. Also Known As: Hard Work Emoji, Sad Sweat Face Emoji. EP

- **Beating Heart** - A heart with vibration / movement lines above it, indicating it is a beating heart. This emoji is used as a beating heart either representing life, or love. Also Known As: Butterflies In Stomach Emoji, Heart Alarm Emoji, Heartbeat Emoji. EP

Sadness is one in the group of basic emotions that has visible (and palpable) universal effects in the form of characteristic facial expressions and tears that accompany it and metonymically stand for it. Another is anger, whose physiological consequences have been a frequent subject of analyses in the cognitive linguistic literature, where a number of pertinent conceptual processes have been defined. Kövecses (1986) and

Lakoff (1987) thus specify a number of metaphors related to anger elaborated via metonymies that reflect naïve, folk understanding of the bodily manifestations of anger such as AGITATION (tension showing on the face as squinting, frowning and popped veins, as well as clenching teeth and yelling), an increase in body HEAT, which leads to RISING INTERNAL PRESSURE in the BODY metaphorically conceptualized as CONTAINER. The intensity of negative emotions (jealously and madness – stronger than anger or frustration) eventually causes overheating and since ANGER / JEALOUSY IS THE HEAT OF A FLUID IN A CONTAINER, steam starts coming out of a jealous person's ears or a steaming mad person's head, as depicted in the emoticons. The emoji *Face With Look of Triumph* (with its alternative name *Airing of Grievances Emoji* containing a fitting metaphor) has air coming out of its nose and adds pride and disdain to the range of stream-producing emotions, while REDNESS IN THE FACE STANDS FOR ANGER together with the appropriate facial expressions i.e. frowning and pouting signals displeasure, grumpiness and ultimately anger. Compared to the entailment of the above metaphor – WHEN ANGER BECOMES TOO INTENSE THE PERSON EXPLODES - graphically illustrated by a series of frames forming Skype's animated emoticon, steam positively looks harmless. The dramatic effect would not be complete without a sticker showing Justin Bieber breathing fire and angrily clenching his fists exemplifying the derived metaphor used for solids, namely, ANGER IS FIRE (cf. Kövecses (1986, 2005) and the conventional expression *burning anger*. Less violent emotions like embarrassment or shame have milder physiological effects i.e. redness of just one part of the face, the cheeks.

In the light of the essential role of blending in providing the analytical apparatus for a deeper understanding of the DESKTOP METAPHOR and for developing interaction modalities aimed at overcoming its limitations highlighted especially by the contemporary mobile devices, as mentioned in the previous sections, it is important to touch on a different take on the metaphor ANGER IS HEAT (to which, as we have seen, the glyphs are no strangers) proposed by Fauconnier and Turner (1999). Within the framework of their theory of conceptual integration, this construct is regarded as a more complex structure, a blend that goes beyond the straightforward one-to-one mapping between emotions and the physiological effects related to them, as part of the folk model of anger. Instead, the source input space contains the metaphor ANGER IS HEAT itself, as well as the physical events that it entails, while the target input space features the metonymy establishing the connection between the effects and causes of

emotions. As the authors point out, when one metaphorically explodes with anger or has steam coming out of his /her ears, head or nose for that or similar reasons, as shown in the emoji above, such an outcome does not result from a direct projection of the elements from the source to the target. Rather a more nuanced process is at work, namely, selective projection from both input spaces, creates a new blended mental space that contains the selectively projected elements of meaning from both input spaces and organizes this conceptual integration network in such a way that these elements can interact to produce the end result. This is possible because the blend preserves its link to the inputs allowing the projection of inferences from the blend back to them. So the elements of this complex structure can fall neatly into place as the steam can be interpreted in the blend as a new physiological sign of intense anger and frustration, or pride and disdain. This inference is in turn projected back to the target input space to show that the person is very angry and showing the signs of experiencing that emotion. The advantage of blending is the creation of a wider network of spaces and crucially the possibility of elaboration of the blend to allow further expansion of inferences (sometimes in the direction of a hyperbole (not unlike fire breathing Justin Bieber) originally absent from the input spaces and existing exclusively in the blend.

Fear is the emotion with opposite bodily manifestations giving rise to the metaphor FEAR IS COLD. The *Fearful Face* emoji provides a striking image of the tell-tale bodily signs of fear or at least an unpleasant surprise (judging by its alternative name *Surprised Emoji*). The blue upper part of the head with hair standing on end indicates goosebumps and cold with wavy mouth as a sign of shivering. The colour *blue* metonymically stands for *cold*, as part of a widespread cultural stereotype[69]. The facial expression marked by wide open eyes and mouth stands for shock. Its name would suggest that *Face With Cold Sweat* would fit the FEAR / OTHER UNPLEASANT EMOTION IS COLD bill, where the metaphor is motivated by the metonymic relation SWEATING FOR FEAR / OTHER ANXIETY-INDUCING EMOTION (activated in the *Unsure* text emoticon above by the feeling of uncertainty, lack of trust and scepticism). However, the quite neutral look of the emoji themselves has prompted other interpretations which, as we shall see, is a fairly frequent occurrence contributing to the ambiguity of picture glyphs. In

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[69] The stereotype is deeply entrenched – it is perpetuated in everyday situations, for instance via symbols on household appliances, water taps or electric heaters - RED FOR HOT and BLUE FOR COLD.

this case, as the indications that the sweat is cold are missing (blue being the prototypical colour of water and sweat), the shift of meaning from fear to physical effort reflected in the name *Hard Work Emoji* seems only logical. Its other name *Sad Sweat Face Emoji* is indicative of another common trend – when multiple names are present, one of them tends to be a literal description of the picture character's features.

One more unpleasant reaction of the body is nausea, a symptom of illness, the meaning of which got metaphorically extended to refer to the feeling of disgust. The context of use of the pertinent text- and picture-based characters is encapsulated in the sentence: "That makes me sick" that translates into the formula NAUSEA IS DISGUST. The change of colour of the emoji from the prototypical yellow to green, which metonymically carries the connotation of sickness and its slight frown, signalling that the person is about to vomit, heighten the effect already present in the corresponding text based glyphs *Barfing* and *Vomit* above, where the act of vomiting is explicitly shown. Disgust may be an emotion concept which is rarely discussed and represented in the Berkley Master Metaphor List by this mapping only, as pointed out by Stefanowitsch (2006, 88), but the emoji had been in high demand (cf. Butterly, 2015) before it was approved and seems to be fairly popular.

Contrary to popular belief, studies (cf. Ilangakoon & Carpenter, G. H. 2011) show no correlation between an increase in salivation and the level of hunger in humans. Therefore, the sensation described by the adjective *mouth-watering* may be something of a psychic phenomenon according to scientists. Still, the folk perception remains reflected in language, linking the act of drooling to a larger metaphor DESIRE IS HUNGER and so, both the text emoticon and the emoji are used to express that we want something really bad.

An increase in heart rate is among the most significant physiological responses occurring in conjunction with a wide range of emotions, one of the most typical being the feeling of nervousness referred to by the idiomatic expression *to have butterflies (in your stomach)* that features as an alternative name of the versatile *Beating Heart* emoji. Having explored the glyph illustrated physiological responses to basic emotions and before we return to the matters of the heart, as part of the discussion of the role of signs and symbols in glyphs, let us briefly turn our attention to the way they

represent elements of language, the ultimate system that relies on signs to convey meaning.

- **Speechless =#** = The number sign (#) represents sealed lips. Direction: horizontal (tilted 90° to the left). PN

- **Tongue Tied :-& (:@** = Also means sick in Yahoo! Messenger. When a person is tongue tied, he or she is too shy, embarrassed, or flustered to speak. The "@" symbol represents a tied tongue. Direction: horizontal (tilted 90° to the left). PN

- **Lips are Sealed :-# :-X :X** = Picture a person voluntarily putting tape or a bandage over his mouth. When someone says, "My lips are sealed," it means he or she will not tell anyone a secret. An emoticon shortcut in ICQ and Skype. Direction: horizontal (tilted 90° to the left). PM

- **Talking :-{ } :y** = The brackets "{ }" represent a person's mouth and indicate he or she is talking. The "y" represents the person's mouth. It can be used to mean either "talking out of the side of the mouth" or "talking with food in the mouth." Direction: horizontal (tilted 90° to the left). PN

- **Face Without Mouth**   - This emoji has eyes, and no mouth. Represents silence, as this emoji is always silent. Imagine the things he would say if he had a mouth! Also Known As: Blank Face Emoji, Mouthless Emoji, Silence Emoji, Silent Emoji EP

- **Zipper-Mouth Face**   - A face with a zipper displayed instead of a mouth. Used to convey a secret, or that one will not discuss a certain matter with others aka "my lips are sealed". Also Known As: Lips Sealed Emoji, Sealed Lips Emoji, Zip It Emoji EP

- **Mouth**   - A human mouth, sometimes displayed as lips instead of the mouth itself. Also Known As: Kissing Lips Emoji, Lips Emoji, Speaking Emoji. EP

Picture characters may be but an aid to textual communication, yet some of them were created to refer directly to our linguistic ability and the view of language they convey is in fact fully consistent with the folk theoretical account analysed by Radden (2001). The analysis based on cross-linguistic data presents a simplified understanding of the production and functioning of language shared by members of different cultures and linguistic communities. These conceptualizations of language are found to be cognitively motivated i.e. systematic rather than random and rooted in semantic shifts of the metonymic kind that participate in metaphoric constructions. The metonymies show people's tendency to focus on the physiology of speech and by extension language, i.e. on the visible organs that take part in the articulation of speech, disregarding the complexity of the entire process (ibid., 60). Thus, in the *Talking* emoticon, the activity it was named after is embodied by the mouth, the choice motivated by the metonymy INSTRUMENT FOR ACTION that in this context becomes SPEECH ORGAN FOR SPEAKING. It results from the cognitive principle CONCRETE OVER ABSTRACT, namely its subclass BODILY OVER ACTIONAL (cf. Radden & Kövecses,1999:

45). This MOUTH FOR SPEAKING variant is depicted in the literal and perhaps even disturbing sight provided by the *Face Without Mouth* emoji condemned to (eternal) silence it represents – no mouth, no speech. *Speechless*, *Lips Are Sealed* and *Zipper-Mouth Face* all exemplify the same metaphoric expression "my lips are sealed" presupposing that MOUTH IS A CONTAINER storing information, notably secrets and offer a number of ways of sealing the container. This is where lips as the outermost part of the container, its door, so to speak become naturally metonymically highlighted, as an unnamed # shaped barrier or tape X is voluntarily put over them. Alternatively, the lips get replaced by an instrument offering a more secure solution, the zipper. TONGUE FOR SPEAKING[70] is another manifestation of said metonymy. In *Tongue Tied*, the organ that stands for the ability to speak is disabled by having been metaphorically tied and this embarrassing CAUSE FOR EFFECT situation is not the product of a voluntary decision, quite the contrary. Finally, the *Mouth* emoji proves just how fluid the popular understanding of speech production and language happens to be, as this glyph is perceived as either mouth or lips, the instrument employed for speaking, kissing being another activity where its/their role is indispensable. With that in mind, we kiss the domain of physiological reactions to basic emotions goodbye and move on to another crucial domain of application of emoji where they interact with signs and symbols.

8.5 Signs (and gestures) of the times. Where universal recognition and cultural variation meet. Explaining the nature of the Sign ICM as linking a concept and a form and resulting in "sign metonymy", which is also at the foundation of linguistic signs uniting form and meaning, Radden & Kövecses (1999, 23), mention the pattern "FORM FOR CONCEPT : dollar for 'money'" where "the form metonymically stands for the concept it denotes" (ibid. 24). It is present in the following examples in the emoji and emoticon sample:

- **Money-Mouth Face** 🤑 - A face with a bank note showing instead of a tongue, and dollar signs instead of eyes. Indicates a love of money, or a feeling of wealth. EP

- **Money Bag** 💰 🪙 💸 - A bag that is full of money. Most likely coins, given the shape of the bag. Has a dollar $ sign on it, so as to not confuse it with other bags. Also Known As: Moneybags Emoji, Rich Emoji. EP

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[70] The same metonymic motivation is present in the alternative names of two more emoji representing human sense organs. *Ear* is thus also known as *Hearing Emoji* and *Listening Emoji,* while *Nose* presents a more complex case with its monikers, *Smelling Emoji*, *Sniffing Emoji*, *Stinky Emoji*, since the latter pair is differently motivated, *Sniffing* being related to the metonymy MANNER OF PERCEPTION FOR THE PERCEPTION and *Stinky* showing that the nose can be metonymically connected to a(n unpleasant) smell and *holding one's nose* may be necessary.

- **Money With Wings** **-** A pile of three cash notes (US Dollar Bills in the Apple artwork) with a money clip that has wings attached. The money is flying away. Also Known As: Flying Money Emoji, Losing Money Emoji. EP

- **Money Eyes -** JA

- **Greedy $_$** = Money eyes, just like in a cartoon. Direction: vertical (not tilted sideways). PN

- **Money Eyes $-)** = Represents a greedy person or a yuppie who's trying to work his way up the corporate ladder. Direction: horizontal (tilted 90° to the left). PN

- **Money Mouth :-$** = Means "Put your money where your mouth is," according to the AOL Instant Messenger emoticon. Can also mean "embarrassed." Direction: horizontal (tilted 90° to the left). PN

- **Stock Broker $:-$** = He has money on his mind and mouth. Direction: horizontal (tilted 90° to the left). PN

Of course, this metonymic relationship is noticed first, because its outcome is the universally recognizable sign "$". Others include establishing a synechdocal link between the dollar sign i.e. money and wealth or greed. In the last two emoticons, the sign is used literally to illustrate the idiomatic expression "Put your money where your mouth is", as is placed precisely where the mouth should be, while the stock broker is described as having "money on his mind", that is his forehead. However, the placement of money on the mouth in the context of said occupation rather indicates that the person is all about (making) money, exemplifying another widespread metonymy type: EFFECT FOR CAUSE stemming from the Causation ICM. When it comes to glyphs, where there is metonymy, metaphor is never far away. Thus, a wad of cash or a bag of money can grow wings and fly away. First the metonymic relation INSTRUMENT FOR ACTION between *wings* and *flying* is established and as a result, money can be quickly lost.

Emoji and emoticons are no exception when it comes adhering to the cognitive principles governing the selection of the preferred vehicle in metonymy discussed in detail by Kövecses & Radden (1998) building on Rosch (1978), Lakoff's (1987) observations on the types of outcome of metonymic categorization, especially prototypes and social stereotypes, as well as on Langacker's (1993, 30) acknowledgement of metonymy as "basically a reference-point phenomenon" allowing us to pick a salient reference point — a part providing the foundation for drawing

conclusions about the whole category, which results in the essential relation THE PART FOR THE WHOLE.

The fact that it is the dollar sign that is used in all the examples above and not the sign for some other currency could be seen as ensuing from the principle DOMINANT OVER LESS DOMINANT, the dollar being the most dominant (i.e. the most frequently used and the most well-known) currency worldwide, with the U.S as the place where the bulk of software is developed (including the platforms featuring text and picture glyphs).

- **Smiling Face With Heart-Shaped Eyes** - A face with hearts instead of eyes, or *Heart Eyes Emoji* as it is generally known. Used as an expression of love, for example: "I love you" or "I love this". Also Known As: Heart Eyes Emoji, Heart Face. EP

- **Face Throwing a Kiss** - An emoji face blowing a kiss; but officially called "Face Throwing A Kiss". One eye is open, the other is winking. A heart is shown leaving the kissing mouth. Also Known As: Blow A Kiss Emoji, Blowing Kiss Emoji, Kissing Emoji EP

- **Black Heart** - A heart shaded completely black. May be used to express morbidity, sorrow, or a form of dark humor. Also Known As: Dark Heart Emoji. EP

- **Broken Heart** - A love heart, broken in two. This emoji represents the aching one feels when they are missing the person they love. Also Known As: Breaking Heart Emoji, Brokenhearted Emoji, Heart Broken Emoji. EP

- **Broken Heart </3 <~3** = This heart (<3) has been broken (</3). It can be used to tell someone you have a broken heart. This torn heart represents heartache. Direction: horizontal (tilted 90° to the left). PN

- **In Love (*_*) <3+<3** = An enamored expression. Each "<3" represents a heart. Therefore, the two hearts together indicate love between two people. Direction: vertical (not tilted sideways). PN

- **Love <3 ~♥~** = Represents a heart. Sometimes used at the end of a message to say "Love, [person's name]," i.e. "<3, Britney." Direction: horizontal (tilted 90° to the left). The tildes (~) next to the heart represent strings. Direction: vertical (not tilted sideways). PN

- **Falling in love -** (fallinlove) SK

- **Love Hotel** - A love hotel is a hotel that can be hired by the hour, instead of as accommodation for the evening. Can be mistaken for a get well soon emoji due to the similarity in appearance to the hospital emoji, or the ambiguity of the Microsoft emoji displaying a bed with a heart above it. Also Known As: Heart Hospital Emoji, Love Heart Hotel Emoji. EP

- **Hospital** - A place where people are taken to receive medical care. This hospital has a large red cross on the front, often used as a symbol for health care. Also Known As: Emergency Room Emoji, Medical Emoji, Red Cross Emoji. EP

The heart sign is a universally popular symbol that is present across cultures[71] and this popularity has surely grown with the rise of emoji. Since a number of emotions (primarily love) are conceptualized via references to the heart, they form an elaborate folk model discussed by Niemeier (2003) and according to Kövecses (1986, 83) that may be why the heart is regarded as the seat of emotions. As a sign, *heart* metonymically stands for *love* which follows from the subtype of the cognitive principle CONCRETE OVER ABSTRACT, giving precedence to BODILY OVER EMOTIONAL (cf. Radden & Kövecses (1999, 45). But as an organ, it is part of the body and according to the general principle shaped by the CONTAINER metaphor THE BODY IS A CONTAINER FOR THE EMOTIONS and therefore LOVE IS IN THE HEART (cf. Kövecses, ibid.). By further extension, LOVE IS IN A KISS too, as shown in the *Face Throwing a Kiss* emoji where the inclusion of the heart symbol becomes especially important as the key distinguishing feature, given just how small picture characters are, even on the larger phone screens, and puckered lips could be easily mistaken for a pout (the facial expression typical of anger) were it not for a small red heart next to the mouth. If THE HEART IS (A CONTAINER FOR) LOVE, then *Smiling Face With Heart-Shaped Eyes* has the look of love in his/her eyes and is a fitting choice of a visual vehicle to express that emotion. Along with the text-based character (*_*) in which asterisk in the place of eyes are supposed to call up the conventionalized expression of loving behaviour, *starry eyed* (cf. Kövecses, ibid. 93), the *heart with strings* emoticon too refers to an old folk belief that the heart is sustained by nerves and tendons. The expression *to be in love* is the clearest manifestation of the view that LOVE IS A CONTAINER. If two people in it are in a harmonious relationship, the result of the metonymic equation <3+<3 where THE HEART STANDS FOR A PERSON IN LOVE is positive. But, as pointed by both scholars referred to above, the heart is associated with negative emotions too which is emphasized by the colour of the *Black Heart* emoji which stands for morbidity, sorrow, or dark humor. The use of the modifying colour adjective, *black* illustrates the metaphor NEGATIVE IS DARK (AND EXTREMELY NEGATIVE IS BLACK) informed by a "metonymic connection between darkness (as source) and negatively-valued physical and psychological states (as target), which we might call DARK FOR THE NEGATIVE STATES CAUSED BY DARK." (cf. Barcelona, 2003: 40) further developed into DARK (source) FOR NEGATIVE VALUE JUDGEMENT OF DARK (target) through "the association of darkness with a culturally

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[71] According to *SwiftKey Emoji Report*, the use of the heart symbol emoji varies considerably from country to country. SwiftKey cloud data show that the highest frequency of use has been recorded among the French.

sanctioned negative value judgment, whereas the (relative) presence of light is positively valued." (ibid.) Conceived as an AUTONOMOUS ENTITY (cf. Niemeier (2003, 203) and stereotypically pictured as red (ibid. 199) the heart can be broken. This predicament is shown in a quite literal fashion in the *Broken Heart* text and picture glyphs alike, which makes them iconic. Skype, however, may be trying to show that darkness does not prevail. If a soft landing is provided when falling in love, the chances of the heart breaking (at least in the initial stages of the love journey) are hopefully reduced. Enter a person who falls from the sky equipped with a parachute decorated with a big pink heart sign and lands safely. According to Kövecses, (ibid. 90) *falling in love* is a passive process. The animated gif *Falling in Love* is an exception that humorously disproves this rule by literalizing the metaphor. The meaning of the *Beating Heart* emoji is not only an instance of metonymic reference to physiological effects of emotions, but also a reflection of the folk belief that the heart is the seat of life. That mental construct (in conjunction with two other factors) is what leads to misinterpreting *Love Hotel* as the *Heart Hospital* emoji. Namely, the confusion is first triggered by the presence of a high degree of visual correspondence between the buildings depicted in *Love Hotel* and *Hospital* emoji respectively. Second, the H-shaped hotel sign can easily be mistaken for a hospital sign and last but not least, the heart sign, which in fact stands for love-making and indicates the purpose of the establishment in question gets transferred from the folk model of the heart as the site of emotions into a new, related domain where the heart (as a vital organ that retains the connection to emotions) is elevated to the seat of life as a whole. The connection to emotions is directly signalled by the name *Love Hospital* - it goes without saying that people in hospital need both medical treatment and the love of those close to them to get better). Luckily, no such confusion is possible when the comparison takes the opposite direction because the meaning of the red cross sign as a symbol of health care is unambiguous.

- **Sleeping Symbol** - A series of three Zs making a Zzz. Represents sleeping, or snoring. Can also be used in some contexts to mean "boring". Also Known As: Bedtime Emoji, Boring Emoji, Sleep Emoji, Zzz Emoji. EP
- **Anger Symbol** - A red symbol found in Anime/Manga and used to represent the veins popping on a very angry person. Also used in other comic books to indicate a punch landed, perhaps next to the words "Bam" or "Pow". Also Known As: Anger Sign Emoji, Vein Pop Emoji. EP

- **Right Anger Bubble** - A form of speech balloon used with angular edges, used to denote angry speech in comics. Also Known As: Zig Zag Bubble Emoji. EP

- **Dash Symbol** - A gust of air, representing the fast movement of a person or object to the left of this character. Can be used in combination with another emoji to express motion, such as a fast runner or fast car. Also Known As: Fast Emoji, Steam Emoji, Vaping Emoji, Wind Emoji. EP

- **Speaker With Three Sound Waves** - A speaker cone displayed with three sound waves, generally used as an icon to indicate the increasing of volume on a phone or computer. Also Known As: Increase Volume Emoji. EP

- **Vibration Mode** - An icon representing vibration mode on a mobile phone, used as a silent alternative to notification sounds. Appears like a phone with a heart above it in Apple's artwork, and various forms of other vibration lines on other platforms. Also Known As: Phone Heart Emoji, Silent Mode Emoji. EP

- **Can you talk?** - (canyoutalk) SK

- **Headache (({..}))** = Reverberating pain caused by a headache. Direction: vertical (not tilted sideways). PN

- **Bell** - A gold or yellow bell, which is commonly used on mobile phones as an icon for notifications or ringing sounds. Also Known As: Liberty Bell Emoji, Ringer Emoji, Wedding Bell Emoji. EP

- **Left-Pointing Magnifying Glass** - A magnifying glass, pointing to the right. The same as the Right-Pointing Magnifying Glass Emoji, but with the glass on the left instead of the right. Also Known As: Magnifier Emoji, Magnifying Glass Emoji, Search Icon Emoji. EP

The first four emoji in the group above are a reminder of the links between the world of picture characters and that of cartoons as non-verbal cartoon elements are turned into picture characters.

The logogram *Zzz* is a conventional cartoon representation of sleep based on the metonymic link between an iconic (human-made sound) effect and its cause, *sleep*. This link then participates in a metaphoric mapping between a *boring event* and *sleep*, conveying the sense that *one is bored to sleep*. It's worth remembering the informal expression "to catch some zzzs" meaning "to catch some sleep" where the interjection is first converted into a verb that subsequently undergoes nominalization (the cognitive mechanism behind the original conversion process being a metonymy of the ONOMATOPOEIA FOR THE VERBAL ACTION PERFORMED BY THAT ONOMATOPOEIA kind (cf. Martsa 2013, 171). Unsurprisingly, this glyph, along with *Dash* was among the original 176 emoji, designed in 1998 or 1999 by Shigetaka Kurita and his team, to be used by

the subscribers to *i-mode*, the world's first mobile Internet system[72] launched by the NTT DoCoMo network. Emoji creators found inspiration in manga, kanji and kaomoji, the already existing Japanese ASCII art glyphs.

The above-mentioned *Anger Symbol* emoji offers proof that iconicity is a continuum. The western version of the meaning of the glyph seems to be a case of full iconicity – the square punch mark left by a cartoon character on the body of his adversary followed by an iconic sound of physical contact. In the Japanese take on the symbol, though the four lines represent veins popping out. Although the colour RED metonymically signifies ANGER. that meaning cannot be guessed right away without some additional information, making this picture character translucent, i.e. situated somewhere towards the middle of the continuum between transparent and opaque.

Speech bubbles are another typical cartoon element turned emoji. The analogy between the sharp edges of these shapes and sharp words contained in them results in a metaphor whereby they ae referred to as *Anger Bubbles*.

Compared to, for example, *Multiple Musical Notes* emoji 🎶 that stands for music and singing and consists of symbolically motivated musical notation signs, where the link between form and meaning is arbitrary and has to be learned from scratch, *Dash Symbol* would be highly iconic, representing a gust of air produced by fast movement of people or objects. Its alternative names, however, point to a somewhat different direction of the development of its meaning. With three out of four available variations deviating increasingly from the original interpretation (there is no semantic connection between the source domain, *fast movement* and *vaping*, but there is between it and another alternative meaning – *smoke*) this emoji too belongs to the group of glyphs that exhibit varying degrees and types of ambiguity.

Due to being restricted to the visual medium only, like cartoons, emoji and emoticons employ cartoon strategies to make up for the absence of sound and movement (which is somewhat compensated in animated emoticons on Skype and some other platforms). Thus, the lines in the *Speaker With Three Sound Waves* and *Vibration*

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[72] Apple was the force behind the spread of emoji worldwide. The company incorporated emoji in its mobile operating system, iOS as early as version 2.2 aiming to facilitate and speed up the adoption of its devices in the Japanese market already accustomed to the advantages of using glyphs via iMode. Emoji have been available to Apple users worldwide since 2011 when iOS 5 was released. They appeared on Google and Microsoft platforms not long after. More details about the history of emoji are presented in the comprehensive account provided by the Verge. The article "How emoji conquered the world" can be found at: http://www.theverge.com/2013/3/4/3966140/how-emoji-conquered-the-world.

Mode emoji are used to point to the presence and absence of sound respectively, or more precisely the movement of sound waves that produces sound. Like the rest of the emoji in this group, they belong to a numerically relatively significant category of glyphs representing icons used in mobile and/or desktop operating system, as part of interface metaphors. These conventional icons belong in the middle of the iconicity continuum, not being completely self-explanatory. The *speaker cone* stands for *sound (volume)*, in an instance of the INSTRUMENT FOR PRODUCT metonymy, while the relation between the name of the *Vibration Mode* emoji and its alter ego *Silent Mode* is analogous to that between ACTION and RESULT, since activating vibration mode on a handset results in near silence (the absence of ringing and notification sounds). What remains is the barely audible buzz of the vibration module inside the device and the vibrating motion. Here too, the lines stand ultimately for motion. What could be named the LINES FOR (THE INTENSITY / SPEED OF) MOTION / SOUND pattern naturally applies to speech in all sorts of situation including the one referred to in Skype's animated gif which translates into the sentence: "Can you talk?" The motion/sound lines were of course used in old school text emoticons as well. A single example, the picture representation of an ailment will suffice. In the *Headache* emoticon, multiple parentheses represent reverberating pain i.e. pounding or pulsating headache, a synesthetic, but quite unpleasant experience.

The *Bell* and *Left-Pointing Magnifying Glass* emoji represent the INSTRUMENT FOR ACTION metonymic model, the former standing for ringing and the latter for searching, but the fact that they are emoji and not interface icons gives them freedom to be used and combined with their picture character counterparts in a wide variety of contexts and that is often reflected in their alternative names, the case in point being *Bell*, also known as *Wedding Bell* emoji.

The representation of signs is one the important uses of emoji and emoticons and a number of sign-related glyphs in our sample are hand and finger gestures. It is to the realm of gesture that we now turn, aware not only of the significance of gestural input and body language in direct, spoken communication, but also of the ability of picture and text-based glyphs to partially fill the void created by the absence of these elements of para language when communicating digitally. Gestures-as-picture-characters take the form of conventionalized signs or "emblems" whose meaning is shared within a language community or cultural group, just like emblematic gestures are shared

among users of electronic devices with touch-based interfaces, as discussed above. Some have developed different culture-dependent meanings, becoming effectively polysemous. Some are analysable in terms of metaphorical and/or analogical mappings between form and meaning and all can be ranked on a spectrum between the two extremes – iconic and symbolic motivation. The majority of examples are emoji. Although rarer, instances of gesture-themed characters can be found among text emoticons too and there is often a high degree of overlap, as the choice of gestures represented as either kind of glyphs is limited. Let us first take a look at one-hand gestures, e.g.

- **Thinking Face** 🤔 - A face shown with a single finger and thumb resting on the chin, glancing upward. Used to indicate thinking, or deep thought. Can be paired with a thought-balloon or a light bulb, to indicate an idea, and is sometimes used to question the intelligence of a written statement aka throwing shade at a person or concept. Also Known As: Chin Thumb Emoji, Thinker Emoji, Throwing Shade Emoji EP

- **Face Palm** 🤦‍♀️🤦‍♂️ - A hand shown pressing against the head of a person, commonly written as facepalm. Used to display frustration or embarrassment at the ineptitude of a person or situation. May be used in a similar context to the acronym SMH (shaking my head), or in relation to the Picard Facepalm meme. Also Known As: Facepalm Emoji, Hitting Head Emoji, Picard Emoji, SMH Emoji. EP

- **Raised Hand** ✋ - A hand held up showing its palm. May be used to mean *stop*, or as a high-five. Also Known As: High Five Emoji, Stop Emoji. EP

- **Victory Hand** ✌️ - Most commonly known as a Peace Sign, but traditionally called as a *Victory Hand.* Two fingers held up on one hand making a V sign. Also Known As: Air Quotes Emoji, Peace Emoji, Peace Sign Emoji, V Sign Emoji. EP

- **Raised Fist** ✊✊🏿✊🏾 - A fist raised in the air used as a celebratory gesture: the fist pump. Can also be used to represent zero items, due to a lack of any fingers being held up. Uses a right-hand in the Apple and Google versions of this emoji, and a left hand on the Microsoft and Twitter artwork. Also Known As: Fist Pump Emoji. EP

- **Raised Hand With Fingers Splayed** 🖐️🖐🏼🖐🏾 - A raised hand with a part between each finger and the thumb. Held up in a manner that may indicate the number five. Similar to a waving hand, without any motion. Also Known As: Five Hand Emoji, Splayed Hand Emoji. EP

- **Talk to the hand** - 🤚 (talktothehand) SK

- **Call** - 🤙 (call) SK

- **Sign of the Horns** 🤘 - A "rock on" hand gesture raising the pinky and index fingers on one hand, which [has] a variety of other meanings. Also Known As: Devil Fingers Emoji, Heavy Metal Emoji, Rock On Emoji EP

- **Thumbs Up Sign** 👍🏿 - A thumbs-up gesture indicating approval. Also Known As: Like Emoji, Thumbs Up Emoji, Yes Emoji. EP

- **Thumbs Down Sign** 👎🏽 - A thumbs-down gesture indicating disapproval. Also Known As: Dislike Emoji, No Emoji, Thumbs Down Emoji. EP

- **^_^/** = This happy person is giving high five to someone. It may be used in online chat or online gaming to congratulate another person. Direction: vertical (not tilted sideways). PN

- **Talk to the Hand =; =** Means "I'm not interested in listening to what you have to say." Direction: horizontal (tilted 90° to the left). PN

- **Metal \m/ lml _** = A metal hand is a fist with the two end fingers pointed up. This a "metal" hand where l's represent the index and pinky fingers and the "m" represents the middle two fingers. This variation of the metal sign also includes the thumb. Direction: vertical (not tilted sideways). PN

The chin holding of the *Thinking Face* emoji does not belong to gestures proper. Voluntary and habitual non-communicative movements, such as holding or stroking one's chin, smoothing hair or positioning one's glasses with one's hand that may or may not accompany speech are variously referred to by different scholars. For example, McNeill (1992) mentions the broadest term "non-gestures", Kendon (2013) opts for "comfort movements", while these movements that are used to satisfy some need are most commonly known as "hand-to-face self-adaptors" (cf. Ekman & Friesen, 1969 who also note that "The head may be scratched almost as an emblem of ongoing thinking or wondering, the forehead wiped almost as an emblem of difficult or tiring thought." Ibid. 87). Following Ekman & Friesen, the same near-emblematic status could be assigned to holding one's chin when thinking. The description provided for this emoji gives an example of the power of combining several glyphs to achieve the desired effect, i.e. provide a successful depiction of the thinking process, which may also be used to show the results of that process, including having an idea or indeed questioning the validity of other people's ideas and attitudes (as indicated by the slang expression *to throw shade*). The serious facial expression of the emoji points to it being another example of the EFFECT FOR CAUSE metonymy like the next picture character which has recently risen to fame.

A curious case of an Internet meme[73], turned noun, turned interjection, turned verb, turned emoji, *Face Palm* shows a person of either sex (no longer simply a typical

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[73] Facepalm. (2017, June 26). *In Wikipedia, The Free Encyclopedia*. Retrieved July 10, 2016, from https://en.wikipedia.org/w/index.php?title=Facepalm&oldid=787656594.

smiley face), hand pressed against her/his head and covering the face, expressing embarrassment and frustration at one's own ineptitude or that of other people or a situation. Its form and meaning are close to another self-adaptor described by Ekman & Friesen (1969, 88) "the eye-cover act in which the hand covers but does not dig, scratch or rub the eye has a shared meaning relating to preventing sensory input or avoiding being seen, and is relevant to shame." Consequently, based on this gesture where the palm is facing inward, the metaphor THE PALM IS A (PROTECTIVE) COVER could be formulated, since, depending on the context, this hand movement is made in an attempt to hide our own shame and frustration or to protect ourselves from an embarrassing situation caused by external factors. Given this meaning, the fact that in online communication it refers to and can stand for another movement, namely, shaking one's head in disapproval, for which the chat acronym SMH (*Shaking My Head*) is used does not seem strange.

The *Raised Hand* emoji also shows the palm of the hand, albeit differently positioned, which crucially influences the meaning of the gesture. As noted by McNeill (2014, 84), focusing on the metaphoric potential of Neapolitan gestures, analyzed by Kendon (1988), "Palms (…) are the site of force, energy, and action. This is why the palms face the danger in warding-off emblems", resulting in the metaphorical conceptualization of the PALM as a BARRIER or an OBSTACLE. It, in turn, prototypically translates into the interjection "Stop!", even more effectively shown both visually and lexically in the animated emoticon *Talk to the Hand*, where again the emotional state is reflected by the EFFECT FOR CAUSE relation between frowning and displeasure or anger. The hand is raised in front of the face, creating a physical barrier between the face which, as ever, stands for the person and the interlocutor. The accompanying informal phrase, the elliptical version of the sentence "Talk to the hand because the ears ain't listening"[74] or "Talk to the hand, because the face ain't listening", often regarded as sarcastic, is a sure sign of the existence of a communication barrier, preventing the flow of information conceptualized via the CONDUIT metaphor. The contemptuous imperative may lend itself to an interpretation as a blend with regard to the fact that body parts are metonymically endowed with the ability to register and decode speech, becoming metaphorically personified in the process. In other words,

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[74] Additional details about the meaning and origin of this expression are available in Gary Martin's Phrase Finder entry retrieved July 26, 2016 from http://www.phrases.org.uk/meanings/talk-to-the-hand.html.

such multiple mappings require multiple interrelated input spaces to produce the complex picture at hand. *High Five*, the alternative name of the *Raised Hand* emoji refers to another gesture that at first sight has the same form, but a quite different meaning. While *High Five* is a friendly, greeting, celebratory or congratulatory gesture and invites contact between two people (the phrases "Give me five" or "High five" are used for that purpose), its counterpart is hostile and forbids it. *High* refers to the position of a person's hand, which is held high in the air, before the other person joins and they slap against the palm of each other's hands. *Five* stands metonymically for the fingers. But that's far from all. There is another documented[75] variation of this gesture known as *Air Five*, or by its even more ingenious name *Wi-Five*, where the participants' hands cannot touch due to them being too far apart and only the line of sight is necessary for the gesture to be completed "over the air", i.e. wirelessly, hence the blend between *wi-fi* and *high five*. The motivation for *Air Five* is thus the same as in *AirPods* and other similar *air* compounds, mentioned in a previous section, where *air* refers to the medium of transmission of information and the resulting absence of physical contact. However, the other part of the definition reads "The participants may simply pretend to high five, or add an imitation sound of hand slapping". In this case, the metaphor is slightly, but crucially different, since this meaning of *air five* is closer to that of compounds such as *air guitar* in that we are dealing with pretence and imagination. The conceptual metaphor behind it could be formulated at the most general level as THE ABSENCE OF PHYSICAL CONTACT IS AIR, or more specifically, ABSENCE OF THE REAL THING IS AIR, which comes close to reflecting the meaning of *hot air* – empty talk, claims or promises without any real value or meaning. Be that as it may, emoji have allowed their users to high five over much greater distances than ever before.

Continuing with that theme, notice the alternative name of *Victory Hand*, *Air Quote Emoji*, which in fact is different gesture that combines *V Sign* with movement. Here too, as in *air guitar*, or the second sense of *air five*, the thing described is not real. *Air quotes* or *finger quotes* are virtual quotes, formed in the air by the speaker who first makes the Victory Hand gesture and from that position quickly lowers their index and middle fingers twice. This gesture is used in speech in the same situations as *scare*

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[75] In addition to this variation, the Wikipedia article on High Five (retrieved 28 July, 2016 from https://en.wikipedia.org/wiki/High_five) also mentions its predecessor Low Five, with which it forms a sequence accompanied by the rhyme "Too Slow".

(*shudder* or *sneer*) *quotes* (another metaphorical formation) in print, their context of use being roughly analogous to that of the phrase *so called*. *Air* or *scare*, they not only mark the non-standard and the unusual, warning against taking things literally (as they can convey derisive, ironic or sceptical undertones) or without a grain of salt, but also sometimes merely introduce a word or a phrase. Naturally, part of the meaning of the modifier *air*, in these examples, points to the fact that these are all gestures, movements of hands forming shapes[76] or tracing shapes in the air, and this fits well with implications of the imaginary. The speculative metonym AIR FOR GESTURE (see 4.5. above) clarifies that air guitar players do not play a real instrument, they *just gesture*. With the issue of *air* hopefully cleared, the main uses of the *Victory Hand* emoji can be discussed.

Like other emblems, the *V Sign* emoji is a substitute for language and has a precise verbal translation, in this case "V is for victory", the meaning that was popularized during the World War II or otherwise a symbol of peace adopted by the post-war counter-culture movements. As a peace sign, it subsequently developed into a constant feature in the photos of people in the Far East, most notably Japan (with China and other countries closely following the trend[77]) which earned it an emoji in the first place. So far so good... or not really? Careful, one wrong move(ment) and things could go bad, even nasty. Victory hand has a bad side, literally. Namely, if instead of palm-front, the V sign is shown palm-inward, facing the signer, it becomes a serious insult of the "Up yours" variety, at least in the UK and the Commonwealth countries. If only some U.S. politicians and pop stars[78] had known that in their day. Such minimal pairs might be rare among gestures, nevertheless, it is never a bad time to reiterate a major point made by Kendon (1988, 134) that emblems "are not shaped on the spur of the moment but follow an established form within a communication community".

This brings us to one of the most emblematic and basic roles of a group of gestures to which our next two examples, *Raised Fist* and *Raised Hand With Fingers Splayed*

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[76] The modifier *finger* in the compounds *finger quotes* or *finger gun* serves the same semantic purpose, to distinguish between a mere gesture and the actual thing. Thus, *finger* (metonymically standing for the hand that forms the gesture and by extension for the gesture itself) immediately signals that the gun is harmless, unlike for example, an *air gun* (this already existing compound precludes the use of *air* to mark the senses related to imagination and gesturing), or many other genuinely lethal types of guns.
[77] The Wikipedia entry for V sign (retrieved 29 July, 2016 from https://en.wikipedia.org/wiki/V_sign) that provides additional information about its origin and uses states that in these countries the association with the peace movement has disappeared, but that it is still associated with victory or simply with the exclamation "Yeah!" implying happiness.
[78] The Strong Language Blog post "Up yours: The gesture that divides America and the UK" (retrieved 27 July, 2016 from https://stronglang.wordpress.com/2015/10/08/up-yours-the-gesture-that-divides-america-and-the-uk/) mentions the V sign related gaffes by Justin Bieber and George Bush Sr.

belong, as indeed does *Victory Hand* too. That role is finger counting. Thus, the *Raised Hand* emoji means "zero" as the hand is clenched into a fist and no fingers stick out, quite unlike the opposite situation where all five fingers are splayed or the V sign which can also mean "two". The fist pumping gesture, to which the alternative name of the *Raised Fist* emoji alludes is "the art or act of engaging in clenching, then raising one fist or both fists, and pumping them rhythmically or out of beat to house/techno music"[79] or perhaps more often, the celebratory gesture, typically performed by a triumphant sports player who raises his/her fist in front of the body and then draws it quickly back towards the body in a motion that resembles pumping, which provided the source of the analogy.

Analogy is what motivates both a modern-day metaphoric gesture like *Call*, better known as *Telephone*, where the hand and fingers form the shape of a telephone receiver, (signalling the gesturer's willingness to give someone a call or the request "Call me") and an ancient one that goes by different names including *Sign of the Horns* and *Devil Fingers* as in the emoji. Its purpose is to ward off evil, and perhaps to give an evil eye, while at the same time protecting the gesturer form an incoming evil eye, as hypothesized by McNeill (2014) or indicate that the person it is shown to has been cuckolded. Nevertheless, it is certain that its connection to rock music (still considered by some to be the work of the devil himself) and particularly to heavy metal, stems from the association with the devil, the link being strengthened by the references to Satanism and its practices made in certain metal genres. The relation between the horns and the devil is of course metonymic and is an instance of the pattern POSSESSED FOR POSSESSOR, while a different metonymy guides the understanding of the compound noun "metal hand" appearing in the description of the text-based glyph representing the horned gesture. That is a case of the INSTRUMENT FOR ACTION relation where *hand* stands for *gesturing* and the modifier is also metonymic since it is a shortening of the compound noun *heavy metal*.

The section about single hand gestures ends with *Thumbs Up* and *Thumbs Down*, the pair of emblems that are perhaps the most widespread worldwide, thanks to the popularity of social networks, above all Facebook that introduced its ever-present Like button shaped like the thumbs up sign, which has had numerous other uses

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[79] A more extensive Urban Dictionary definition of *fist pumping* is available at: https://www.urbandictionary.com/define.php?term=fist%20pumping.

throughout its eventful history. The social network has since complemented the like button with half a dozen emoji, making it possible for its users to express a wider range of reactions. Morris et al. (1979) list its five specific uses (from *OK* and *number one* to *sexual insult*, *hitchhike* and *directional* scenarios) and show that the claim about the gestures' origins in the gladiatorial combat setting has no historical foundation. Their alternative names as emoji, the same as the names Skype gives to their animated emoticon counterparts - *Yes* and *No* - point to a variation of the metaphors MORE IS UP and LESS IS DOWN, namely, POSITIVE IS UP and NEGATIVE IS DOWN. We will return to them briefly later, but now we are about to face new faces and two-hand gestures.

- **Hugging Face** - A face displayed with an open hands gesture, offering a hug. Also Known As: Hug Emoji, Hugging Emoji, Hugs Emoji EP

- **Open Hands Sign** - Two open hands, representing openness. Sometimes used as a hug, or as a display of *jazz hands*. Also Known As: Hug Emoji, Jazz Hands Emoji. EP

- **Person Raising Both Hands in Celebration** - Two hands raised in the air, celebrating success or another joyous event. Also Known As: Arms In The Air Emoji, Banzai Emoji, Festivus Miracle Emoji, Hallelujah Emoji, Praise Hands Emoji, Two Hands Emoji. EP

- **Person With Folded Hands** - Two hands placed firmly together, meaning please or thank you in Japanese culture. Other common uses for this character include prayer/praying hands, or a high-five. A previous version of this emoji displayed a yellow burst of light behind the two hands on iOS. Android showed a blob-character with closed eyes and folded hands in Android 5.0. Also Known As: High Five Emoji, Please Emoji, Praying Hands Emoji, Thank You Emoji. EP

- **Shrug** - A person shrugging their shoulders to indicate a lack of knowledge about a particular topic, or a lack of care about the result of a situation. Displays as raised shoulders, sometimes in conjunction with raised arms and flat hands. The shrug gesture in text (emoticon) form is known as the **shruggie** and typed as: ¯_(ツ)_/¯. Also Known As> ¯_(ツ)_/¯ Emoji, Shrugging Emoji. EP

- **Two Men Holding Hands** - Two men holding hands, most likely due to being in a relationship. Also Known As: Boys Holding Hands Emoji, Gay Couple Emoji, Gay Men Emoji. EP

- **See-No-Evil Monkey** - One of the three wise monkeys, known as Mizaru. This See-No-Evil monkey has hands covering his eyes, as part of the proverb "see no evil, hear no evil, speak no evil". Sometimes used as a playful *I didn't want to see that* expression. Also Known As: Cheeky Monkey Emoji, Monkey Covering Eyes Emoji. EP

- **Hands in air in celebration** (celebrate) SK

- **Hear No Evil -** KA

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- **LA Hand -** KA

- **Heart Gesture -** JA

- **Cheer \o/** = Shows a person with his or her hands raised in the air. May represent a cheering motion or the signal for a touchdown in football. Direction: vertical (not tilted sideways). PN

- **Hug {} ({}) :)X** = The left and right brackets represent arms giving you a hug. It is a common way to send a hug to someone online. This is a "big hug" that can be used to add some extra enthusiasm to the standard {} emoticon. It is also the emoticon shortcut used to display the hug icon on BlackBerry smartphones. Direction: vertical (not tilted sideways). The same as saying, "I hug you." Represents a person wrapping his or her arms around someone. Direction: horizontal (tilted 90° to the left). PN

- **Prayer _/_** = The underscores (_) represent the person's forearms, while the angled lines represent two hands in the stereotypical prayer pose. Direction: vertical (not tilted sideways). PN

- **Speak No Evil :-M** = The M tilted 90 degrees to the right is a backwards E, which represents "no evil." Direction: horizontal (tilted 90° to the left). PN

- **Shoulder Shrug ^^** = A non-verbal way of saying, "I don't care" or "I don't know." Direction: vertical (not tilted sideways). PN

The open hands gesture combined with a smiling face clearly indicates openness, friendliness, that is readiness to offer someone access to our body conceptualized as a CONTAINER. But before behavioural reactions and gestures could be so easily read, text based emoticons had to resort to various forms of conceit, such as the familiar repetition of elements to mark an increase in the desired effect, as in the *Hug* emoticon where an extra pair of brackets mean a bigger hug. Although it might be mistaken for a barrier between our personal space and others, similar to the obstacle created by the *Raised Hand* emoji, the *X* in *Hug* are arms wrapped around someone who is hugged. Even *Open Hands Sign* can be taken to mean something else, namely, *jazz hands*, the hand movement originating from jazz dance, typically used in musicals and cabaret performances too and also in everyday life, sometimes ironically, to show excitement, enthusiasm or express triumph, glee etc. In the absence of emoji, expressive punctuation (e.g. *JAZZ HANDS!!!*)[80] can be used to convey these in writing. And thus, the recurrent theme of multiple related or unrelated meanings and

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[80] In addition to pointing to this conventional use of punctuation, the Urban Dictionary definition of the terms *jazz hands* (retrieved 30 July, 2016 from https://www.urbandictionary.com/define.php?term=jazz%20hands) gives a nuanced account of its meaning and includes a perfect example of its use by the master of exuberance himself, Jack, the character from the TV series *Will and Grace*.

uses of glyphs is back. Hands may be put in the air by way of celebration (as explicitly indicated by the addition of confetti in the Skype animated gif) or the intention may be to praise god or a god-like ruler (think *Banzai* and the divine status of the Japanese emperor). The same gesture may refer to a cheering motion or even scoring a touchdown in American football, as signalled by the text emoticon. Like *Hug* before it, *Cheer*, as well as the following text emoticon *Prayer* have names that are nouns referring to actions: *hugging*, *cheering*, *scoring a touchdown* and *praying* indicating the metonymic relation RESULT FOR ACTION. Furthermore, all actions represented by gestures are, in general, part of a bigger scenario, an event consisting of several subevents generating the metonymy PART OF THE SCENARIO STANDS FOR THE WHOLE SCENARIO. Thus, the praying gesture, for example, stands for the whole of the praying process that includes things like saying a prayer, while a celebration incorporates much more than cheerfully putting one's hands in the air, confetti being just one memorable detail. The description of the *Prayer* emoticon offers just one meaning, but the alternative names of the *Person With Folded Hands* emoji provide another three, two of which are not restricted to the Japanese culture only. Besides *please* and *thank you*, it can represent the hands of two gesturers high fiving. It also takes two to form the conventional hand holding gesture that metonymically points to the fact that two people are in a relationship and form a couple, as physical connection stands for the emotional one. An individual can also hold her or his hands together to form a particular sign such as the *LA Hand* emblematic gesture represented on the Kimoji sticker, where Kim Kardashian's fingers form the letters *L* and *A* standing for *Los Angeles*. The previously mentioned conceptualization HEART IS LOVE makes the popular *Heart* gesture replicated by Justin Bieber metaphoric. The examples like the *V Sign* and *LA Hand* gesture glyphs that refer to shortened words i.e. linguistic signs where the connection between form and meaning is arbitrary are the most obvious proof of the claim that emoji can have language-like properties, functioning more like symbols that exhibit no causal links between the signifier and the signified. Although that might not seem to be the case at first glance, another instance of symbolically motivated picture characters comes in the form of the three wise monkeys from the story of the same name. As pointed out by Evans (2015), although they look like icons − a picture of a monkey[81] represents a monkey alright − Mizaru, who covering his

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[81] Interestingly, as stated in the Wikipedia article on the subject (retrieved 30 July, 2016 from https://en.wikipedia.org/wiki/Three_wise_monkeys) the very choice of monkeys to illustrate the maxim is a play on words

eyes sees no evil; Kikazaru, whose hands cover his ears so he hears no evil and Iwazaru who, with his mouth covered, speaks no evil provide a symbolic pictorial depiction of a Confucian maxim. The maxim that makes no mention of evil reads: "Look not at what is contrary to propriety; listen not to what is contrary to propriety; speak not what is contrary to propriety; make no movement which is contrary to propriety". The emoji and emoticon sample contains three different picture characters referring to these principles that have reached the West as the proverb: "See no evil, hear no evil, speak no evil". The See-No-Evil Monkey emoji shows Mizaru performing its symbolic role. As an emoji, the Japanese macaque is also seen as cheeky and can be used to playfully express displeasure at having seen something one did not want to see. The text glyph *Speak No Evil :-M* provides an original depiction of that principle. Namely, the letter *E* is taken to represent evil. Since, M tilted sideways happens to look like a backwards *E*, it is the opposite of evil and in combination with the colon for the eyes and the dash for the nose represents a person who speaks no evil. One neither knows or cares what inspired Kim Kardashian to channel not only Kikazaru, but Mizaru and Iwazaru as well, so all one can do is ¯_(ツ)_/¯, which brings us to the last gesture to be examined here.

The *Shrug* emoji, better known as *shruggie* is an odd one out. It is the only gesture in the sample that does not necessarily involve the use of hands. As the name of the text-based emoticon *Shoulder Shrug* suggests, this widespread emblem refers to a distinctive movement (represented by two caret symbols whose shape is reminiscent of shoulders) signalling indifference or lack of information. *Shrug* is also the only kaomoji, a Japanese text emoticon, whose frequency of use across the web (before the emoji was introduced) earned it a place in the sample, which includes some other well-known gestures, like *OK Hand Sign* or *Clapping Hands Sign* that will not be discussed since the world can't wait.

8.6 Emoji poured out into the world and the world burst in upon them. Picture this. Smileys i.e. faces of every description expressing a range of basic emotions and representing widespread signs and gestures may be the role most commonly associated with glyphs, but there is so much more to them. Ever since the early days

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exploiting the fact that an archaic negative form of verbs that ends in -*zaru* 「〜ざる」 and *zaru*, the modified form of *saru* (猿?) "monkey" are homophones. At the same time, monkeys are extremely important in Shinto, Japanese ethnic religion, and the three mystic apes are attendants of the Shinto God of Roads, Kishin.

of text-based emoticons, the altogether anthropocentric realm of picture characters has always managed to include not only a relatively wide array of creations referring to the activities of humans, but also occasional depictions of the natural world. In view of the finite set of creative choices offered by the computer keyboard, the emoticons that go beyond smileys, might look rudimentary, but it is precisely such constraints that make these complex characters remarkable achievements. Fast forward a couple of decades into the era of emoji, stickers-images, full colour and animations and the possibilities for expression look infinite by comparison. As the context of use broadens and meanings multiply, more underlying semantic relations emerge. However, the limited space at our disposal calls for brevity and makes the selection of examples to be discussed rather small, but still representative of all the productive conceptual relationships present in our sample.

People, their occupations, various activities, and the related equipment are the area that showcases the successors of smileys in all their glory, while at the same time illustrating and striving to overcome different stereotypes and taboos.

The need to be universally recognizable and transcend language barriers makes emoji and emoticons particularly susceptible to the powerful principle TYPICAL OVER LESS TYPICAL in a variety of ways (our sample includes emoji that support a range of skin tones and represent same-sex relationships and families, as well as occupations where women used to be rare, e.g. female construction worker, astronaut or technologist). Occupation-related emoji feature typical tools or products of each individual trade and/or uniforms and accessories. For example:

- **Smiling Face With Halo** 😇 **-** A face with a halo above it, used to represent an angel, or a good person. / person who has done a good deed. Also Known As: Angel Emoji, Halo Emoji EP

- **Female Technologist** 👩‍💻 **-** The Female Technologist emoji is a sequence of the 👩 Woman and 💻 Personal Computer emojis. These are combined using a zero width joiner between each character and display as a single emoji on supported platforms. Also Known As: Female Blogger Emoji. EP

- **Male Farmer** 👨‍🌾 **-** The Male Farmer emoji is a sequence of the 👨 Man and 🌾 Ear of Rice emojis. These are combined using a zero width joiner between each character and display as a single emoji on supported platforms. EP

- **Princess** - The face of a princess; a young girl or woman wearing a small crown or tiara. Has yellow hair (previously blonde) on Apple devices, but is brunette on Windows and Android. This princess emoji has no matching prince emoji. Also Known As: Blonde Girl Emoji, Girl With Crown Emoji, Girl With Tiara Emoji. EP

- **Female Construction Worker** - The female version of the 👷 Construction Worker emoji. The Female Construction Worker emoji is a sequence of the 👷 Construction Worker, ♀ Female Sign and Variation Selector-16 emojis. These are combined using a zero width joiner between each character and display as a single emoji on supported platforms. EP

- **Ninja Cat** - The Ninja Cat emoji is a sequence of the 🐱 Cat Face and 👤 Bust in Silhouette emojis. These are combined using a zero width joiner between each character and display as a single emoji on supported platforms. EP

- **Crown** - A gold crown with jewels on the sides. Representative of a King, Queen, or other form of Royalty. Also Known As: King Emoji, Queen Emoji, Royal Emoji. EP

- **Anchor** - A metal device, dropped out of a boat to prevent it drifting away from the current location. An anchor also refers to a place on a webpage that may be directly linked to, rather than simply loading a page and requiring a user to scroll to the correct location. Also Known As: Admiralty Pattern Anchor Emoji, Fisherman Emoji. EP

- **Crystal Ball** - A crystal ball, used by a clairvoyant to see information or inform a person of their future. Also Known As: Clairvoyant Emoji, Fortune Teller Emoji, Gypsy Emoji, Psychic Emoji, Purple Crystal Emoji. EP

- **Working from home -** (wfh) SK

- **Devil -** KA

- **Angel -** KA

- **Ninja QK Qx [-_-]~** = The "Q" is the ninja's head and the "K" represents the ninja's arms and legs. The "Q" is the ninja's head (with a headband) and the "x" represents the ninja's arms and legs. Direction: horizontal (tilted 90° to the left). This ninja face includes a mask with two small slits for the eyes. The tilde (~) represents cloth from the head wrap. Direction: vertical (not tilted sideways). PN

- **Pirate P) b)** = This smiling pirate has a patch over his left eye. This pirate has a patch over his right eye. Direction: horizontal (tilted 90° to the left). PN

- **Pope <+]:¬) +O=-)** = The pope is wearing a mitre (pronounced "miter"), which is a tall hat worn by bishops and other Catholic leaders. The +O is the pontiff's hat. Direction: horizontal (tilted 90° to the left). PN

- **Princess ~<:-) \&&&/** = The ~< represents the traditional princess hat. Direction: horizontal (tilted 90° to the left). The princess' crown. Direction: vertical (not tilted sideways). PN

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- **Innocent 0:-) O:D** = The "0" is a halo, representing an angel, and implies the person is as innocent as an angel. The "O" is a halo and the "D" is a big smile, indicating the person might be sarcastically saying he or she is innocent. Direction: horizontal (tilted 90° to the left). PN

Here, a technologist works on a computer, while a ninja (cat) is instantly identifiable by his uniform and headband, as is a pirate by his eye patch. In the case of rulers, priests or soldiers, official emblems stand for rank – crown for a princess or mitre for the Pope. Prototypical cases of the POSSESSED FOR POSSESSOR metonymic relationship occur when an object alone stands for an occupation as in *Crown* for king, queen, princess or royalty in general. They provide a useful counterpoint for one of the relationships that diverge from the norm, where particular kinds of divergence are caused, on the one hand, by the formal makeup of the picture characters themselves and the nature of alternative names of emoji on the other. Namely, as pointed out above, the development of the Unicode standard has made emoji sequences possible, increasing the appeal of these most recent glyphs across demographics. It has also allowed cramming more and more elements into individual pictures. But it is precisely these features that complicate matters from the analytical point of view, because creating emoji with a human face (that also reflect gender, race and age differences) has put, for instance, both the POSSESSOR and POSSESSED or INSTRUMENT/ ACTION and AGENT together in the picture, clearer than ever before. This trend that was introduced in text emoticons (see the Pope emoticon, picturing the whole of the pontiff's head or face, complete with the nose, wearing the hat) and continued with standard smileys (such as *Smiling Face With Halo* metonymically representing an angel and metaphorically referring to a good person via the conceptualization GOOD (PERSON) IS AN ANGEL) has culminated with emoji and stickers. Here's how: because of the not so subtle differences between platform-dependent emoji artwork, farmers are shown alongside their produce or tools and princesses wear crowns or tiaras, all of which adds complexity. And on her stickers, Kim accessorizes her look with horns or a halo, presumably to reflect her mood. Luckily for metaphoric devils (and angels alike) unlike the supposed real ones, the Possession ICM produces a relationship between POSSESSED and POSSESSOR that is based on the notion of alienable, as opposed to inalienable possession. If it were otherwise, she would be stuck with either accessory *for all eternity*.

The other facet of the conundrum, the issue of the diversity of alternative names of emoji and the mechanisms behind their production seems to be trickier, as it appears, at least sometimes that naming is the result of free association. But there is always a link, however remote or close, such as the one between *Anchor* and *Fisherman* i.e. INSTRUMENT and AGENT. The metaphorical extension of *anchor* meaning "place on the web" is part of the larger metaphor BROWSING THE WEB IS SURFING / NAVIGATION describing the process of clicking on web links and moving around the web, which entails that THE WEB IS THE SEA and INTERNET USERS ARE SEAFARERS, like the emoji naming fisherman. Thus, SEA itself may well be used to refer to any large quantity, for example "a sea of information", fitting into a larger conventional metaphorical conceptualization stated by Kövecses (2016, 10) A LARGE NUMBER OR QUANTITY (OF SOMETHING) IS A LARGE MASS OF SUBSTANCE.

As in all conceptual phenomena, the existence of a link between the source and the target is essential, but as the examples of (alternative) emoji meanings show, metonymic links may transcend the confines of the traditional referential schema X FOR Y. That is why it is important to remember that Radden and Kövecses' (1999) definition of metonymy, quoted in the section dedicated to the theoretical background of the present analysis, focuses on the broader notion of *mental access*, rather than strictly reference, which makes it possible to account for the less clear cases of metonymy, including stereotype-related relationships within an ICM (ibid. 22). Therefore, when describing some semantic relations pertaining to picture characters, it may be justifiable to use a less firmly delimited term *metonymic links* represented by the tentative pattern X AND Y e.g. INSTRUMENT AND AGENT and its possible elaboration EQUIPMENT AND/FOR THE OCCUPATION / ACTIVITY / ROLE PERFORMED BY THE AGENT AND THE AGENT. Equipment is understood in the broadest possible sense of the world and may refer to the characteristic type of clothing i.e. uniform, tools or accessories standing for an occupation or role, in addition to the above-mentioned examples of the *Female Technologist / Blogger* and *Ninja Cat*, the emoji *Female Construction Worker* pictured hammer in hand, wearing her signal vest and helmet, also illustrates the pattern. This evokes the point made again by Radden and Kövecses (ibid. 40) about the overlap between control and possession in a similar, more general metonymy OBJECT FOR USER OF THE OBJECT explained via the sentence *Mrs. Grundy frowns on blue jeans* quoted from Lakoff and Johnson's (1980, 35). Namely, as the phrase *blue jeans* stands for

those who wear blue jeans, it follows that users simultaneously control and possess the objects they use, which is especially true of tools and equipment and thus relevant to the occupation- and role-related emoji.

The reliance on a stereotype is what creates the connection between *crystal ball* as an INSTRUMENT and *Gypsy* as an AGENT, since the Category-and-Property ICM contains the relationship whereby a CATEGORY can conventionally stand for a certain DEFINING PROPERTY. Through this generalization, Gypsies are traditionally connected with fortune telling and psychic powers and angels are associated with innocence, as shown by the *Innocent* text-based emoticon.

Certain categories of occupations allow working from home (modern-day clairvoyants are no exception, judging by the number of websites offering the services of predicting the future). In the Skype animated emoticon showing a rotating image of a laptop "built into" a home, there is a clear-cut link between INSTRUMENT – computer and ACTION – working.

While on the topic of categories, but moving slightly away from people to objects and food, both relationships belonging to the Category-and-Member ICM are represented by the emoji in the sample. E.g.

- **School** - A school building with multiple storeys, and a clock on the front. A place that children, or teenagers attend for their education. Displays on Windows as a collection of school-related items: an apple, ruler, and pencil. Also Known As: Clock Tower Emoji, Elementary School Emoji, High School Emoji, Middle School Emoji.

- **Motor Scooter** - A motor scooter, which may be displayed as any type of motorbike with or without a step-through frame. Distinct from the racing motorcycle, which is used for sport, not transport. Also Known As: Motor Bike Emoji, Motor Cycle Emoji, Vespa Emoji. EP

- **Credit Card** - A credit card emoji, showing the back side of the card with magnetic strip. The Apple artwork for this symbol shows an authorised signature for John Appleseed, with 448 as the security code. Also Known As: AMEX Emoji, Diners Club Emoji, Mastercard Emoji, VISA Card Emoji. EP

- **Top Hat** - A top hat, worn in traditional British weddings and other formal occasions. This is also a popular playing piece in the game of Monopoly. Also Known As: Formal Wear Emoji, Groom Emoji. EP

- **Ice Cream** - A bowl containing one or more scoops of ice cream. Also Known As: Bowl Of Ice Cream Emoji, Dessert Emoji. EP

- **Spaghetti** - Spaghetti being twirled on a fork, from a bowl of spaghetti Bolognese. Also Known As: Pasta Emoji, Spaghetti Bolognese Emoji. EP

The *School* emoji has two variants. In the first one, *School* is regarded as a category – an umbrella term by which category members, listed as emoji alternative names, *Elementary School*, *High School*, *Middle School* are covered. Referring to education levels, the names of the subcategories reflect a metonymic PART-WHOLE relation on which the pattern CATEGORY FOR A MEMBER OF THE CATEGORY is based. The Windows 8.1 emoji showing an apple and stationery is best viewed as representing the PART-WHOLE schema that is SUB-EVENTS – writing and drawing in class and eating between classes – STANDING FOR THE WHOLE EVENT – spending the day at school. The reverse relation within the Category ICM, MEMBER OF A CATEGORY FOR THE CATEGORY is exemplified by the *Top Hat* emoji referring to formal dress wear in general. When in an alternative scenario, it is taken to mean *the groom* in particular, as someone who wears formal clothing, the emoji triggers a no frills instance of the proposed pattern EQUIPMENT FOR THE ROLE PERFORMED BY THE AGENT, since the groom himself is not featured in the picture character.

Using the name of a prominent brand name to refer to the entire category of things, as in the emoji situation where *Vespa* stands for any kind of motor scooter means that the trademark that is so used has become genericized, epitomizing SPECIFIC FOR GENERIC, a type of the metonym MEMBER OF A CATEGORY FOR THE CATEGORY. Different credit card brand names, as alternative names of the *Credit Card* emoji, convey the perception of credit card users, namely, the fact that they regard the specific brand they are using as generic.

As far as food emoji are concerned, normally only typical kinds of food are represented so as to be easily recognized by the global user base[82]. Therefore, as its alternative name indicates, the *Ice Cream* emoji, showing a universally loved dessert can stand for the category *dessert*. *Spaghetti*, on the other hand, has it both ways, as it cultivates both relations with its alternative designations. When referred to as *Spaghetti*

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[82] A recent NPR article has more interesting details on the subject. A Brief History Of Food Emoji: Why You Won't Find Hummus On Your Phone. Retrieved January 15, 2017 from http://www.npr.org/sections/thesalt/2016/12/28/506160715/a-brief-history-of-food-emoji-why-you-wont-find-hummus-on-your-phone.

Bolognese Emoji, it exhibits the MEMBER OF A CATEGORY FOR THE CATEGORY connection to its main name. Conversely, when called *Pasta Emoji* that superordinate category exemplifies the CATEGORY FOR A MEMBER OF THE CATEGORY pattern, in relation to both other names of the glyph in a hierarchically structured semantic space, where as shown, *spaghetti* is superordinate to *spaghetti Bolognese*, but subordinate to *pasta*.

There is also the issue of the necessity for the glyphs to be instantly discernible on small screens, which calls for a certain level of reduction of detail in emoji artwork, which can lead to ambiguity – as stated in the Emojipedia description of *Tomato*, included in the sample, that glyph "looks similar to the red apple emoji at small sizes". Still, even common kinds of fruit and vegetables can acquire less than common meanings that extend their combinatory potential to unexpected contexts. Witness the current notoriety of the unsuspecting peach and aubergine.

- **Peach** - A fleshy pink/orange-colored peach, with fuzzy skin. Displayed with a green leaf or leaves on most platforms. Most commonly used as a "butt" emoji. Also Known As: Bottom Emoji, Butt Emoji. EP and

- **Aubergine** - An eggplant emoji, known as an aubergine in Japan and some other countries speaking British English. A long, purple-looking vegetable used in many types of cooking around the world. It is considered lucky in Japan to dream of an eggplant in the first dream of the new year. The hashtag featuring a single eggplant / aubergine emoji # cannot be used to view photos using Instagram's emoji search function, due to common usage as a phallic symbol. Also Known As: Eggplant Emoji, Phallic Emoji, Purple Vegetable Emoji. EP

- **Pile of Poo** - A pile of poo that is shaped like a soft-serve ice cream. Brown in color with a friendly smile in most versions of this emoji. Previously shown as a more literal pile of poo (with flies circling above it) on Android 5.0. Also Known As: Dog Dirt Emoji. Smiling Poop Emoji. E

- **Pistol** - gun emoji, more precisely a pistol. A weapon that has potential to cause great harm. Displayed facing right-to-left on all platforms. iOS 10 displays this emoji as a toy squirt gun / water pistol instead of a realistic-looking weapon. Also Known As: Gun Emoji, Revolver Emoji. EP

- **Reversed Hand With Middle Finger Extended** - A middle finger emoji, used in some western cultures as a rude or insulting gesture. The back of the hand is shown with the middle finger raised. Also Known As: Dito Medio Emoji, Flipping The Bird, Emoji, Middle Finger Emoji, Rude Finger Emoji. EP

- **WTF -** (wtf) SK

This is where we enter the realm of euphemisms and taboos where metonymy plays a crucial role, which has only recently received due attention in the academic circles.

The fate of peach, aubergine (and a number of other emoji[83] covertly referring to taboo body parts and sex) has been decided by the powerful mechanism of visual blending, brought about by an analogy linking these shapes to things in a different area altogether and leading to new inferences. As a cognitive mechanism that operates within the same domain or ICM, metonymy has the ability to either highlight or hide the aspects of a domain. As noted by Littlemore (2015, 93): "the basic reason for employing euphemism is to find an indirect way of talking about topics that may be embarrassing or face-threatening, and metonymy is the perfect trope for expressing indirectness". The evolution of the Pile of Poo emoji exemplifies the role played by a type of metonymy in which PART OF THE SCENARIO STANDS FOR THE WHOLE SCENARIO. As the level of acceptance of this emoji grew, the (animated) flies buzzing around the pile of poo conveniently disappeared. Thus, the part of the scenario associated with the inescapable smell of excrement was gone. Give the pile a smiling face and presto the almost equally inevitable visual analogy with a soft-serve ice cream (i.e. everyone's favourite food) of all things readily kicks in.

The extraordinary evolution of the *Pistol* emoji shows how efforts to euphemize a weapon ultimately backfire like when, in the latest version of its mobile operating system iOS 10, Apple replaced the pistol with an image of a water gun. The controversial move whereby a toy came to represent all guns, including real ones via the metonymy MEMBER OF A CATEGORY FOR THE CATEGORY was meant as a symbolic gesture contributing to the fight against gun violence. What made the decision problematic was the fact that neither Unicode Consortium nor other manufacturers of phones and operating systems followed suite, so when an iPhone user sends the pistol emoji to users of other mobile platforms, he/she will see a bright green squirt gun, while they will receive a picture character of a regular gun. What's more, the context of use of the two glyphs is very different which can lead to (even a potentially lethal) misunderstanding. All because the principles structuring linguistic categories have been violated. The standard *Pistol* emoji shows a prototypical gun, while Apple chose a non-focal member of the category, rendering it far too innocuous to be used without creating confusion. Using a gun is not child's play and cannot easily be

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[83] *Banana*, *Ear of Corn* or *Cancer* may be among the most obvious choices for sexually suggestive emoji (although Emojipedia makes no mention of such uses), but the web is rife with other examples of flirtatious use of glyphs based on their reinterpretation as objects that look similar. This is a very fast-changing field and the peach is already fading from the spotlight due to the changes Apple introduced in iOS 10.2 as pointed out in the Mashable article: "14 emoji you can sext with now that the peach is dead". retrieved January 15, 2017 from: http://mashable.com/2016/11/02/emoji-sexting-peach-dead/#UlxXcxyomqq3.

understood as such. Interestingly, Microsoft took the opposite approach, much before Apple, as in Windows 8 said emoji was shaped like a fictional device, the raygun, but the change to an image of the real thing happened quietly in Windows 10.

Expletives, regularly containing taboo words, need to be avoided or at least explicit language is to be made less explicit. This is one of the situations where emoji have borrowed the solution from cartoons. The foul-mouthed smiley provided by Skype is gagged by what looks a piece of tape with a grawlix on it. In a familiar cartoon cliché, a random string of typographic symbols − known as *grawlix*− stands for swear words. Apparently, despite its own metonymic nature, the three-letter initialism featuring *the* four-letter word, is not effective enough as a means of concealing the interjection: *"What the fuck?!"* (it is also much less effective than silently giving someone the finger by sending them the *Reversed Hand With Middle Finger Extended* emoji, thus digitally replicating the ancient obscene hand gesture[84]). Still, in other online chat and messaging situations the word-forming strategy of shortening excels.

The imperative of speed and efficiency in both synchronous and asynchronous computer-mediated communication, coupled the limitations of space and the related cost of text messaging on phones were instrumental in the development and adoption of chat shorthand that has since crossed over into the domain of emoji and emoticons, whose runaway success is a proof that a picture is indeed worth a thousand (even shortened) words. E.g.

- **Squared CL** **-** CL is what shows on the CLear button of some older mobile phones. Also Known As: Clear Emoji, Clear Button Emoji. EP

- **Yes** **-** (y) (Y) (ok) SK

- **No** **-** (n) (N) SK

- **Be right back** **-** (brb) SK

- **BAE** **-** KA

- **Thumbs Down (n)** = Windows Live Messenger and Skype emoticon shortcut; opposite of the Thumbs Up (y) emoticon; the "n" is not case-sensitive. Direction: text (used as a shortcut). PN

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[84] As pointed out by Danesi (2016a: 38) even the most widely used gestures, like Thumbs Up can be ambiguous. He says: "This seemingly universal gesture is hideously offensive in parts of the Middle East, West Africa, Russia, and South America. In many of these areas, it is the equivalent of using the middle finger in the Western world."

- **Thumbs Up (y) *THUMBS UP*** = Inserts a thumbs up graphic in Windows Live Messenger and Skype chat. Inserts a picture of two thumbs up in ICQ. Direction: text (used as a shortcut). PN

However much the contemporary (mobile) computing devices rely on graphical user interfaces (GUIs) to make them accessible, the elements of older interaction modalities have an uncanny way of resurfacing, sometimes where they are least expected. Thus *CL*, the result of the word-forming process of final clipping, becomes squared evoking the shape of a keyboard button to which it migrated from the once indispensable command-line environment. It belongs to the same category as its fellow commands / keyboard buttons *Ins* and *Del*, whose final clipping of *Insert* and *Delete* respectively might not be the result of the impact of the SALIENT PART OF FORM FOR WHOLE FORM metonymy. Rather, such formations may be a matter of convention. Even so, if the convention is a well-established one, the elements that remain after clipping may over time come to be regarded as salient. This also applies to the shortcodes *((y) (Y)* and *(n) (N)* that have the same pre-GUI background. They insert the Thumbs Up and Thumbs Down graphic in instant messaging applications. *BRB* is a well-known initialism, frequently used in situations typical of computer-mediated communication. Skype has transformed it into a handy door sign, bringing to mind the CONTAINER metaphor, allowing the conceptualization of a communication device as a ROOM or a BUILDING with doors and windows. The full form of this initialism "be right back" is an elliptical sentence (cf. Barcelona 2009) where the subject is not regarded as salient. The always trendy Kim Kardashian has made a nowadays frequent US informal term *bae* (pronounced /beɪ/)[85], an abbreviated form of *baby* or *babe*, into a sticker in her app. This is yet another instance where the Thing-and-Part ICM leads to THE PART FOR THE WHOLE metonymy (cf. Radden & Kövecses 1999, 31). These examples are a colourful reminder of the presence of metonymy and metaphor at all levels of language organization.

The centrality of PART – WHOLE relations within the network of metonymic patterns can hardly be overstated. It is also the most prevalent pattern in our sample of picture characters and in the present discussion of their features. As a reference-point phenomenon, metonymy is manifested in *active zones* of entities (i.e. their features

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[85] The Oxford Dictionary defines the noun "bae" as "A person's boyfriend or girlfriend (often as a form of address): 'I'm going to see my bae' [as name] 'Bae just made me tacos' 'what's wrong, bae?'" situating its origin in the early 21st century U.S. Retrieved from: https://en.oxforddictionaries.com/definition/bae.

that figure most directly and fundamentally in relationships, depending on how they are profiled by particular viewpoints) (cf. Langacker 1993, 2009). The choice of profile is a matter of cognitive salience in a particular context, in other words, focus. The realm of emoji and emoticons is characterized much more by such pervasive relations definable in terms of active zones and changes of focus than in terms of the typical "stand for" take on metonymy.

Before making a brief overview of the remaining less productive semantic strategies, let's return to the PART – WHOLE schema and the ways in which the two patterns it represents highlight different aspects of meaning.

- **Milky Way** - The Milky Way – a galaxy of billions of stars that includes our own solar system and planet earth. Represented in emoji realistically by Apple – a night sky as viewed from earth. Google uses an abstract display of many yellow stars for this emoji. Also Known As: Galaxy Emoji, Night Sky Emoji, Space Emoji, Stars Emoji, Universe Emoji. EP

- **Cinema** - An emoji representing the cinema: a large screen showing the latest movies, available to the public. Displayed by Apple and Twitter as a film projector, and by Google and Microsoft as a cinema screen with curtains. Also Known As: Cinema Screen Emoji, Movies Emoji. EP

- **Stadium** - A large capacity stadium, featuring a large amount of seating for sporting fans, or people attending other shows hosted by the stadium. Also Known As: Grandstand Emoji, Sport Stadium Emoji. EP

- **Syringe** - A syringe, containing what appears to be blood. May be from a blood test at the hospital. Also Known As: Blood Donation Emoji, Blood Test Emoji, Needle Emoji, Vaccination Emoji. EP

- **Rain** - (rain) (london) (st) SK

- **Boobs -** KA

- **Butt -** KA

- **Front -** KA

- **Back -** KA

- **Butt** - **(Y)** N

- **Smart ass - (_e=mC2_)** NL

- **Big boobies - (O)(O)** NL

- **Silicon boobies - ($)($)** NL

Our galaxy, the Milky Way, represented in the emoji form in a photorealistic or abstract way has a number of alternative names that employ either THE PART FOR THE WHOLE metonymic relation (the *Night Sky* emoji refers to a tiny part of the galaxy visible from the Earth throughout the night, while *Stars* picks out the most salient part of the galaxy, a system consisting of stars and other elements, and brings it to a human scale) or its reverse form THE WHOLE FOR THE PART (where the holonym – the whole of the universe/(outer) space stands for its meronym, a single galaxy, representing the holonymy relation).

The *Cinema* and *Stadium* emoji offer an insight into the direction of the development of individual glyphs, which results in a steady increase of their total number. Different platforms that support emoji choose different features to identify a concept, giving them salience and representing them as pictures. The pace of the process is so rapid that there are more coexisting variations of picture characters than there are alternative names describing them. So, the glyphs showing a film projector, a cinema screen with curtains, a film roll or a piece of film all access the same "cinema schema", each of them emphasizing a different aspect of the *cinema experience* as a whole and becoming salient as a result. There are just two alternative names for the *Cinema* emoji, one of which is *Movie*. The relationship between the two concepts might be accounted for in terms of the EVENT FOR PLACE metonymy if a movie is regarded as an event which takes place at the cinema (the reverse relation, PLACE FOR EVENT could be said to exist between Skype's *Rain* animated emoticon and one of the shortcodes, *(london)* that inserts it into the chat message, the British capital being the epitome of a place where rain is a common event). The *Stadium* emoji, displayed as a round open-air structure, its part with entrance gates or the grass-covered field has an alternative name referring to *grandstand*, the most important part of the venue (and the most prominent in the picture glyph itself), as far as the audience is concerned (that is at least before the actual sporting event they come to see begins). The stadium field variation of the character does not have a name listed in Emojipedia.

Syringe is another instance of focus shifts within a schema leading to several names and relations. *Needle* is the part of the device that has by far the highest salience and

it stands for the whole, while the three remaining alternative names, *Blood Donation Emoji*, *Blood Test Emoji* and *Vaccination Emoji* emphasize different contexts – real-life scenarios in which syringes are used.

As is so often the case, we return to Kimoji, this time because they provide the material for drawing a useful analogy about the nature of PART – WHOLE relations as a whole. Her mobile app may have inspired the coinage *Buttmoji*, but emoticons depicting prominent parts of the female anatomy, also known as *assicons* and *boobicons* go way back to the pre-smartphone era of creations based on computer keyboard characters. Purely descriptive or humorous, they represent the bottom and female breasts, often exploiting conventional phrases with a figurative meaning. Thus, the metaphoric expression *smart ass* is represented as Einstein's mass – energy equation, standing for intelligence, inserted within the round brackets metonymically showing the minimalistically represented salient part, the outline of a *derriere*. *Silicone boobs* do not come for free. A good boob job costs good money, hence DOLLARS FOR MONEY in the place of nipples. Compared to the global success of Kim Kardashian's app, all boobicons and assicons are a joke. The photorealistic stickers showing her feminine assets bring to mind two terms from the domain of photo editing - *zooming* and *cropping*. That is how all of her best-known stickers were made – zoom on the desired body part and crop the image to cut out the rest, thus providing focus on the bottom, the breasts, front or back torso. The same strategy, as it has been shown, is behind the functioning of the PART – WHOLE schema in general – take a feature of an entity, make it the focus of attention by singling it out and allowing it to stand for the entity as a whole. This mechanism produces both the morphological process of word clipping and *buttmoji*.

Viewing metonymy in terms of scenarios and their parts and mental access makes it possible to regard the following relation, hereby tentatively glossed as OBJECT FOR/AND PLACE, as a subtype of the PART FOR WHOLE pattern. Here are some instances of these:

- **Movie Camera** - A classic reel-to-reel film camera, used as a symbol for movies or films in general. Also Known As: Film Camera Emoji, Hollywood Emoji, Movie Emoji. EP
- **Ferris Wheel** - A large rotating wheel, often found at a carnival or fair. Also Known As: Big Wheel Emoji, Fairground Emoji, Observation Wheel Emoji. EP
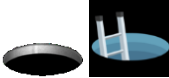
- **Roller Coaster** 🎢 🎢 - A roller coaster in a theme park going down a dip in the ride. Three carriages can be seen with two people in each red carriage. Also Known As: Rollercoaster Emoji, Theme Park Emoji. EP

- **Cactus** 🌵 - A cactus emoji, usually found in warm or desert climates. Most commonly displayed as a three-branch Saguaro cactus. Also Known As: Desert Emoji, Wild West Emoji. EP

- **Shamrock** ☘️ - A three-leaf clover, otherwise known as a shamrock. Commonly used on St Patrick's Day in Ireland and around the world, as it is said that he used the shamrock as a symbol to explain the Christian Holy Trinity. Not to be confused with the four-leaf-clover, which has a similar appearance, but four leaves. EP

Given the diversity of the alternative names of individual emoji it is not unusual that they represent different relations: the *Movie Camera* picture character metonymically represents not only *Hollywood* to which it is connected via the OBJECT – PLACE link, but also *Movie*, as part of the INSTRUMENT FOR PRODUCT pattern, within the Production ICM. Ferris wheels and roller coasters are regular items at fairgrounds and in theme parks respectively. Their salience stemming from that fact qualifies these glyphs to stand for the venues in question.

The notion of object in our tentative formula is to be understood broadly, so as to include plants as well. Thus, as an example of generic reference *Cactus* refers both to any desert in general, as a place where cactuses grow in the wild. However, this emoji can also have specific reference, when it is taken to mean Wild West, being seen itself as a particular kind of plant – Saguaro cactus, native to the Sonoran Desert in Arizona and areas in California and Mexico. Another plant, the shamrock clover whose meaning is emblematic, rather than simply iconic has become a symbol of Ireland and thanks to its prominent association with the country has come to metonymically stand for it. The older metaphoric meaning of the species that is not unique to Ireland goes back to the pre-Medieval period of the country's Christianization and its patron saint, St. Patrick who, legend has it, used the three-leaved plant as a metaphor for the Holy Trinity. Other examples of the OBJECT – PLACE link include *Graduation Cap* glyph meaning *College* or *University* and *Slot Machine* standing for *Casino*.

After Idealized Cognitive Models related to location, there remain several specific relationships as part of the Action ICM to be examined. They are all much less

productian the prolific one connecting INSTRUMENT and ACTION whose influence is felt in all categories of emoticons and emoji, as a powerful force that shapes their meaning, often interacting with other patterns. What follows is a selection of examples of action-related metonymic relationships:

- **Surfer** - A person on a surfboard, riding on a wave in the ocean. Wears a wetsuit or board shorts in most versions. Also Known As: Surf Emoji, Surfing Emoji. EP

- **Fishing Pole and Fish** - A fishing rod (pole) with a fish caught on the end. Also Known As: Fishing Emoji, Fishing Rod Emoji. EP

- **Cooking** - A frying pan with an egg being fried, representing cooking. Also Known As: Breakfast Emoji, Fried Egg Emoji, Frying Pan Emoji. EP

- **Hole** - A round, cartoon-style hole in the ground. May be used in the context of "crawling into a hole" in a shameful or embarrassing situation. EP

- **Let's meet** - (letsmeet) SK

Surfer, representing the activity in which he is involved stands in the AGENT FOR ACTION relation to *Surf Emoji* and *Surfing Emoji*. A fish caught is the obvious RESULT of the fishing ACTION, while *Cooking* is connected to its interpretation as *Breakfast Emoji* and *Fried Egg Emoji* via the ACTION AND RESULT metonymic link. *Frying Pan* is of course, just a literal interpretation of the image. The link between TIME AND ACTION can be discerned in Skype's animated emoji *Let's meet*, where a *calendar with a circled date*, specifying time, refers to the action of meeting someone. That *Hole* may look like the one from which Bugs Bunny is about to emerge and say: "What's up, doc?". The image is the result of what could be tentatively referred to as "literalization of the metaphor (in the image form)" or "calquing", to use in Danesi's (2016) term. It represents a chance to metaphorically crawl into a hole in shame. The situation may be embarrassing, but at least one of the holes has a handy ladder, which might make things a little bit easier.

As one of the fundamental image schemas, Containment is a potent cognitive mechanism, but its metonymic representations, the following pair of reversible relationships are rare among the glyphs in the sample depicting objects:

- **Envelope** - An envelope, used to post letters and cards. Also Known As: Letter Emoji. EP

- **Love Letter** - A white envelope, sealed with a sticker or seal of a red love heart. Contains a love letter. Also Known As: Heart Envelope Emoji, Love Note Emoji. EP

- **Bed** - A comfortable bed, shown with bedposts and a headboard. May be found in a household bedroom, a hotel, or other form of sleeping accommodation. Limited support on major platforms. Also Known As: Bedroom Emoji. EP

- **Open Book** - An open, hard-back book with blue cover. In the Apple artwork for this emoji, the book is open to a page with the following text: *Here's to the crazy ones. The misfits. The rebels. The troublemakers. The round pegs in the square holes. The ones who see things differently. They're not fond of rules. And they have no respect for the status quo. You can quote them, disagree with them, glorify or vilify them. About the only thing you can't do is* From "The Crazy Ones" text as part of Apple's Think Different Advertising campaign of the late 1990s to early 2000s. Also Known As: Book Emoji, Novel Emoji. EP

Referring to *Envelope* as *Letter Emoji* or *Open Book* as *Novel* reveals that the relation CONTENTS FOR CONTAINER is at work. The reverse is true of the association between the alternative name *Heart Envelope Emoji* and *Love Letter*. The former is an accurate literal description of the CONTAINER and the latter focuses on the content specified via the HEART IS LOVE metaphor. In the light of the fact that containment belongs to the group of locational relations (cf. Radden & Kövecses,1999), the above OBJECT – PLACE relationship can actually be regarded as an instance of a wider metonymic pattern CONTENTS FOR CONTAINER. *Bed*, also known as *Bedroom Emoji* is a simple example that corroborates this view, since *bed* – the contents stands for the container, *bedroom* or more generally for a building full of bedrooms, such as a hotel or some other kind of establishment offering sleeping accommodation.

The penultimate group of examples illustrates the least productive metonymic relations, often represented by very few or even a single emoji each:

- **Eyes** - A pair of eyes, glancing slightly to the left on most platforms. The Google version of this emoji previously showed only a single eye, despite the name of this character being eyes (plural). Sometimes used to indicate 'pervy eyes' to indicate approval of an attractive photo posted online; or 'shifty eyes' to convey a deceitful act. Also Known As: Eyeballs Emoji: Shifty Eyes Emoji, Wide Eyes Emoji. EP

- **Scroll** - An ancient scroll on papyrus, with shorter versions known as a roll. The Apple version of this emoji contains the following words: *Here's to the crazy ones. The misfits. The rebels. The troublemakers. The round pegs in the square holes. The ones who see things differently. They're not fond of rules. And they have no*

respect for the status quo. You can quote them, disagree with them, glorify or vilify them. From "The Crazy Ones" text as part of Apple's Think Different Advertising campaign of the late 1990s to early 2000s. Also Known As: Degree Emoji, Parchment Emoji. EP

- **Video Game** - A video game emoji, shown on major platforms as a console gamepad with D-pad, joysticks, and buttons. Also Known As: Gamepad Emoji, Playstation Emoji, Wii U Emoji, Xbox Emoji. EP

The first of the alternative ways of referring to the *Eyes* emoji, *Eyeballs* (which in this context may well be just a literal description of the picture character, like *Wide Eyes Emoji* apparently) is a well-known metonymic term used by Internet companies to describe regular and mobile Internet users alike via the POSSESSED FOR POSSESSOR relation, because the thing that matters to them is the time people spend on the web looking at the screens of their various devices, consuming the information these companies serve them. The two other names, however, *pervy eyes* and *Shifty Eyes Emoji* (indicating appreciation rather than perversion and dishonest behaviour respectively), are informed by their relation to the Perception ICM and the metonymy MANNER OF PERCEPTION FOR THE PERCEPTION, already mentioned as influencing the meaning of *Sniffing Emoji*, the alter ego of the *Nose* glyph (see footnote 32 above). Representing the INSTRUMENT FOR PRODUCT relation in its meaning *Degree*, *Scroll* also goes by the name of *Parchment Emoji*, as a result of the MATERIAL CONSTITUTING AN OBJECT FOR THE OBJECT conceptualization and the Constitution ICM. *Gamepad* standing for *Video Game* is the most direct reference possible to the CONTROLLER FOR CONTROLLED metonymy, as part of the Control ICM, gamepads being the actual physical controllers of consoles, allowing gamers to have control of the characters and items in video games. The fact that gamepads have a different appearance on different platforms is not only the outcome of the process as part of which of specific trademarks become genericized, but also the tendency of hardware giants like Microsoft or Sony to advertise their products in subtle ways on all the platforms they have access to. Thus, the *Video Game* emoji will be shaped like a Microsoft X Box controller on a Microsoft computer or mobile phone, while a Sony PlayStation controller shaped glyph will appear on a device made by Sony.

In an attempt to end the discussion of the semantic features of emoji and emoticons with a bang rather than a whimper, an interesting group of examples that embody a pair of pretty vocal meaning-making patterns was saved for last:

- **Collision Symbol** **-** A symbol that represents a crash or collision. An angular burst of orange and red in a star-like shape. Also Known As: Bang Emoji, Explode Emoji, Impact Emoji, Red Spark Emoji. EP

- **Oops =X** = Might be used after typing something you didn't mean to type. Direction: horizontal (tilted 90° to the left). PN

- **Uh-Oh =-O** = Shows a feeling of surprise, worry, or a combination of the two emotions. The "O" is not case-sensitive when typing the emoticon shortcut. Direction: horizontal (tilted 90° to the left). PN

- **Yay *\o/*** = The middle section of the emoticon is a cheerleader and the asterisks (*) are pom-poms. It may be used to either express joy or to cheer someone on. Direction: vertical (not tilted sideways). PN

- **Yum :-9** = The "9" represents a person smiling and licking his lips. It is another way of saying, "Yum!" or "That tastes really good." Direction: horizontal (tilted 90° to the left). PN

These are all but one interjections employed as exclamations accompanying actions or expressing emotional reactions. *Oops* after a mistype in a chat session, represented as an emoticon with furrowed brow and twisted mouth, or its counterpart meaning *uh-oh* that has an open mouth to show surprise or concern, or indeed *yum* showing appreciation of tasty food by licking lips could be regarded as products of the EFFECT FOR CAUSE metonymy owing to their link to emotions. However, there is always some action preceding and/or producing emotions, which means that exclamations can be part of the Action ICM too, when they are converted to verbs, as in the sentence: "The students ooooohed and uh-ohed". This simultaneous connection to emotions and action is made explicit in the description of the *Yay* text emoticon (depicted as a cheerleader with pom poms holding her arms in the air) stating that he glyph is meant to express joy or cheer people on. The potential of interjections to refer to action is manifested in the metonymy EXCLAMATION FOR THE VERBAL ACTION PERFORMED BY THAT EXCLAMATION kind (cf. Martsa 2013, 171). The alternative name of *Collision Symbol – Bang Emoji* is first and foremost the sound effect standing for the cause, *collision*. But again, the action of two things colliding or something exploding is what is behind it, and *bang* can be used to refer to action, as in: "It all went bang". Therefore, here we have another example of an onomatopoeia with links to the ONOMATOPOEIA FOR THE VERBAL ACTION PERFORMED BY THAT ONOMATOPOEIA metonymy (cf. ibid. 171) becoming an emoji (see *Sleeping Symbol* above). We hope that by now the reader has been

wowed by picture characters, and as this overview draws to a close some concluding considerations are in order.

8.7 United colours of emoji going glocal. What started from a smiley, one man's 1980s creation in the U.S. and took another man's idea in Japan, a decade or so later to take it to a different level of visual expression, has become a ubiquitous, firmly established feature of the digital communication in the new millennium. At first available only locally, in a single country and on a single network, pictograms come pre-loaded on the vast majority of phones and computers today, more often than not with text-based emoticons and colourful emoji image characters available as coexisting keyboard options. Having become a global phenomenon that has recently won recognition for their artistic value[86], emoji continue to evolve. The most recent trend shows their swift development in the opposite direction of particularization that takes two forms – localization (with continent- country- ethnic group- or organization/company-specific emoji sticker apps for smartphones launched, for instance by Finland[87], Jamaica, Corinthians Football Club, Disney or Pixar) and individualization (as dozens of celebrities, including singers, bands, actors and sportsmen embrace the emoji keyboard craze). It is even possible for individuals or groups of people to petition[88] the Emoji Consortium to include specific glyphs into the standard set as alternative platforms, such as Emojidex, develop alternative emoji collections.

While these trends must certainly be acknowledged as significant, even from the point of view of word-formation, because they give us the shortening *Moji*[89] and potentially productive suffix-like elements *-moji* and *–oji* stemming from the process of blending

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[86] The original set of 176 first ever emoji is now part of the permanent collection of the Museum of Modern Art in New York where the glyphs are currently displayed in the form of an interactive installation. The article *Emoji inventor Shigetaka Kurita says MoMA New York acquisition 'feels like a dream'* (retrieved March 22, 2017 from: http://www.abc.net.au/news/2017-02-11/meet-the-man-who-invented-emoji/8249456?pfmredir=sm) documented the reaction of the emoji designer to the event.

[87] Finland is credited as the first country to have its own emoji. The iOS and Android app Finland Emojis has been released by the country's Ministry for Foreign Affairs.

[88] The case of the dumpling emoji which may be added after a successful Kickstarter campaign has attracted considerable media attention. Digital Trends is just one of the media outlets reporting about this trend in the article DUMPLING AND FORTUNE COOKIE EMOJIS COULD BE INBOUND AFTER KICKSTARTER SUCCESS retrieved January 15, 2017 from: http://www.digitaltrends.com/web/dumpling-emoji-kickstarter/.

[89] Skype's use of the word *Moji* to refer to short video clips that can be inserted in chat messages on that platform is idiosyncratic as that word is normally employed in emoji-related contexts, for instance the name of the mobile app Moji Me, which allows the users to create emoji in their own likeness, based on photos.

the names of persons or things inspiring the stickers and the word *emoji* together to provide names for mobile apps[90], the focus of this chapter lay elsewhere.

As specified in the introductory remarks, the decision was made to analyze primarily the emoji that are part of the Unicode standard and get incorporated directly into mobile operating systems[91], which ensures a high level of intra-platform compatibility, globally. A very limited number of emoji stickers have been thrown into the mix in order to illustrate this genre of picture characters. The aim was to highlight the semantically significant features of text-based and animated emoticons and emoji, relying on the definitions and descriptions of glyphs provided almost exclusively by two major online resources, *Emojipedia* and *pc.net*. Such a choice regarding resources had both positive and negative consequences, the crucial positive one being that it allowed rare systematic access to explicit definitions of emoji and emoticon meanings which are generally left unexplained. The fact that the resources occasionally also provided examples or details about the context of use of glyphs was also significant. However, this came at a cost. Picture characters had to be analyzed in isolation, instead of in combination with words and their fellow pictograms, which is what real-world situations in which they are used typically look like. That limitation is caused by one of the biggest hurdles facing anyone wishing to explore computer-mediated communication. As pointed out by Crystal (2008, 2011) in relation to analyzing text messages and identifying problem areas in Internet linguistics respectively, getting access to real-world data is notoriously difficult. Very few people would let others take even a quick look at their messages or social media exchanges, let alone allow a humble linguist to extract entire conversations to analyze their use of emoji. The other issue with this essentially context-free approach is that it does not take the full impact of culture on meaning into account. It is these issues that we aim to address briefly here, before summarizing our investigation of picture characters.

8.8 Combining emoji. When three (or more) is not a crowd. Since real-life examples of the use of emoticons and emoji in day-to-day messaging situations are

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[90] The list given in the iMore post These Celebs Have Caught A Case Of Emoji Keyboard Fever (retrieved December 12, 2016 from: http://www.imore.com/celebrity-emoji-fever) is far from exhaustive. Let us add a few more apps and celebrities: Afreekmoji that celebrates African culture, the Maori Emotiki app, Jamoji - sticker collection representing Jamaica, the Corinthians app – Timaoji, Neymoji by the Brazilian football star Neymar or Phelpsmoji, launched by the swimming legend, Michael Phelps. Another famous footballer, Ronaldinho has a sticker app whose name *Emojinho* resulted from blending taking the other direction, so as to produce a pronounceable word.
[91] As such they are free of charge, unlike the majority of sticker apps that are a great source of revenue for their owners.

hard, if not impossible to get, turning to the web for illustrations of the ways in which meaningful glyph sequences are formed seems the only option, aside from buying one of a number of books [92] listing ready-made emoji combinations. The examples available online and in the sample include:
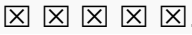
- **LMAO** - 😄🐴➡️

- **When Pigs Can Fly** - ⏰🐷✈️

- **Food Poisoning** - 🍕🚾🏃💨

- **Let's Make a Baby**? - 👫➕🍻🎶➕🔥👉👈👶❓

- **Let's Grow Old Together** - 👩👨👉👈👵👴

- **That Was Cold** - 😰❄️

- **Bombshell Bikini Bod** - 💣🐚👙

- **Flying pig** - 🐷 KA

- **Alien in the box** - 👾👾👾👾👾👾👾👾👾👾

- **In a Nut Shell (@)** = The at symbol is the nut. Direction: vertical (not tilted sideways). PN

The chat acronym *LMAO* (*Laughing My Ass Off*) continues the ancient tradition of rebuses combining a laughing smiley, a *donkey* (*ass*) emoji representing the animal because its name is homonymous with the word *ass* meaning *bottom* and the *right-pointing arrow button*. The third glyph stands for the adverb *off*, indicating that the force of laughter is going to cause said body part to become detached. Since the donkey head faces left, the arrow pointing in opposite direction shows that ass is *left behind*. The characters forming the humorous or sarcastic idiomatic phrase "pigs might fly" or

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"when pigs fly", referring to the unlikeliness of an event provide a word-for-word "transcription" into emoji: *alarm clock* and *time passing* and *airplane* and *flying* establishing the same metonymic relation INSTRUMENT FOR ACTION. Pig face stands for the whole animal via the pattern FACE FOR PERSON. But why use three pictograms when, thanks to Kim Kardashian's sticker, we can use one to say the same thing? A slightly more complex sequence, *Food Poisoning* begins with a slice of pizza, one of the most popular kinds of food worldwide standing for food in general, exemplifying the relation MEMBER OF A CATEGORY FOR THE CATEGORY. The squared initialism *WC* (*Water Closet*) is also an internationalism – the universally recognized sign, establishing the metonymic link FORM FOR CONCEPT between the two-letter form WC and the concept, *toilet*. The representation of a poisoned person running to the toilet is self-explanatory, the speed of movement being emphasized by the addition of the *Dash Symbol* emoji. But given the alternative name of that emoji and the nature of his predicament, might he be *breaking wind*, as the Japanese would interpret it? Moreover, the fact that the person is (generically) represented as male is explainable as resulting from the influence of the cognitive principle DOMINANT OVER LESS DOMINANT. From potty topics to birds and bees, emoji can be used when a euphemism is felt to be needed or when talking about sex, as in the next elaborate combination referring to procreation. In a sequence of events and emoji that evokes the EVENT STRUCTURE METAPHOR, in *Let's Make a Baby?* the question of making a baby is raised in a boy-meets-girl scenario, when after some drinking and listening to music (the plus signs indicating the passage of time i.e. that the events in question form a sequence), they realize that they are attracted to each other – find each other hot. Hence the *fire* emoji stands for the metaphorically employed adjective *hot*, motivated by the EFFECT FOR CAUSE metonymy illustrating physiological reactions to emotions. The use of the right pointing hand that signals a future event − the making of and birth of a baby or growing old together, as shown in *Let's Grow Old Together* reflects the deeply entrenched conventional conceptualization of time in terms of space and viewing the future as being in front of us, the present right by us, and the past behind (cf. Lakoff and Johnson (1980). Here, as mentioned above in the context of interfaces, the past is located on the left side and the future on the right side (cf. Calabris, 2009: 43). People can be *hot* and people can be *cold*, as succinctly depicted by the next combination *That Was Cold*. When the *Face With Open Mouth and Cold Sweat* emoji, expressing concern or nervousness is coupled with *Snowflake* standing for snow and by extension cold, it is the opposite of

the metaphor AFFECTION IS WARMTH that is exemplified. With the metaphor that could be glossed as INSENSITIVITY IS COLD, the strategy of emoji is unchanged. As with other metaphors, render it literal in order to depict it. *Bombshell Bikini Bod* is an example of the manner in which emoji can be grouped together to represent complex noun phrases. The term *bombshell* metaphorically referring to a *female sex symbol* can be traced back to the actress Jean Harlow, the first woman who earned that epithet[93], by starring in the film of the same name. The literal pictorial representations of a bomb and a sea shell are stacked together to refer to the metaphoric term. The bikini glyph is purely iconic and *bod*, the informal clipping meaning *body* is absent from the picture, but the shape of a bikini is evocative enough of a sex symbol's hourglass figure. The expression *In a Nutshell* shows that the same semantic and pictographic strategies were present in text-based emoticons before emoji. The figurative expression is depicted literally, the brackets representing the shell and the @ sign the nut.

Receiving a message that looks like one of the following sequences maybe enough to drive one nuts: □□□□□□□□, ������ or ☒ ☒ ☒ ☒ ☒ ☒ ☒. Seeing a group of alien heads inside square boxes on your screen, if you are an Apple device owner, does not signal an impending alien attack – close encounters of the third kind. Rather, depending on the platform you are using, aliens, empty boxes, question marks on black rhomboids or Xs in rectangle boxes are in fact picture placeholders, meaning that you do not have the particular emoji that someone sent you (most likely if your device has not been updated to the latest operating system version). Knowing that the question mark glyph is conventionally used metonymically in place of missing or unknown data and that *X* implies negation, Apple's choice to place an alien head inside the otherwise empty box, which serves the same purpose as the question mark, points to the rehashing of the metaphor ALIENS ARE (THE FEAR OF) THE UNKNOWN often exploited in Hollywood. This rounds off the cursory look at combinations of picture characters and the next thing to do is to go back to where it all started to briefly appreciate the impact of culture on meaning and to complete the circle, as it were.

8.9 An underlying cultural influence. Made in Japan. Emoji have undoubtedly become a worldwide phenomenon of unprecedented popularity and diversity, but the

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93 The Wikipedia entry *Bombshell (sex symbol)* (retrieved January, 12, 2017 from: https://en.wikipedia.org/wiki/Bombshell_(sex_symbol)) documents its history, providing information about its rise and fall in popularity and a list of film stars to whom the term was subsequently applied.

links to their roots and the country of origin run like DNA through our sample. The continuing references to Japan[94] and its culture can provide an illustration of the ways in which one's knowledge of a culture or the lack of it essentially determine meaning. For instance:

- **Tokyo Tower** - The Tokyo Tower is the second-tallest building in Japan, located in Minato, Tokyo. Built in 1957, the design of the Tokyo Tower was inspired by the Eiffel Tower in Paris, France and may be confused for it due to the small size of the emoji. Also Known As: Eiffel Tower Emoji, Red Tower Emoji. EP

- **Bank** - A retail bank branch, where people can perform money-related tasks. Also a common location to find an ATM. This emoji came to also mean "slacking off" or evading responsibility in Japan, due to the BK letters being associated with the slang term bakkureru. Also Known As: Bakkureru Emoji, Bank Branch Emoji, BK Emoji. EP

- **Name Badge** - A name badge, used to identify oneself in a location that others may not know your name, such as a school trip, or a work conference. This tulip-shaped name badge is one of many designs commonly found at kindergartens in Japan. Also Known As: Fire Tag Emoji, Name Tag Emoji, Tofu On Fire Emoji. EP

- **Heavy Large Circle** - Used as an alternative to a check (tick) in Japan for a something that is correct. The opposite of an X (cross mark) for something wrong. Also Known As: Circle Emoji, Correct Emoji, Red Circle Emoji. EP

- **Hot Springs** - Representation of hot springs with steam rising from a circular tub. This is the common symbol used to represent an onsen on maps in Japan. Also Known As: Onsen Emoji, Steam Emoji. EP

- **Hundred Points Symbol** - 100 emoji: the number one-hundred, written in red, underlined twice for emphasis. Originating from the number 100 written on a school exam or paper to indicate a perfect score of 100 out of 100. Teachers in Japan may also use a stamp in addition to the 100 mark, to indicate that a student has performed very well. This 100 emoji is commonly used as a shorthand for 100%, with the usage meaning "keep it real" or a similar sentiment. A 100 emoji can be used to express pride or general acceptance of an idea. In Snapchat, the 100 emoji appearing next to a fire emoji indicates a 100 day Snapstreak. Also Known As: 100 Emoji, Keep It 100 Emoji, One Hundred Emoji. EP

- **Diamond Shape With a Dot Inside** - A glyph that is used for kawaii in Japan, resembling the shape of a flower. Also Known As: Cuteness Emoji, Diamond Emoji, Kawaii Emoji. EP

- **Wheel of Dharma** - A symbol often used in relation to the Indian religions of Hinduism, Buddhism, Sikhism and Jainism. Also Known As: Helm Emoji. EP

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[94] The country does indeed have something of a special status in the realm of emoji. It is the only country to have its map represented as a glyph (*Silhouette of Japan Emoji*) while, as stated in the emoji description: "other countries can be found on the various globe emojis, or the world map emoji." Also, the *Crossed Flags* emoji features two flags of Japan, on all software platforms, except on Samsung's devices where two South Korean flags are shown.

A tower in Tokyo inspired by the famous French landmark and the influx of manga, anime and kawaii culture to the West prove the well-known fact that influences go both ways. They also underline an issue inherent to emoji arising from their pictorial character and the general lack of written descriptions of their features or even the information about their names within the interface[95]. The similarity of appearance, as always, results in ambiguity on small screens and elsewhere, so the *Tokyo Tower* emoji becomes *Eiffel Tower*. Moreover, in these examples, the knowledge of culture plays a crucial role. Every culture has its own set of symbols – emblems whose meaning is learned through immersion into each individual civilization and this is nothing new or strange. But here, the global reach of emoji has made both the universal and culture-specific pictograms accessible to millions of connected users worldwide and the uninitiated multitude readily takes them at face value. The interpretations are literal, as expected. The *Hot Springs* emoji, commonly representing onsen bathing facilities in Japan is simply interpreted as *Steam*, which is the salient part of the hot springs scenario highlighted in the emojified symbol, while analogy motivates the perception of the flower-like kawaii glyph as a diamond, based on the close resemblance between their respective shapes. The same kind of analogy is behind the visual parallel between the *Wheel of Dharma*, one of the most powerful religious symbols of another great Asian civilization – India and a *ship's helm*, quite a mundane thing in comparison. But sometimes the degree of visual similarity triggering analogy is not so high and things can take an unexpected turn, as far as reinterpretation is concerned. The emoji depicting the stylized tulip framed name badge, worn by children in kindergartens or on school trips, in Japan is also called *Fire Tag Emoji* and *Tofu On Fire Emoji*. This shows that the tulip shape of the badge has been stylized beyond immediate recognition, as it becomes associated with fire on account of its colour and the three spikes resembling flames and the actual name tag part having the shape and colour of tofu allowing the creation of an altogether surreal alternative name. Continuing with the school theme, the hundred points symbol represents the highest mark, the perfect score, but as an emoji in online exchanges its meaning gets metaphorically extended to mean "keep it real", in other words, be

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[95] *Botmoji*, Emojipedia's Twitter bot comes to the rescue, providing another roundabout solution to this and the problem of the missing emoji that are not recognized by our devices. One can tweet a picture of any emoji to the bot and she will tweet back the answer with its name, or one can copy the text with the absent glyph, tweet it @Botmoji and Botmoji will kindly reveal what it is. More information available at: http://emojipedia.org/botmoji/ and http://blog.emojipedia.org/turn-a-question-mark-box-into-an-emoji/.

true to yourself, 100% authentic, or otherwise express satisfaction and agreement in general. Like a number of other glyphs, some of which were mentioned above, it can have other application-specific uses, as in Snapchat. What to the rest of the world may look like a plain red circle, in Japan replaces the tick symbol to show that something is correct. It thus implies achievement of a goal, bringing to mind the already analysed rings in the Apple Watch *Activity* application and the metaphor CLOSING THE RING IS ACHIEVING THE GOAL. Success sometimes requires a bit of luck, which is where a good luck charm comes in handy, preferably in the shape of poop, which brings us back to the *Pile of Poo* emoji 💩 (also one of the 176 original glyphs) that the Japanese would tell us we've been using all wrong. According to the Japanese tradition rooted in Shinto rites related to the religion's numerous deities, residing practically everywhere and regulating everything, including bodily functions, the use of poop as a good luck charm stems from a play on words, a frequent mnemonic device in Shintoism, based on the partial similarity of pronunciation of the words meaning *poo* and *luck*[96]. The use of *Bank* emoji shows an international term acquiring a new meaning in Japan which, as in the case of the good luck charm, turns out to be completely unrelated, except for the fact the word *bank* happens to feature letters *B* and *K* associated with the slang term ばっくれる(*bakkureru*) meaning "to evade one's responsibilities".

It is always worth remembering just how frequent is the occurrence of multiple meanings in emoji, cultural influences being an important source of expansion of semantic fields, along with language and especially context.

8.10 What you get is what you see. The only way is up. With more than a ten-fold increase in the number of standardized emoji approved by Unicode Consortium in less than a decade since the first 176-strong batch was introduced in Japan and with half a dozen billion glyphs and stickers sent every day via mobile messaging applications[97] by 92% of the online population[98], the ever so popular and expanding field of pictograms is interesting because of its potential for a fruitful examination from the point of view of cognitive semantics. Applying the taxonomy of PART AND PART

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[96] The Japan Times article *Gold poop* (retrieved January 10, 2017 from: http://www.japantimes.co.jp/news/2007/03/20/reference/gold-poop/#.WKPe8G8rJso) brings an interesting back story on the subject that caused one of its readers to become culture shocked.

[97] The 2013 data provided by Statista (available as premium content at: https://www.statista.com/statistics/301061/mobile-messaging-apps-sticker-emoji-usage/) can probably no longer be considered accurate. It is safe to suppose that four years and innumerable stickers and emoji later, the number must be significantly higher.

[98] According to 2015 Emoji Report by Emogi Research Team.

metonymic relationships, arising from ICMs and governed by a number of overarching cognitive principles, developed by Kövecses and Radden (1998) and Radden and Kövecses (1999), the semantic patterns behind the largely decontextualized emoji and emoticons were pinpointed and analyzed. As suggested by the name of the text-based glyphs, which is a blend of *emotion* and *icon*, the primary role of picture characters in general is to express emotions or broadly speaking to reflect the state of mind of their users. Smileys, depicting facial expressions; signs, notably, heart-shaped and heart-related pictograms and hand gestures all perform this crucial emotive (cf. Jakobson, 1960) function in the context of contemporary digital communication and have been, therefore, examined first and in most detail. Their analysis revealed a range of emotion-centric metonymies, highlighting bodily responses to affective states and conventional metaphors around the main source domains of HAPPINESS, LOVE, ANGER and SADNESS, as well as the associated ones, such as COLOUR. It also pointed to the presence of larger structures – folk models of anger, language and the heart. The claim about the centrality of these domains in the field of image characters has been confirmed by a recent and according to its authors (cf. Lu et al. 2016) most likely first ever large-scale study of emoji use internationally based on a data set[99] provided by the makers of the mobile app *Kika Emoji Keyboard* that collects anonymized user meta data. The research focusing on finding out whether emoji use preferences can be correlated to cultural differences singled out the top 20 most frequently used emoji. The vast majority were happy-faced smileys and hearts and the combinations thereof, followed by an occasional gesture or two and only one other glyph that did not belong to any of these categories.

Aiming to be representative of the growing diversity of emoji and the diverse make-up of emoticons, our overview included a range of other picture characters describing people's body parts, occupations and activities, equipment, objects and places. Special attention was paid to sign glyphs, as well as those that are used euphemistically or to refer to taboos. Emoji combinations were illustrated only briefly, since they are not featured in our sample. The currently observable directions of development and cultural aspects of emoji were also considered, namely, their links to popular culture i.e. cartoons and the civilization of their country of origin, Japan.

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[99] It incorporated over 400 million messages containing emoji generated by more than three million Kika users from 212 countries and regions over a period of 25 days.

Cultural differences were shown to influence the interpretation of emoji meanings. The branching of the meaning of pictograms was identified in their descriptions on *Emojipedia* and *PC.net* websites and alternative names listed in their respective *Emojipedia* entries. The departures from the basic meaning contained in the main names of the glyphs were found to be largely metonymic. They were shown to belong to different Idealized Cognitive Models, with all ten principle ICMs, determined by Kövecses and Radden, represented by at least one metonymic pattern. These metonymies would often provide input for metaphors and analogy motivated reinterpretations of certain pictograms based on the similarity relations existing between them and the objects they resemble. Naturally, literal interpretations are always present and ambiguity is also to be taken into account. The catalogue of alternative names of emoji is so wide and the number of additional uses that can be spotted in the wild on the web or in the budding genre of (mock) glossaries compiling examples of usage of modern pictograms is so great that the meaning situation could be described as "what you get is what *you* see", depending on the context. Emoji semantics is a very dynamic field. As operating system manufacturers are free to change and tweak the appearance of any given glyph at will, as pointed out above, which they periodically do, the shape of picture characters is not strictly codified and neither is their meaning. Such a situation invites a parallel with Denroche's (2015: 87) take on what he refers to as "ham sandwich metonymies", after the well-known example of the POSSESSED FOR POSSESSOR type of relationship. Namely, in his view their source is in the context. Accordingly, he proposes the metonymic principle SALIENT FEATURE IN THE CONTEXT FOR PERSON, which, in the case of picture and text-based characters could be modified as SALIENT FEATURE IN THE CONTEXT FOR PICTOGRAM. Denroche (ibid. 87-88) also suggests that the human conceptual system "is particularly suited to one lexical item having a literal, a metonymic and a metaphoric meaning". Adding that "there seems to be room in the lexicon for these to remain distinct and not cause misunderstandings", he calls this phenomenon "the triangle of tropes". This tendency is exemplified by the above-mentioned *Nauseated Face* emoji, also known as: *Disgust Emoji, Green Face Emoji, Vomit Emoji*, whose main name and two out of three alternative ones could be taken to reflect literal meaning, with *disgust* resulting from metaphoric extension. Alternatively, the adjective *green* could be taken to metonymically refer to sickness. The emoji and emoticon sample features a number of other glyphs where the trio of tropes is present.

This summary of the main elements of the present analysis of emoji and emoticons clearly shows that the exploration of their uses has remained within the confines of the meaning of individual characters, without venturing into the exploration of their discourse functions discussed by Danesi (2016a) who analysed a database of messages containing emoji provided by the students at the University of Toronto. These text messages, tweets and social media exchanges provided a wider context of use and evidence that pictograms perform a phatic function, where the focus is more on social aspects of communication than on meaning. Thus, they can be used to keep the communication channel open, begin or end an utterance, avoid silence, in short, maintain a friendly atmosphere, when communicating mostly with friends or family. Furthermore, as said above, their main function overall and in discourse situations is emotive. This is where they act like paralinguistic elements in face-to-face exchanges (cf. bid. 27-30) or often become emotive punctuation marks ending messages in a particular, generally positive, tone (ibid. 74). Because of the different primary focus and the lack of access to actual messages involving emoji or emoticons, the exploration of the semantics, grammar, syntax or pragmatics of glyphs used in context is beyond our scope and Danesi offers a valuable account of these and other aspects of emoji. However, the author's observation that "in a cognitive or neuroscientific sense, emoji can be characterized as blends" and that "one can easily see blending processes at work in the origination of the emoji code, which presents visual forms that are pictographic amalgamations encoding various connotative meanings"[100] (cf. ibid. 68) fits into the present analytical framework and is mentioned here. Given the frequency with which on-line meaning construction, as one of the hallmarks of the blending process (cf. Fauconnier, 1997 and Fauconnier and Turner, 2002), takes place when using emoji, resulting in the adaptation of their meaning in messaging situations, Conceptual Integration Theory indeed seems to provide the most accurate general description of their nature. Ultimately, codification of some of the meanings occurs and they appear as alternative names of individual pictograms in online resources. Sometimes referred to as universal and/or ubiquitous language (cf. Evans, 2016, Lu et al. 2016 and Danesi 2016a) emoji are certainly predominantly used to add a positive tone to communication (cf. Kralj Novak et al, 2015, SwiftKey

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[100] The author also observes that blending operates at various levels, as each glyph is a logogram at the micro level, while at the macro level, various elements of the picture are combined to produce metaphorical meaning, or further when several emoji are combined into sequences.

Emoji Report and Danesi, ibid.). However, as noted by both Evans and Danesi, mentioning the situations where instances of use of emoji were allowed as evidence in trials against people accused of committing serious crimes, glyphs can even be perceived as the complete opposite to their overall positive role in the communication process. Moreover, they can also be become a secret code, a jargon among specific groups of people excluding others, be it among children as a means of cyber bullying[101] or adults devising ways of using emoji for sexting[102]. Such practices reflect the fact that emoji use is peer- and age-sensitive stated by Danesi (ibid. 27), a semiotician whose investigation into the "post-alphabet" picture-word phenomenon was inspired by the need to distinguish the ways in which they get integrated into the alphabet i.e. define the relation between glyphs, writing systems and other means of communication[103]. That is the issue that will be briefly looked into here, before touching upon another area that is also the topic of the book *Semantics of Emoji* – the possibilities of translation into and from the emoji code.

8.11 Once more with feeling. Lost and found in emojification. Tracing the origins of writing to prehistoric cave art and tracking the development of writing systems from concrete to increasingly abstract representations of human thought, Danesi (2016a: 18) defines emoji as "an annotative code, used largely in informal communications, to add visual annotations to the conceptual content of a message". Given their pictorial nature, emoji and emoticons are pictograms or ideograms, depending on the stylistic variations of individual glyphs (cf. ibid: 21) or indeed logograms. As such, they are modern additions to the pre-alphabetic modes of writing that effectively combine with alphabets and other scripts, like Chinese, Japanese or Korean to produce a hybrid code that permeates contemporary digital exchanges.

In his widely influential book *Understanding Media: The Extensions of Man*, McLuhan (1964: 87) makes a series of remarks about the impact of the development of the

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[101] As explained in the Huffington Post article: The Secret Language Of Emojis And Your Children by Dr. John DeGarmo (Retrieved December 12, 2016 from: http://www.huffingtonpost.com/dr-john-degarmo/the-secret-language-of-em_b_11525876.html).
[102] The Mic Network article: Beyond the Eggplant, Here's How Emojis Are Making Us More Sex-Positive interviewed ordinary people and experts in different fields about emoji use for sexting (Retrieved from: https://mic.com/articles/130745/beyond-the-eggplant-here-s-how-emojis-are-making-us-more-sex-positive#.5QdLFSuwO)
[103] The author stated this as a motive for writing a book on emoji in M. Danesi (2106b, November 7) 'We're living in a post-alphabet future': How a new 'bilingualism' has emerged through emoji" (Interview by David Barry) National Post. Retrieved from http://news.nationalpost.com/arts/were-living-in-a-post-alphabet-future-how-a-new-bilingualism-has-emerged-through-emoji.

alphabet, as a fully abstract writing system, on the human mind and society. The following observation provides a starting point for Danesi to draw conclusions about emoji writing:

To sum up, pictographic and hieroglyphic writing as used in Babylonian, Mayan, and Chinese cultures represents an extension of the visual sense for storing and expediting access to human experience. All of these forms give pictorial expression to oral meanings. As such, they approximate the animated cartoon and are extremely unwieldy, requiring many signs for the infinity of data and operations of social action. In contrast, the phonetic alphabet, by a few letters only, was able to encompass all languages. Such an achievement, however, involved the separation of both signs and sounds from their semantic and dramatic meanings. No other system of writing had accomplished this feat.

As a new form of code, whose core elements are quickly learned and embraced by the global population immersed in digital culture, the emoji/emoticon script re-introduces the pictorial aspect, reconnects thoughts and feelings and mitigates the effects of the split between the two. The fact that emoji blend with alphabetic writing, while they themselves as glyphs blend universal with particular meanings is, according to Danesi (ibid. 69) attributable to the nature of the brain because "the brain is a blending organ that, like its expressive products, connects parts to the whole, as in symbols and other sign structures". Thus, we may add, a three-tier blending process emerges active at the level of signs, since emoji are perceived as blends of various meanings (see above), as well as at the level of the alphabet which they enrich and ultimately in the brain, which again highlights the dominance of conceptual integration in reasoning.

Building on McLuhan's remarks (1962: 158) about the role of literacy and print in bringing about the culture of individualism such as:

Print is the extreme phase of alphabet culture that detribalizes or decollectivizes man in the first instance. Print raises the visual features of alphabet to highest intensity of definition. Thus print carries the individuating power of the phonetic alphabet much further than manuscript culture could ever do. Print is the technology of individualism.

Danesi emphasizes that in the "global village" and the Age of the Internet that followed the Age of Print things have changed since literacy now comes by default. As a result of the creation of new online communities and the appearance of the contemporary communal spirit, the changing functions of literacy have got us to the point where "the

type of language used on social media makes it obvious that the previous rules of literacy have less and less value, evidenced, as we saw, by the fact that orthographic and grammatical perfection are no longer strict requirements for 'proper communication'" (ibid: 148).

The current age which we might call the Age of Mobile favours social networking, sharing, even collaborative reading sites and apps like *Goodreads* where reading no longer feels like a lonely affair – the reader can still be alone with a book, but people can be alone together reading, sharing their book lists, book reviews and comments online. Mobile is an age that mixes individualism with new social platforms, a multimedia age where text, images and sounds blend together into new experiences that add value to old ones. As such it needed a multimedia language, a mixed code, a hybrid alphabet quickly learned and understood by the inhabitants of the global village and that is what emoji have become. Looking at the development of writing systems, they and their predecessors, emoticons may seem to have been long time coming, but earlier technologies paved the way for their arrival. As McLuhan (1964: 174) puts it:

If the phonetic alphabet was a technical means of severing the spoken word from its aspects of sound and gesture, the photograph and its development in the movie restored gesture to the human technology of recording experience. In fact, the snapshot of arrested human postures by photography directed more attention to physical and psychic posture than ever before. The age of the photograph has become the age of gesture and mime and dance, as no other age has ever been.

With the age of the photograph, gesture, mime and dance were back in the picture and radio and TV brought more and more people together, until the process culminated with the advent of the mobile technology and the modern thumb tribe. Today, emoji encompass gestures, the body, its parts and physiological responses to the world around us. Internet memes can be incorporated into messages alongside glyphs and dancing, animated gifs. That does not kill individuality, though. With an app or by visiting a web site offering such services, we can create emoji in our own likeness, make a meme or a gif to share with others, Alternatively, we can choose from the many readymade options available online. So, this is the humanity's current attempt to reinstate feelings, fuse emotions and images with the alphabet and turn it into a multimedia tool. This kind of tool, a post-alphabet seems, for now, to be a functional solution for the needs of the post-PC era marked by intense multimedia consumption

and increasingly production via mobile devices – smartphones and tablets. These devices make emoji more easily available and easier to use than ever before. For an illustration of how far we have come, one needs to look no further than the emoji prediction capability offered by Apple in iOS and in standalone keyboards by SwiftKey and Google's Gboard. As mobile phones and texting gained ground in early 21st century, the speakers of world's major languages were grateful for the now rudimentary looking T9 predictive text option that came preloaded with pre-touchscreen phones that allowed entering text (i.e. predefined whole words) with a single tap instead of using the default multitap input method. And now, smart devices can predict, that is automatically translate eligible words into emoji, which brings us to the issue of the possibilities and limitations of the attempts of translation of entities larger than single words, including entire literary works from individual natural languages into the near-universal code of emoji.

Although the emoji code is not a full-fledged sign language and it does not look poised to become one, since it has to be learned, there has been talk of bilinguism (cf. Danesi, 2016b), at least at the level of the alphabet. It has also been claimed that glyphs perform the communicative functions of language of getting our ideas across and interacting with others, influencing them in the process (cf. Evans, 2015). The pictograms are meant to be used primarily in personal short textual exchanges, as auxiliary devices compensating for the lack of face-to-face communication. However there have been multiple and diverse attempts to cross the boundaries of messaging and employ emoji elsewhere, both in the digital medium, notably for the purposes of advertising and political campaigns, or translating pop songs for fun, as well as in print, where literary classics have been emojified to varying degrees. All of these approaches involve composing either emoji-only or hybrid text and the translations of works of literature result from individual or collaborative effort. Needless to say, the constraints of space will make this look at the nature of emoji translations cursory at best.

Perhaps the best-known foray of contemporary pictograms into literature is *Emoji Dick* edited and self-published in 2010 by Fred Benenson. Herman Melville's 1851 masterpiece *Moby Dick or the Whale* was translated by over eight hundred people hired through Amazon's crowdsourcing Internet marketplace, Mechanical Turk. The

project was funded through a Kickstarter campaign and the workers a.k.a. *turkers* were paid to translate[104] the approximately 10,000 sentence novel.

The translations of three sentences from the first two chapters showing different levels of complexity will have to suffice to illustrate the outcome of turkers' work:

- 😃 😃 😃 ! 👻 👏 👏 👏 👏 👏 😃 😃 😃 😃 👎 👎 👎 👎

  how cheerfully we consign ourselves to perdition!

- ➡️ ➡️ 👦 ❌ 👂 ❓

  But go on, Ishmael, said I at last; don't you hear?

- 🚹 ↗️ 🔣 9️⃣ 🍦 🍑 🆙 ⏩ 🍸 ☝️ 🔊 ©️

  Tough I cannot tell why it was exactly that those stage managers, the Fates, put me down for this shabby part of a whaling voyage, when others were set down for magnificent parts in high tragedies, and short and easy parts in genteel comedies, and jolly parts in farces-- though I cannot tell why this was exactly; yet, now that I recall all the circumstances, I think I can see a little into the springs and motives which being cunningly presented to me under various disguises, induced me to set about performing the part I did, besides cajoling me into the delusion that it was a choice resulting from my own unbiased freewill and discriminating judgment.

In the book, each emoji-only sentence is accompanied by its textual counterpart which facilitates, or rather makes comprehension possible in the first place. With the help of text, it is possible to decode the intended meaning of the sequentially arranged glyphs. Smileys stand for cheerfulness, multiple smiling faces for plural, followed by a displaced cartoonish exclamation mark. The happy ghost emoji shows that we are willingly committing ourselves to the loss of life – becoming a ghost. Another set of smiling faces and repeated hand clapping gesture emoji are there to heighten the effect and the tone of wonder(ing), while the thumbs down metaphor encompasses negative experiences including death. There is no literal translation here – no calquing; the arrangement of picture-words is primarily conceptual (cf. Danesi, 2016a: 73) but the nuances of meaning brought by using the words *consign* and *perdition* instead of *settle for* and *death*, for instance are predictably lost, as they cannot be conveyed by

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[104] The translation process is described in the book and on the project website www.emojidick.com as follows: "Each of the book's approximately 10,000 sentences has been translated three times by an Amazon Mechanical Turk worker. These results have been voted upon by another set of workers, and the most popular version of each sentence has been selected for inclusion in this book. In total, over eight hundred people spent approximately 3,795,980 seconds working to create this book. Each worker was paid five cents per translation and two cents per vote per translation." The editor's personal website http://fredbenenson.com states that "in 2013, the book became the first emoji book acquired by the Library of Congress" It is available for free in a variety of digital formats from archive.org. Retrieved from https://ia600305.us.archive.org/7/items/emojidick/emojidick.pdf.

emoji. In the next example, where arrows represent movement, one of the interlocutors is not represented, most likely the speaker and there is no pictorial mention of the temporal reference (*at last*). The cartoonish X for negation and the question mark play their part and so does the ear standing for hearing. Still, parts of the sentence are lost in translation. In the last example sentence, it is the readers who are lost, trying to fathom the meaning of a 116-word-long sentence condensed into just twelve emoji. Compression is normally the great communicational advantage of glyphs, but in this case, the confounding density has the opposite effect for all intents and purposes, and it is beyond us to attempt to decipher this string of glyphs here. The translation of *Moby Dick* into emoji has been analysed by Radford et.al. (2016) using Natural Language Processing techniques to compare the EMOJI corpus to the corresponding TEXT corpus. The translations were "expected to be extremely noisy, due to the high subjectivity of human emoji comprehension, and the scarcity of native speakers and it was shown that "emoji operate in a far smaller space" (ibid. 162 and 164 respectively).

It is significant to note that Benenson's much more ambitious 2015 campaign The Emoji Translation Project aiming to build a "general purpose emoji translation engine" failed to secure Kickstarter funding. In the meantime, Benenson (2016), who is a computer scientist, published an emoji phrasebook which is interestingly classified as humour, in online bookshops, alongside similar books including *The Emoji-To-English Dictionary: Your Text-Message Translation Guide* mentioned above. This is perhaps a good indicator that it is too early for emoji-only translations to be taken seriously.

On the other hand, the posters created by artist, designer and author Joe Hale featuring his translations of the full text of Lewis Carroll's *Alice in Wonderland* and J.M.

Barrie's *Peter Pan* (that he named *Wonderland* and *Neverland* respectively), as well as Carlo Collodi's *Pinocchio* (named *Pleasureland*) into emoji are even more confoundingly condensed. Thousands of picture characters are crammed on large posters without spacing or parallel text in English. However, according to Hale (2015), although they are translations, for which he developed a unique emoji layering method, they are not necessarily meant to be read, but rather looked at and used as a stimulus to imagination and an inspiration to read the books. Were they meant to be read, that would be an impossible task, given the time and effort it would require. That effort, which is the opposite of the principle of language economy stems from the fact that the range of the connotations i.e. shades of meaning that can be attributed to each individual emoji and their combinations is virtually open-ended in emoji-only texts. These different meanings produce what Danesi (2016: 54) has named "the thesaurus effect" and defined as "the implied, potential set of related cultural and symbolic concepts that are evoked by an emoji as it is used in some specific context". The translations of Melville, Carroll, Barrie and Collodi are opaque because emoji are used outside of their customary context and artificially elevated to the role of a fully developed language which they cannot fulfil. But there are instances where the ways in which the emoji are employed for translation purposes are closer to the glyphs' usual context of use, like in the two differently emojified versions of Jane Austen's classic *Pride and Prejudice*.

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The first excerpt is from the emoji assist edition (Austen, 2014) of the novel which adds thirty-two different smileys to the unabridged text indicating emotional states of book characters next to the lines of the dialogue. The pictograms were added automatically by the software custom-developed by the publisher based on different linguistic metrics[105]. This may look gimmicky, nevertheless, this use of emoji is a return to their primary function of signalling the changes of mood and also possibly enhancing the reading experience in this and other books which include the emoji assist option.

The other illustration is taken from a heavily abridged version of the book, aptly titled *Emoji Pride and Prejudice: Epic Tales in Tiny Texts* (Austen, Furman, 2016) as the novel has been reduced to text messages sprinkled with picture characters. This edition belongs to the Condensed Classics book series and the notice on the cover reads: "Jane Austen sent from my iPhone". Here both the text of the novel and the additional meaning provided by emoji are completely condensed in the typical form of text message conversations in cartoon-like speech bubbles. The exchange between the emojified versions of Jane Bennett and her sister, the heroine, Elizabeth after the Meryton Hall Ball features the unapologetically contemporary informal language and quite a few picture characters. This book is meant to be humorous and is classified as such. It has no lofty aspirations as far as translation is concerned and highlights what emoji do best – add a light tone to a subject, however touchy or awkward.

"To emojify or not to emojify?" That is not even the question now. The answer is affirmative – Shakespeare's plays have already been retold in a similar fashion. The OMG Shakespeare Boxed Set[106] contains the three famous plays *Romeo and Juliette*, *Hamlet* and *Macbeth*. The emoji-only approach to these plays by the artist Jamie Rector as part of her Shakespeare Today project has met with critical and public approval and the posters[107] shown below have been used as teaching tools.

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[105] As stated in the book description provided by the publisher, Jonki Monkey Networks on the Amazon.com website available at: https://www.amazon.com/dp/B00LCJZSCI/ref=rdr_kindle_ext_tmb.

[106] Additional information about the books can be found at The OMG Shakespeare Boxed Set Amazon.com page at https://www.amazon.com/OMG-Shakespeare-Boxed-Set/dp/B01JRIMO9A/ref=sr_1_2?s=books&ie=UTF8&qid=1488160978&sr=1-2&keywords=macbeth+carbone. These were met with mixed reactions, from acceptance, as a means of getting young people interested in classic literature to rejection and accusations of dumbing down masterpieces already seen in the case of *Emoji Dick*.

[107] The images have been taken from the article *Graphic designer perfectly sums up Shakespeare plays in an emoji nutshell* retrieved December 12, 2016 from: http://metro.co.uk/2015/08/25/graphic-designer-perfectly-sums-up-shakespeare-plays-in-an-emoji-nutshell-5360238/. More information about the Shakespeare Today project can be found on the artist's website http://www.jamierector.co.uk/.

Macbeth — William Shakespeare

Romeo & Juliet — William Shakespeare

Hamlet — William Shakespeare

The secret of their success lies in combining the suggestive power of emoji with the cultural knowledge of viewers. Only thirty-two picture characters are used to effectively retell each of the three famous plots. The posters do not claim to provide a translation. Instead, the well-chosen and positioned glyphs point to the key moments in the stories, doing away with the need to use words and natural language grammar. Read in the sequential order horizontally in a 4 x 8 slot grid, they evoke characters and events that seem to come alive before our eyes in quick succession. The essential thing here, as in the other examples of using emoji in the contexts of translation and retelling is that the viewers / readers are already familiar with the stories in question having read the original works beforehand or seen a film or play based on them. Without that prior knowledge or the original text provided alongside the strings of glyphs like a subtitle of sorts, much of the meaning is inevitably lost. Still, regardless of the cultural background and the knowledge it brings, the skeletons of the stories consisting of universally recognizable elements remain. After browsing just a few pages of *Emoji Dick*, we know that it is a tale about a seafaring journey, that *Pride and Prejudice* is about finding love and that Shakespeare's plays feature kings and queens, people in love wishing to marry, poisoning and multiple murders, which in turn may spark our curiosity to read the actual books. In the end, that is enough to justify the existence of these visual experiments conducted by technologists and artists, not linguists and translators, who are yet to take on the emojification challenge.

In the meantime, emoji are likely to continue to thrive as a hybrid form, mixing images with the dominant writing systems and continue to spread and develop. These processes will be spurred on by two concurrent trends in mobile technology defining the current state of mobile devices. Namely, as pointed out in previous sections, the inevitable phasing out of older technologies and feature phones in particular results in more and more people worldwide embracing smart phones, regardless of their social or economic status. The spread of low-end and mid-range devices will, in turn, help to spread emoji as a means of communication even further, while high-end devices, running the latest operating systems will be instrumental in the diversification of picture characters, as new ones continue to be added periodically. The glyphs are also conquering new platforms – they are already present on wearables i.e. smartwatches, where they contribute to taking the speed and compression of short messaging exchanges to a new level. The emoji use in the context of wearables is especially effective in the situations when only picture-words are exchanged, which tends to happen as remarked by Danesi (2016: 87) "when the content and tenor of the textual conversation had become predictable". This is when the option to send a glyph from one's watch becomes a godsend. Alternatively, one would be forced to reach for the phone, open the message, which contains yet another cute kitten gif sent by a friend or relation and answer using a text or an emoji keyboard. This is where the "save-a-keystroke principle", defined by Crystal (2006) as applicable to Netlingo and chat acronyms, becomes replaced by its "save-a-sentence" counterpart. Instead of replying by writing back "What a cute kitten!" one can send a single pictogram 😻 (Smiling Cat Face With Heart-Eyes) from one's watch. Moreover, as was shown in the examples here, some popular chat acronyms have been preserved in the emoji form or replaced by picture-words. In fact, saying that chat shorthand as a whole has been killed by emoji would not be far from the truth.

The invasion of emoji is not limited to computer-mediated communications. They are starring in the 3D animated feature film *The Emoji Movie* produced by the major studio, Sony Pictures slated for release on August 4th, 2017. What is now the *Guess the Emoji* smartphone app is supposedly still set to become The *Great Emoji Challenge* game show as pictograms are headed for TV, having already conquered online news media outlets and advertising. More importantly, the emoji (and to a lesser degree emoticon) phenomenon has recently spurred a flurry of academic interest in a variety of fields

including psychology, neuroscience, social sciences, semiotics and linguistics with the findings being published in scholarly journals and books. As the glyphs continue to evolve our understanding of them will deepen. The contexts of emoji-only use may still be rare, as best illustrated by the demise of the Emojili mobile app and social network[108] offering the possibility of communicating exclusively in picture words. Emoji translation, at the present moment, is either done by machines and offered on a number of specialized websites[109] (presumably meant as nothing more than a fun way to impress your friends) or by artists and other non-language specialists. Linguists seem to be wary of accepting this challenge, apparently with a good reason, although things may change if professional emoji translation jobs[110] prove to be in demand. Whatever the direction of development of emoji, their meaning is likely to follow the semantic patterns described here. Whether these descendants of cave drawings, hieroglyphic and other non-alphabetic writing systems, as well as specialist typefaces integrating symbols and pictograms (cf. Lucas, 2016) will survive the imminent advent of augmented and virtual reality devices remains to be seen. But as long as there is a need for text-based communication in the digital world, their future looks bright (yellow).

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[108] Fortune article *Remember Emojli, the emoji-only social network? It's shutting down.* Retrieved November 26, 2016: http://fortune.com/2015/06/10/emojli-emoji/ is one of the examples of the media coverage of the event.
[109] http://superemojitranslator.com/, http://emojilator.com/, http://emojitranslate.com/, or http://decodemoji.com/ are just a few places to visit when in need of a quick way of emojifying one's thoughts.
[110] The story about the first-ever job posting of this kind was reported by the media worldwide including the BBC. The article *Emoji translator wanted - London firm seeks specialist* is available at: http://www.bbc.com/news/world-38287908.

IX SUMMARY AND CONCLUSION - The future is now. (Dis)integrated cognition as the body and the mind get empowered and entrapped by technology.

9.1 The cornerstones of cognition moulding mobile media. The fantastic four.

The aim of this dissertation was to explore the influence of the cognitive mechanisms of metaphor, metonymy, analogy and conceptual integration in the domain of mobile communications. The investigation was based on a sample of words and phrases related to modern mobile media, mobile operating systems, the terminology of mobile networking, interface design, as well as slang and texitisms employed by mobile gadget users. A separate sample consisting of a selection of emoticons and emoji exhibiting the potential for semantic expansion was also analyzed, in view of the significance of glyphs for text-based exchanges in the form of text messages or posts and comments on social media sites that are increasingly accessed via mobile devices. Opting for a hands-on approach to handheld devices, which seemed fitting given the embodied nature of interaction, also meant basing the study on a different sample consisting of both dumb and smart phones, tablets and wearables, representing different form factors and stages in the development of mobile technology.

The analytical framework implemented in this work relied on the combined impact of some of the major constructs comprising the cognitive linguistic enterprise, namely, Lakoff and Johnson's (1980, 2003) notion of conceptual metaphor, Johnson's (1987) image schemas, Fauconnier's (1984, 2007) mental spaces, Lakoff's (1987) idealized cognitive models, Grady's (1997) primary metaphors and Fauconnier and Turner's (1998, 2002) conceptual integration networks and their relation to metaphor (cf. Grady, Oakley & Coulson, 1999) and metonymy (cf. Fauconnier and Turner, 1999) as well as Rosch's (1975, 1978) findings on the nature of human categorization, prototypes and basic level categories. The framework also provided explanatory tools for understanding the role of the conceptual phenomena of metonymy and analogy. The facets and types of the former were described applying the classification based on idealized cognitive models (ICMs) developed by Kövecses & Radden (1998) and Radden & Kövecses (1999), keeping in mind the views on the nature of metonymy expressed by Langacker (1993), Goossens (1990), Barcelona (2003), Ruiz de Mendoza (2011), Denroche (2014) and Littlemore (2015). The significance of the latter conceptual strategy, analogy and its relation to metaphor and blending was grasped by means of the interpretations of its character and exceptional reach offered by

Hofstadter (2001), Hofstadter and Sadler (2013), Gentner (1983), Holyoak and Thagard (1995), Holyoak, Gentner, Kokinov, (2001), Gentner, Bowdle, Wolff, & Boronat, (2001), Gentner and Markman, (2003), Bowdle and Gentner (2005) and Fauconnier (2001) among others. The insights provided by Lakoff's (2008, 2014) Neural Theory of Thought and Language and Feldman's (2006) view that a powerful computational theory of language should contribute to the development of significantly improved human-computer interaction programs were also taken into account.

The primary goal of the analysis presented here that covered a diverse range of phenomena and branched into two main directions was to established metaphors conceptualizing mobile communications. The distinction between the two inevitably turned out to be somewhat artificial, and a degree of overlap in the material under examination wax expected. The first direction focused mainly on the technical side of mobile computing and began by examining the concepts related to the domains of mobile software and network engineering, as well as web development that are all conceived in terms of ARCHITECTURE and BUILDING, followed by a consideration of user interface types and their evolution in the face of the changes caused by the shift of computing from being desktop-bound to mobility and ubiquity, marked by miniaturization. The most important outcome of this examination is formulation of the metaphors reflecting the transformation of the DESKTOP interface, whereby multiple co-occurring windows were replaced by a single one, because an open app always covers the whole screen. Consequently, AN APP SCREEN IS A DISTINCT VISUAL STATE OR MODE IN A MOBILE APP and A MOBILE APP IS A COLLECTION OF SEQUENTIAL SCREENS. As part of tracing this transformation, due attention was paid to the changes in the understanding of human-computer interaction (HCI) as catalogued by Imaz and Banyon (2007) who link alternations in the perception of HCI that has been viewed, among other things as a DIALOGUE, DIRECT MANIPULATION or INDIRECT MANAGEMENT OF AGENTS to the progress in the development of interfaces from command-line ones that had laid bare the complex syntax of the textual operating systems to graphical user environments that allowed visual representation that took the form of *windows, icons, menus* and *pointers* (*WIMP*) and ultimately delegation of certain tasks from human users to intelligent digital agents. In the light of the importance of that move that represented a huge mental leap, achieved through the use of metaphor, together with analogy, metonymy and conceptual integration, special emphasis was placed on

mobile interface metaphors and the evolution of direct manipulation as evidenced by the changes of mobile hardware and software. The possibilities for classifying mobile interface metaphors by applying various criteria (universal as opposed to those specific to a particular platform (operating system), device or application; relating to the modes of interaction: visual, haptic or voice-based and technological versus cultural i.e. those referencing elements of induvial cultures instead of focusing on technological features were illustrated. Since getting around visual interfaces requires navigating one's way through digital space, a segment of the work was dedicated to the close connection between direct manipulation and navigation that were both found to be embodied, in other words, grounded in sensorimotor experiences that are domains of primary metaphors. With the loss of windows, mobile interfaces lost the illusion of DEPTH of the two-dimensional on-screen SPACE, not only because windows cannot be stacked and cascaded (which is something that PCs allow) but also on the account of the fact that mobile users, by default, have little or no access to the hierarchical file system that lies beneath graphical user interfaces (GUIs) and that the presence of menus is reduced and they are hidden in DRAWERS. The mobile context, thus, adds further validity to Manovich's (2001: 201) remark (quoted below) about the structure of interfaces that is much more syntagmatic (metonymic) than paradigmatic (metaphorical), thus resembling the flat SURFACE of the hypertext and the web, with which interfaces share the imperative of NAVIGATION, often conceptualized as a JOURNEY, where the HOME sceren(s) and the HOME button, just like HOME pages on websites are points of departure or return.

"Interactive interfaces foreground the paradigmatic dimension and often make explicit paradigmatic sets. Yet, they are still organized along the syntagmatic dimension. Although the user is making choices at each new screen, the end result is a linear sequence of screens which she follows. This is the classical syntagmatic experience. In fact, it can be compared to constructing a sentence in a natural language. Just as a language user constructs a sentence by choosing each successive word from a paradigm of other possible words, a new media user creates a sequence of screens by clicking on this or that icon at each screen."

The correspondences with language do not end there since an analogy is made between the strong version of the Whorfian hypothesis stating that "we dissect nature along lines laid down by our native languages." (cf. Whorf, 1956: 213) and the claim (cf. Manovich, 2001: 76) that

"The interface shapes how the computer user conceives the computer itself. It also determines how users think of any media object accessed via a computer. Stripping different media of their original distinctions, the interface imposes its own logic on them. Finally, by organizing computer data in particular ways, the interface provides distinct models of the world. For instance, a hierarchical file system assumes that the world can be organized in a logical multi-level hierarchy. In contrast, a hypertext model of the World Wide Web models the world as a non-hierarchical system ruled by metonymy."

In view of the fact that interaction with mobile devices is experienced daily by ever-younger children who use or have access to mobile phones and tablets, this analogy may indeed ring truer than ever. While mobile interfaces yield a number of novel sometimes OS-specific, sometimes more universal metaphors, a number of which have been identified as part of this work, some conceptualizations have a constant form across all computing platforms: NAVIGATION IS (always) a JOURNEY, INTERFACE ELEMENTS ARE OBJECTS viewed in terms of CONTAINMENT and information transfer via networks of all kinds, including mobile ones relies on the CONDUIT metaphor, but even these adapt to new technological realities. For example, the notion of *liquid computing* referring to a technology allowing users to start working on one device and continue on another, provided that both are connected to the same wireless network is understood via a CONDUIT-type metaphor, COMMUNICATION BETWEEN COMPUTING DEVICES IS THE FLOW OF LIQUID. Simplified interfaces have certainly made mobile devices easier to use, but it has become much harder for users to take full control of their gadgets, because of the restrictions placed on them by device and operating system manufacturers and mobile carriers alike. These technology-specific issues that produced metaphoric terms related to both sides, the manufacturers / sellers and their customers were discussed in a separate subsegment, since they are the source of such iconic notions as WALLED GARDEN and JAILBREAKING implying that THE DIGITAL ECOSYSTEM IS A WALLED GARDEN and ACCESSING/MODIFYING (BREAKING INTO) THE OPERATING SYSTEM IS BREAKING OUT OF JAIL respectively. The remaining technical aspects of mobile computing inquired into are different device form factors and interaction modalities developed within the direct manipulation paradigm that shifted from the predominant use of one finger (thumb) and many physical buttons that the devices used to have to the next generation of phones sporting large touchscreens and few physical buttons controlled via touch gestures involving two or more fingers. The presence of picture metaphors, highlighting visual resemblance between the

source and the target is very pronounced in the words describing different physical designs of phones and the ways of interacting with phone hardware. Generally speaking, image metaphors have been found to exist across the phenomena analysed in this study, likely not only because some of these phenomena are highly complex and easier to be understood via the association with some familiar shapes and substances e.g. *liquid computing*, but also because they tend to actually physically resemble the target object such as *stylus* or *clamshell phone*. The same reasons are behind the use of image metaphors in relation to touch-based interaction via multitouch gestures e.g. *pinch to zoom* or *3D Touch*, where the realm of the visual is connected to gesture and touch to show how they are translated into the digital domain. Multitouch and to a lesser degree touchless gestures, combined with sensor-equipped touchscreens and different communication chips integrated in devices (GPS location, NFC) have become trademark features of modern smartphones and many contemporary dumbphones. The popularity and ubiquity of touch is evident in a wide variety of contemporary communication contexts that go well beyond mobile devices (e.g. touchscreen equipped home appliances, kiosks, ATMs, etc.) From the standpoint of the embodied cognition thesis that foregrounds the centrality of bodily experiences to human thinking, which represents a shift from the Cartesian split between mind and body, and in view of the claim that concepts of all kinds i.e. those that refer to action (e.g. grasping) or objects, together with abstract concepts are the result of the brain's neural activity, that is embodied in the sensorimotor system (cf. Gallese and Lakoff, 2005, Lakoff, 2008, 2014), gestures in HCI are more than just one of the interaction modalities (cf. Pirhonen, 2010). Namely, "it can be argued within the embodied cognition framework that gestures are both a means of interacting with our physical environment and of thinking" (ibid. 286). Having covered some of the more technical aspects of mobile computing, the analysis took another direction which is in keeping with Wilken's (2013) observation about "the ongoing relevance of metaphor to understanding technologies and the techno-social".

Accordingly, the next challenge was to pinpoint the metaphors that show personal, social and economic import of mobile media, but unsurprisingly purely technical terms continued cropping up, because technology, its functionalities and failures are so frequently conceptualized in terms of human bodies, minds and everyday lives. The themes identified as recurrent in our sample of mobile-communications related terms

were examined. They centred around the widespread anthropomorphism, attaching human characteristics to devices, from simple animatness e.g. *sleep/wake button*, *doze mode* and movement i.e. animation e.g. live tiles, to speech and conversation, the quality of intelligent personal assistants, whose intelligence comes from the combined effect of voice recognition and natural language processing. Humanizing technology is a clear indicator of its acceptance by people as individuals and the entire societies. But there is more to that trend or as the saying goes "It takes two to tango". The influence is felt both ways. As we project human traits on machines, resulting in THE MIND eventually residing IN THE MACHINE, we also feel their positive and negative impact, for instance, in the form of various health and activity tracking applications, on the one hand and painful conditions that can develop as a result of excessive use of technology, exemplified by metonymic compounds such as *tech neck* or *Blackberry thumb*. The ailments can also be metaphoric e.g. *upgrade fever*. Animacy ultimately also implies death, so when gadgets stop working, it is interpreted as their demise. Humans, on their part have grown so attached to their devices that they hold on to them for dear life, which can lead them straight to *death by iPod*, among other things. Cultural, mainly literary, references relatively frequent in the sample are an obvious reminder of the encyclopaedic nature of meaning illustrated by the terms like *boot* and *breadcrumb trail* or *zombie phones, apps* and people enslaved by technology – *smartphone zombies*. While the cognitive process of anthroporphization, which is as old as Man is widely used and well documented, emergent technologies like augmented, mixed and virtual reality were also touched upon, because of their strong ties to mobile devices and vast potential as sources of new metaphors, given the latest efforts on the part of the biggest technology companies, Google and Apple to implement AR and VR in the mobile setting. These efforts are part of the general tendency to make humans smarter, almost superhuman, empower them by making things around them smart too. Current attempts include wearing smart devices (i.e. those that include advanced functionality of different kinds) on our head (*smartglasses*), wrists (*smartwatches*), bodies (*smart jacket*) or making our homes and cars smarter, but the futuristic goal compatible with the push towards ubiquity of computing would be to incorporate miniature devices in our bodies and the nervous systems, so as to achieve thought control of technology (cf. Scoble and Isreal, 2013), which, for now, remains a distant goal. Anyhow, all that smartness originates from a single pair of anthropocentric metaphors, THE PHONE (*dumbphone*) or more generally

DEVICE IS A STUPID PERSON (cf. Imaz and Banyon, 2007) illustrating the underlying belief that humans are, by default, smarter than machines, or its opposite, with a strong presence in different technologies/industries and in the sample analyzed, THE PHONE (*smartphone*) and more generally DEVICE or THING IS A SMART PERSON and its variations, a few of which have been identified in this study. Device-specific constructs, such as a series of metaphors related to the smart capabilities of Apple Watch have also been determined. The interesting thing concerning smart devices is that however much they proliferate, thanks, in no small measure to another emerging trend, the Internet of Things, they are fundamentally conceptualized in terms of a single very simple metaphor and that despite their diversity, these devices and entire places (e.g. *smart homes*) tend to be interacted with via smartphone apps. Our present is dominated by screens of increasingly numerous smart and touch controlled devices. When it comes to counting the screens, from second to fifth and the jocular n^{th}, analogy comes to the rescue, offering a quick and efficient mechanism for permanent expansion of meaning and categories.

Since human cognition is embodied, it tends to employ concepts from our immediate surroundings and the natural world, in which our bodies and minds function daily, as targets of metaphors to grasp the miracles of miniaturization and the abstract, invisible, near magical domain of data transfer, storage and size. Hence, metaphoric references to AIR, indicating that modern mobile devices, get lighter and lighter, almost without the loss of features (e.g. *MacBook Air, iPad Air*) as a medium - CONDUIT for wireless data transfer (*AirDrop*, *AirPods*) or a means of pointing to the absence of physical contact. The CLOUD has been identified as one of the most significant concepts of contemporary computing, making information available anywhere and anytime by storing it online. Its ongoing evolution has yielded terms like *fog computing*, denoting its more distributed counterpart, suited for the many data producing devices mushrooming with the expansion of the Internet of Things, and even *human cloud,* referring to people who can be hired as needed and work from anywhere, which may be felt to imply that these workers are objectified, dehumanized and treated like data. Here, again, the synergy between metaphor and analogy provides an effective conceptual strategy for bridging the gap between the abstract and the concrete, man-made and natural. Time travel, a long-standing theme in sci-fi, vividly conveys the importance of offline data backup (e.g. *Time Machine, Time Capsule*) which is a

valuable resource, judging by terms like *data mining*, based on the metaphoric perception DATA ANALYSIS IS ORE MINING. The number and diversity of data-related terms reflects the growing importance and size of data produced daily. Its staggering vastness gets comprehended via a simple but fundamental association with the sensorimotor domain of vertical orientation i.e. MORE IS UP (e.g. *big data, thick data*) and an analogical reference to length in *long data*. The signs of social changes brought about by the rise of mobile computing are varied and include a transformation of the workplace, where people can use their personal devices and subscriptions to services. Terms like *Bring Your Own Device* (*BYOD*) and *Bring Your Own Cloud* (*BYOC*) and the many analogical formations sharing the same semantic field) appearing as initialisms, and thus products of shortening i.e. PART-WHOLE metonymy are typical of realm of technology as a whole, rich in complex phenomena referred to by compounds and phrases. Indeed, even a quick look at our sample is enough to notice the towering presence of two word-forming patterns, compounding and shortenings, compared to which all other types of coinages and simple words fade into insignificance, with the exception of blending, appearing occasionally in mobile computing terms e.g. *freemium (free + premium)* or *Mi-Fi (my + Wi-Fi).* However, the field where blending truly shines is the slang of mobile gadget owners / texters and Twitter users e.g. *Glasshole (Glass + asshole), cellfish (cell + selfish), narcisstick (narcissistic + selfie stick), sexting (sex + texting), smexting (smoking + texting), Tweeple (Twitter + people), twalking (tweeting + walking), egotwistical (egotistical +Twitter)*, etc. Fusing words and often involving clipping, blending is metonymic and so is chat shorthand that originated in chatrooms, precursors of modern social media and successfully migrated to texting and the social microblogging platform, Twitter, both of which impose limits on the length of messages. Thus, using the abbreviated language of textspeak, featuring logograms and respellings e.g. *1daful (wonderful),* initialisms e.g. *aamof (as a matter of fact)* and acronyms e.g. *YOLO (You Only Live Once)* is a welcome space-saving communication strategy. Social changes caused by the swift spread of mobile communications are deep and much more significant than current crazes like using one's phone to post innumerable *selfies, belfies* or *usies* and other pictures online. Among the areas where their effects are felt are social activism, travel and the ways in which people handle money, which has itself gone digital, as computers, mobile phones and smartwatches have become places where we keep all sorts of personal information, such as credit card details. These devices are now digital WALLETS. Mobile

gadgets are our powerful allies, but with power comes the danger of attracting unwelcome attention, including becoming a target of thieves who are after our sensitive data or devices in a society of gadget worship, where owning a handheld device sometimes means being perceived as belonging to a particular social group, from *thumb tribe* and *head-down-tribe* to *white-cord subculture.*

 While identifying individual metaphors of mobile communications has been a rewarding pursuit, providing an insight into how we conceptualize and interact with mobile media, there can be no argument about the validity of the point made by Imaz and Banyon (2007:69) who remark that in the context of human-computer interaction "metaphors are the original generative force, but we have to use blend (and generic) spaces as a way of making triggering concepts workable, or to elaborate these triggering concepts". In the light of the fact that it has been shown that both the graphical user interface, the COMPUTER DESKTOP as a whole (cf. Fauconnier and Turner, 1998, 2002), and individual on-screen objects and the method of interaction involving direct manipulation i.e. using the mouse and grasping and moving objects are in fact blends (cf. Fauconnier, 2001), we have attempted to show how blending works in the touchscreen environment of mobile devices. For that purpose, existing graphical representations of the computer mouse and folder blends were used as a starting point. It turns out that new modes of interaction (multitouch gestures) and modifications of the well-established forms of representation (computer folders compared to folders in the mobile setting) are instances of (re)blending, building on the existing knowledge of users of computing devices and thus further facilitating interaction. An analogy was made with convergence in analogue and digital devices, which can also be seen as an instance of blending, since a single device incorporates multiple capabilities and the conclusion was drawn that the same perspective could be applied to the entire process of technological development, because new technologies always use old ones as an input and in the course of blending, new creative solutions arise as emergent structures of blends, so as to satisfy new requirements. On a side note, a brief overview of the Interface Theory of Perception was given on account of the fact that it uses the DESKTOP metaphor as a way of explaining the nature of human consciousness and perception (cf. Hoffman, 2008, 2011, 2015, Hoffman and Prakash. 2014 and Hoffman, Singh & Prakash 2015). Taking this analogy, made by cognitive psychologists and mathematicians, to refer to the DESKTOP blend, rather than DESKTOP

metaphor does not seem implausible in view of the evidence to that effect provided by cognitive linguistics. The basic premise of this theory is that human perception is not an approximation of the true nature of the world and that instead it functions not unlike the windows computer interface, obscuring all the unnecessary details about the functioning of the machine and enabling users to focus on efficiency the completion of tasks, such as composing documents or editing pictures. Namely, perception is thought to be a product of the evolutionary development of each species, tailored to its needs to survive and reproduce. The idea that our perception and consciousness are conditioned by the nature of our minds and bodies is complementary with the embodied cognition thesis developed by cognitive linguists.

One of the goals of this study was to trace the ways in which the desktop blend has been adapted to the mobile environment. The arguments in favour of Norman's (1990) statement that the computer is disappearing and becoming invisible can easily be found in the elimination or reduction of the elements of WIMP-based GUIs. However big they seem to be getting of late, mobile phone screens are much smaller than those on PCs and the move from many windows to the design solution where an open app has a single window was inevitable, as was reduction of the number and visibility of menus that are hidden in DRAWERS and can be accessed as the need arises. Pointers have hardly any purpose without mice, which have been replaced by fingers. So, icons turn out to be the only surviving salient feature of the standard graphical user interfaces on mobiles. Row after row, icons dominate the mobile screen space. Every installed app has one, and they function much like desktop shortcuts on computers, but there are some significant differences, like the creation of mobile folders, illustrated by the metaphor DRAGGING ONE APP (ICON) OVER ANOTHER ON THE HOME SCREEN IS MAKING A FOLDER and the ability of app icons to dynamically incorporate smaller ones, like notification badges. The metonymies underlying a selection of icons implemented in different mobile operating systems and apps were examined in conjunction with significant changes in mobile interface design that were also found to be metonymic in nature. Like their computer counterparts, mobile icons are considered to be blends because they are selectable, tappable and draggable using fingers. Unlike them, however, they frequently experience changes in appearance and shape caused by the choices made by mobile device users, operating system and device manufacturers or app developers.

Enjoying much higher diversity and power of transformation than icons, emoji and to a lesser degree emoticons, the pictograms that preceded them, seem to have become every mobile phone user's little communication helpers. While experts (cf. Danesi 2016, Evans, 2015 2017) agree that they are not a language but a code, these glyphs have an important communicative function of providing visual cues as to the state of mind of the participants in text-based exchanges, where face-to-face contact is non-existent. If emoticons are known to have been a feature of chatrooms and text messages composed on early mobile phones, the colourful emoji rose to prominence thanks to and with smartphones, the iPhone in particular, subsequently flocking to social media apps and websites and social chat apps in droves. Their links to mobile communication and language have earned them a prominent place in this work. Having already summarized the semantic patterns revealing the interplay between metonymy and metaphor in individual emoji analyzed in the absence of context (see 8.10) above, let us, simply, reiterate that they or chat shorthand, for that matter, which raised similar concern first do not spell the doom of language. Rather, as Danesi (2016: 133) puts it, they might be signalling a "a shift in cognition that both retrieves the past (pictography) and amplifies the present (hybridity)". By adding a visual layer to the otherwise purely textual content of writing, and because these visuals tend to become more and more photorealistically detailed and cover an ever-growing range of topics and situations, with every new release of pictograms, emoji can be said to constitute "augmented reality elements" of writing, expanding the blend in which the projections from the input spaces of writing and visuals produce a unique emergent communicational structure that is more than a juxtaposition of the two. This hybridity allowing them to fuse emotions, gestures and pictures, which distinguishes emoji from other writing system is what makes them capable of turning the alphabet into a multimedia tool, a fitting vehicle of communication in an age saturated with multimedia. Moreover, as dozens of new pictograms periodically join the ranks of Unicode approved emoji (*Breastfeeding Woman* and *Woman Wearing a Headscarf* emoji being the latest examples), these glyphs prove to be a facet of technology that reflects and catalogues social changes and trends, while at the same time causing social change itself. Global text-based communication is no longer conceivable without emoji. But simply increasing the number of pictograms does not automatically increase their potential for translating (literary) text into images and images only. Our cursory examination of several attempts to translate literary classics, namely, *Moby Dick, Alice*

in the Wonderland, Pinocchio, Pride and Prejudice or Shakespeare's plays into emoji has shown that emoji-only sequences are hard to understand, while readers fare much better with combinations of text and pictograms. Evans (2017) identifies the lack of grammar to be the cause of comprehension difficulties. Without a set of rules to guide the process of constructing larger units of emoji meaning, we are bound to remain forever perplexed by them, at least when it comes to more elaborate forms of textual expression that go beyond an occasional joke or a marketing exercise. The genie has left the bottle and there is no going back. They have spilled out into other media, from print to moving pictures. There is even an unofficial holiday World Emoji Day celebrated on July 17th and an anthem sang on that occasion. 2016 saw the first Emojicon – Emoji Convention held in San Francisco and attended by linguists, emoji designers from Google and Unicode consortium officials (cf. Steinmetz, 2016). Despite the fact that in some ways they are language-like (cf. Evans, 2015, 2017), there are only so many ways in which they can function like language. Eventually, they are probably best taken for what they primarily are, visual aids that clarify the intended meaning of a message and express emotions. Occasional forays into the realm of translation, humorous or otherwise are welcome, but the best results in terms of comprehension are guaranteed if glyphs are used alongside words and sentences, not when text is out of the picture.

As the discussion of the conceptual mechanisms marking the field of mobile communications draws to a close, the question formulated in relation to the automotive analogy made in the introduction part of this study needs to be answered. In view of the material analysed, the following verdict could be reached regarding the respective roles of metaphor, metonymy, analogy and blending in conceptualizing mobile communications. Blending emerges as the uniting force, since both interfaces and interaction methods of desktop and mobile computing are seen as blends. The same interpretation captures the essence of the predominantly visual elements of the communication between humans and computers (icons) and computer-mediated communication between people (emoji and emoticons). The effective functioning of all these is ensured by the force of conceptual integration that keeps the blends stable and their constituent spaces connected despite the fact that certain optimality principles of network construction get violated. Throughout the sample and the examples analyzed, analogy has been recognized as the fundamental cognitive

process, manifested in the ability to extract abstract relations, in other words go beyond visual similarity, but frequently making use of it. The essential thing it brings to the table is "the sense of essence" (cf. Hofstadter, 1995) which makes it the core of cognition (cf. Hofstadter, 2001, 2013). Analogy, thus, informs numerous metaphors that allow nuancing of meaning and interact with metonymies, which on their part play a considerable role in the semantic makeup of the words and phrases in the sample, being a supreme tool for highlighting certain features of phenomena, thought to be salient in the context, while hiding those that are perceived as less significant. Accordingly, aware of the fact that the automotive logos in our introductory analogy can only ever be imperfect approximations of the relations between the tools of thought, we declare that Mercedes Benz has crossed the imaginary finish line first, powered by the force of blending that brings together the other three elements of cognition. With this quadrilemma solved, at least provisionally, we now briefly revisit the significance of mobile communications, in the light of present and future achievements and challenges and the directions for future research.

9.2. Quo vadis computing? Moving past visibility. Fade to great. Mobile devices in all their forms embody today's dominant technology. They are the present of computing. A statement like "Almost everyone I know has a mobile phone" is likely to be perceived as true by many people worldwide, regardless of their background. The phones we carry in our pockets have defined the period spanning the last decade and the half or so. A frequently quoted observation from Agar's (2003, 2013) book *Constant Touch* captures an interesting point about the society by suggesting that "you can tell what a culture values by what it has in its bags and pockets", followed by the author's opinion that in our day mobile phone is such an object that we always carry with us. There are, however indications, that mobile technology, as we know and use it has reached maturity and that progress in this field will continue, but without ground-breaking advances, as we await the next big wave of innovation. Giving an overview of the history and future trends in modern computing, Mossberg (2017) who made the claim about the current maturity of phones and the calm before the next tech storm elaborates on the well-known view that the computer is disappearing (cf. Norman 1990) noting huge improvements in the usability of computing devices over the last quarter of a century, culminating in user-friendly touchscreen devices like the iPad, pointing out that computers have become as common as furniture. By the same token, we

could add that mobile phones that never leave our side are like the keys to one's home or car, always in one's pocket. It is our hope that our attempt at exploring the conceptual mechanism of mobile media and communications, at this moment of mobile maturity is not ill-timed. It gave us an opportunity to compare and contrast a selection of current and discontinued devices and operating systems, pinpoint individual metaphors describing interaction modalities and graphical user interfaces and take a glimpse into the ways in which mobile communications influence individuals, the society and the economy, as it remains to be seen to what extents machines will become us, physically integrated in our bodies and clothes (cf. Katz, 2003). The terms in our sample show that the development is underway in both areas, as well as in the field of "communication technology environments" like smart homes and similar distributed systems (ibid. 1). Mossberg (2017) considers the following trends to be the building blocks of the future: "artificial intelligence / machine learning, augmented reality, virtual reality, robotics and drones, smart homes, self-driving cars, and digital health / wearables". For computers to fade to the background completely and remain great in the process, better distributed computing, better sensor technology and networks will have to be implemented. Voice-based communication is expected to be key to interacting with sensor-rich smart surroundings. Devices will no longer be scattered all around us, as computing power will be blended into the environment. While this vision of the future looks tempting, there is always the other side of the coin, manifested in the lack of security and privacy that should worry technology users, and perhaps even more troubling, our current excessive exposure to screens of all sizes and social media platforms of every descriptions, not to mention innumerable apps luring us into the electronic embrace of the digital. The possibilities are numerous and experiences may be overwhelming. Are technology giants the horsemen of the app-ocalipse? The reasons for taking breaks from gadget use are many and tech leaders know it (cf. Fleming, 2015). The side-effects of the human symbiosis with screens, including the shortening of attention span are well-documented. Spending too much time with a tablet or a mobile phone can hamper the development of communication skills in children, but an iPad can also give voice to children with autism (Seshadri, 2012). It is up to adults to act responsibly and exercise wisdom. Technology has no (evil) mind yet. Our lives are still in our own hands. Advances in technological development bring us closer to the future, they bring the future to us, here and now. Whichever form that future takes, it will be shaped by the embodied minds of people

who will use the same cognitive mechanisms to interact with the world and the new technologies that are bound to emerge. With the new technologies powering the next industrial revolution, new opportunities will arise to assess their influence from the point of view of many disciplines, including cognitive linguistics. This will be a task for future research. The appearance of new gadgets is likely to be met with the usual mixture of appreciation and apprehension. But most of the time, a leap forward requires a leap of faith and more importantly a mental leap. The presence of technology in everyday life is bound to increase although its visibility may diminish. Mobile devices have a major role at the current stage of its development, as mobile phone has become a hub for so many activities of exceptional diversity. The field of mobile communication promises to continue to provide novel exciting experiences attracting new analytical interest.

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Appendix 1.

List of Sample Sources with Abbreviations

(in order of appearance)

XDA - XDA Developers Forum
http://forum.xda-developers.com/wiki/Glossary

RC – Recode.net
http://www.recode.net/2015/7/27/11615046/whats-the-difference-between-virtual-augmented-and-mixed-reality

GSMA – GSM Arena
http://www.gsmarena.com/glossary.php3

WP - Webopedia
http://www.webopedia.com/

UD – Urban Dictionary
https://www.urbandictionary.com/

JF - The Jargon File v. 4.4.7
http://www.catb.org/jargon/oldversions/jarg447.txt

RRW – ReadWriteWeb
http://readwrite.com/2016/11/14/cold-chains-and-low-power-iot/

DF – Diffen
http://www.diffen.com/difference/Jailbreak_vs_Unlock

TT-R - *Tech Terms: What Every Communication and Digital Media. Professional Should Know*

NL – Netlingo
http://www.netlingo.com/dictionary/newest.php

WhatIs TT – WhatIS.com TechTarget
http://whatis.techtarget.com/

AC - Android Central
http://www.androidcentral.com/what-fork-fork

MBG - Mobile Burn Glossary
http://www.mobileburn.com/definitions.jsp

PSG - Phone Scoop Glossary
http://www.phonescoop.com/glossary/

EP - Emojipedia
http://emojipedia.org/botmoji/

SA – Source Android https://source.android.com/compatibility/

LH – Life Hacker https://lifehacker.com/5914400/six-awesome-lesser-known-features-in-android-40-ice-cream-sandwich

WC - Windows Central https://www.windowscentral.com/chaseable-live-tiles-coming-windows-10-and-mobile; http://www.windowscentral.com/continuum

AP – Android Pit https://www.androidpit.com/custom-rom-and-root-the-most-important-terms-explained

RP – Redmond Pie http://www.redmondpie.com/pinch-to-unlock-tweak-replaces-stock-slide-gesture-method-on-the-lock-screen-to-unlock-ios-devices/

MMIG - Mobile Marketing Industry Glossary https://definedterm.com/a/document/10735

UFG - Usability First Glossary http://www.usabilityfirst.com/glossary/

HU - Handheld Usability

AF - About Face

PCME - PC Mag Encyclopedia
http://www.pcmag.com/encyclopedia

RUNDb -The Rice University Neologisms Database
http://neologisms.rice.edu/index.php

WIKI - Wikipedia
www.wikipedia.com

TP – Techopedia
https://www.techopedia.com/definition/14937/geofencing

YD – YourDictionary
http://www.yourdictionary.com/

OD – Oxford Dictionaries
https://en.oxforddictionaries.com/definition/dumbphone

OUPb – OUP Blog
http://blog.oup.com/

MD – Macmillan Dictionary
https://www.macmillandictionary.com/dictionary/british/ecosystem

BCS – Blue Cloud Solutions
http://www.bluecloudsolutions.com/articles/advantages-re-skinning-apps/

BI – Business Insider
http://www.businessinsider.com/app-flipping-helps-developers-make-a-quick-buck-2014-2

PCN - pc.net http://pc.net/emoticons/

KA (AS) - Kimoji App on the App Store
https://itunes.apple.com/us/app/kimoji/id1068019093?mt=8

JA (AS) - Justmoji App on the App Store
https://itunes.apple.com/us/app/justmoji/id1082958340?mt=8

SK – Skype Support
https://support.skype.com/en/faq/FA34582/what-are-mojis;
https://support.skype.com/en/faq/FA12330/what-is-the-full-list-of-emoticons?intcmp=blogs-_-generic-click-_-emoticons-for-business-or-pleasure

WS - Word Spy - The Word Lover's Guide to New Words
http://wordspy.com/index.php

WP TDG - Twitter Dictionary: A Guide to Understanding Twitter Lingo
http://www.webopedia.com/quick_ref/Twitter_Dictionary_Guide.asp

TWNRY - Twittonary
http://www.twittonary.com/

AG - Androgeek
http://androgeek.com/5-android-errors-how-fix/

GH - Gadget Hacks https://android.gadgethacks.com/news/big-android-dictionary-glossary-terms-you-should-know-0165594/

iMG - iPhone and iPad glossary
http://www.imore.com/glossary

AWUG - Apple Watch User Guide

AUD - Apple user's dictionary of tech jargon
http://www.macworld.co.uk/feature/apple/apple-jargon-buster-tech-terms-explained-dictionary-3472377/

CED - Collins English Dictionary
https://www.collinsdictionary.com/dictionary/english

MW-AAZ - Macworld's complete Apple A - Z - your total guide to the Cupertino-based company
http://www.macworld.co.uk/feature/apple/macworlds-complete-apple-z-your-total-guide-cupertino-based-company-3484264/v

COM – Cult of Mac
http://www.cultofmac.com/389804/become-an-apple-watch-time-traveler-with-watchos-2/

ALTG - The Missing Apple iOS Localization Term Glossary
https://www.ibabbleon.com/apple-ios-localization-term-glossary.html

GB-AAZ - Android A to Z: A glossary of Android jargon and technical terms
http://www.greenbot.com/article/3012144/android/android-a-to-z-a-glossary-of-android-jargon-and-technical-terms.html

MTC - Microsoft Terminology Collection
https://www.microsoft.com/Language/en-US/Search.aspx

BBG - BlackBerry Glossary
http://www.blackberryfaq.com/blackberry-information/blackberry-glossary/

BBUG - BlackBerry Bold 9900/9930 Smartphones User Guide

CHD - Computer terms, dictionary, and glossary http://www.computerhope.com/jargon.htm

LWPUG - User Guide Lumia with Windows Phone 8.1 Update 2 –

TR- Techradar http://www.techradar.com/news/gaming/microsoft-xbox-smartglass-what-you-need-to-know-1084819

L950UG - User Guide Lumia 950

 SE X1 UG - User Guide Sony Ericsson Xperia X1

AMTL – Amtelnet http://www.amtelnet.com/mobile-device-management-the-zombie-phone-killer/

AUG - Android 4.0: The ultimate guide (plus cheat sheet)
http://www.computerworld.com/article/2505708/android/android-4-0-the-ultimate-guide-plus-cheat-sheet.html

TRP – Tech Republic
http://www.techrepublic.com/article/the-rise-of-zombie-apps-on-the-mobile-landscape/

ADM – App Developer Magazine
https://appdevelopermagazine.com/4316/2016/8/22/Beware:-Zombie-Apps-Are-on-the-Rise/

GMD - Google Material Design Patterns
https://material.io/guidelines/patterns/notifications.html#notifications-behavior

N7GB - Nexus 7 Guidebook

HTG - How to Geek https://www.howtogeek.com/170990/5-cool-uses-for-androids-daydream-mode/

iOS-HIG - iOS Human Interface Guidelines

iPhUG - iPhone iOS 10 User Guide

TGD - Txting:The GR8 Db8

ASKG - Alexa Skills Kit Glossary https://developer.amazon.com/public/solutions/alexa/alexa-skills-kit/docs/alexa-skills-kit-glossary

IF – iPhone FAQ http://www.iphonefaq.org/archives/975459

TTCD - The Tech Terms Computer Dictionary https://techterms.com

GS4MM - Galaxy S4: The Missing Manual

KFUG - Kindle Fire HD 8.9" Tablet User Guide

LGUG - USER GUIDE LG-H340n

PPUG - Palm® Pre™ Phone User Guide

ML – Marketing Land http://marketingland.com/for-consumers-android-is-more-clopen-than-open-2388

IS - Internet Slang - Internet Dictionary http://www.internetslang.com

PPDG - Palm Programming: The Developer's Guide

HTDE-Z - How to do Everything with Your Zire Handheld

iJB – iJailbreak http://www.ijailbreak.com/jailbreak/untethered-tethered-semitethered-jailbreaks/

TTNI - The Tech Neck Institute http://text-neck.com/definition-of-text-neck.html

Appendix 2.

Device List

Feature phones

  Sony Ericsson

1. **T100i** – under 2 inches grayscale screen blue background, non-expandable storage, removable battery, no camera, compact design, inbuilt ringtones, games, calendar, alarm, SMS, WAP proprietary charging/cable/handsfree port, dualband 2G network [block]. Release date: 2002.

2. **W850i** – 2-inch colour screen, Walkman functionality, dedicated backlit colour-changing Walkman button, camera, video recording, dedicated camera button, flash/light, flash animated themes, software, calendar, alarms, notes, ringtones, voice dealing, RSS reader, games, MP3, radio {store, sideloading}, proprietary browser, PC synchronization, Bluetooth, IrDA, SMS, MMS, e-mail, expandable storage (MemoryStick Pro DUO card), removable battery, camera, proprietary charging/cable/handsfree port, GPRS, UMTS, triband 2G network, proprietary Java-based operating system [vertical slider] Release date: 2006.

3. **S500i** – 2-inch colour screen, light notifications, camera, video recording, no dedicated camera button, no flash/light, thin, proprietary charging/cable/handsfree port position, flash animated themes, calendar, alarms, notes, RSS reader, ringtones, software, games, MP3, {store, sideloading}, PC synchronization, Bluetooth, SMS, MMS, e-mail, proprietary WAP browser, expandable storage (MemoryStick Micro (M2) card), removable battery, GPRS, quadband 2G network, proprietary Java-based operating system [vertical slider] Release date: May 2007.

  Siemens

4. **Siemens A 35** – Alphanumeric display, fitting 2 lines of text (16 characters), monophonic ringtones, phonebook – SiM only, SMS, external antenna, removable battery, dualband 2G network [block] Release date: regular/mini SIM. Release date: 2000.

Smartphones, tablets, wearables

  Sony Ericsson

5. **M600i** – 2.6-inch colour screen, resistive touchscreen, no multi-touch, stylus, rocker keyboard, software {store, sideloading}, no camera, software, calendar, alarms, notes, ringtones, voice dealing, RSS reader, games, MP3, Bluetooth, PC synchronization, IrDA, SMS, MMS, e-mail, proprietary WAP browser 80 MB non-expandable storage, removable battery, proprietary charging/cable/handsfree port, dual band 2G HSCSD, GPRS, UMTS network, UIQ (Symbian-based) operating system [block] Release date: February 2006.

6. **Xperia X1** – 3-inch resistive touchscreen, no multi-touch, stylus, full side-sliding keyboard, software {store, sideloading}, calendar, alarms, notes, ringtones, voice dealing, RSS reader, games, MP3, FM radio, voice dealing, voice mem, camera, flash, video recording, SMS, MMS, e-mail, 2.0 XHTML, HTML, Opera, P browser, PC synchronization, Bluetooth, mini USB, GPS, 400 MB non-expandable storage, removable battery, mini USB charging port, quadband 2G, triband 3G GPRS, EDGE, UMTS, HSDPA network, Windows Mobile operating system [full QWERTY horizontal slider] Release date: 2008.

Apple

7. **iPhone 3Gs** – 3.5 inch capacitive touchscreen screen, home button, software keyboard, apps, music distribution system (App Store, iTunes), jailbreaking – sideloading, OS modification, camera, video recording, HTML. Safari browser, GPS limited Bluetooth functionality, 16 GB non-expandable storage, non-removable battery, proprietary charging/cable/handsfree port, Wi-Fi, quadband 2G, triband 3G GPRS, EDGE, UMTS, HSDPA network, regular/mini SIM. iOS 6.1.2 Release date: June 2009

8. **iPhone 5c** – 4 inch capacitive touchscreen screen, home button, software keyboard, apps, music distribution system (App Store, iTunes), Siri natural language commands and dictation, jailbreaking – sideloading, OS modification, camera, video recording, HTML. Safari browser, GPS limited Bluetooth functionality, 16 GB non-expandable storage, non-removable battery, proprietary charging/cable/handsfree port, Wi-Fi, quadband 2G, triband 3G GPRS, EDGE, UMTS, HSDPA, 4G LTE network, nano SIM. iOS 9.0.2 Release date: September 2013.

9. **iPad** – first-ever mainstream tablet, 9.7 inch capacitive touchscreen screen, home button, software keyboard, apps, music and film and TV content, e-books, educational material distribution system (App Store, iTunes, iBooks, iTunes U), jailbreaking – sideloading, OS modification, 16 GB non-expandable storage, non-removable battery, no camera, limited Bluetooth functionality, proprietary, charging/cable/handsfree port, Wi-Fi, 3G data, micro SIM, iOS 5.1.1 Release date: March 2010.

10. **Apple Watch 42 mm** – 1.65 inch AMOLED capacitive touchscreen, multitouch 3D Touch display, sensors: accelerometer, gyro, heart rate, Siri natural language commands and dictation, 8 GB non-expandable storage, non-removable battery, no camera, limited Bluetooth functionality, proprietary wireless charging cable, Wi-Fi, no cellular connectivity, watch faces, apps (App Store, iTunes), Release date: April 2015.

Amazon

11. **Kindle Fire HD** – the second Amazon tablet, 7 inch capacitive touchscreen, HD screen resolution, software buttons, software keyboard, apps, music and film and TV content distribution system (Amazon App Store, Amazon Prime Instant Video streaming), apps and games proprietary virtual currency system (Amazon Coins), rooting – sideloading (Google Play), Carousel interface, no rear camera (front-facing only), video recording, Bluetooth, non-expandable storage, non-removable battery, micro HDMI, micro USB charging/cable/port, Wi-Fi, Fire OS Release date: September 2012.

Asus

12. **Nexus 7** – first Google tablet, 7 inch capacitive touchscreen, software buttons, software keyboard, apps, music and film and TV content distribution system (Google Play), Google apps, widgets, NFC, rooting – sideloading, ROMs, non-expandable storage, non-removable battery, no rear camera (front-facing only), video recording, Bluetooth, micro USB charging/cable/port, Wi-Fi, 3G data, micro SIM, vanilla Android OS Release date: 2012.

13. **Transformer T100** – tablet laptop combo, tablet, 10 inch capacitive touchscreen, dedicated Windows hardware buttons, software buttons, keyboard dock, software keyboard, apps distributions system (Windows Store), SSD drive, expandable storage (micro SD), non-removable battery, no camera (front-facing only), video recording, Bluetooth, micro HDMI, micro USB charging/cable/port, microphone/audio combo port, Wi-Fi, Windows 8.1 OS Release date: November 2013.

Palm

14. **Palm Pre** – 3.1 inch capacitive touchscreen, home button, software buttons, sliding full hardware, software keyboard, card interface, apps (Palm Store), camera, video recording, Bluetooth, non-expandable storage, removable battery, micro USB charging/cable/port, Wi-Fi, Palm Web OS [QWERTY vertical slider] Release date: November 2009.

15. **PalmOne Zire 72 –** 3 inch resistive touchscreen, stylus, handwriting recognition, no hardware keyboard, 5-way directional pad, Bluetooth, camera, video recording, expandable storage (SD card), micro USB charging/cable/port, non-removable battery, no Wi-Fi, PDA, Palm OS. Release date: April 2004.

Nokia

16. **N9** – 3.9 inch capacitive touchscreen, software buttons, swipe-based card interface, software keyboard, apps (Nokia Store), Music Store camera, video recording, Bluetooth, NFC, non-expandable storage, non-removable battery, micro USB charging/cable/port, Micro SIM, Wi-Fi, quadband 2G, quadband 3G GPRS, EDGE, UMTS, HSDPA network, MeeGo Haramattan OS. Release date: June 2011.

17. **Nokia 808, Pureview** – 4 inch AMOLED capacitive touchscreen, multitouch, hardware buttons, software buttons, dedicated sleep/wake button, 41 megapixel camera, image stabilization, video recording, dedicated camera button, limited screen rotation, apps, (Nokia Store), Bluetooth, NFC, expandable storage (micro SD), removable battery, micro HDMI port, micro USB charging/cable/port, Wi-Fi, quadband 2G, pentaband 3.5G, Symbian Belle OS. Release date: May 2012.

Alcatel

18. **Alcatel One Touch Fire** – 3.5 capacitive touchscreen no multi-touch, software buttons, camera, video recording, web-based apps (Marketplace), Bluetooth, 160 MB expandable storage (microSD), removable battery, micro USB charging/cable/port, Wi-Fi, regular/mini SIM, Firefox OS. Release date: July 2013.

BlackBerry

19. **BlackBerry Bold Touch 9900** – 2.8 inch capacitive touchscreen, TouchPad/TrackPad?, hardware buttons, software buttons, hardware QWERTY keyboard, dedicated sleep/wake button, camera, video recording, dedicated camera button?, limited screen rotation?, apps, (Blackberry World), Bluetooth, NFC, 8 GB expandable storage (microSD), removable battery, micro USB charging/cable/port, Wi-Fi, quadband 2G, pentaband 3G, mini SIM. BlackBerry OS. Release date: August 2011.

Microsoft

20. **Microsoft Lumia 640 LTE** – 5 inch capacitive touchscreen, no hardware buttons, software buttons, hardware QWERTY keyboard, dedicated sleep/wake button, camera, video recording, no dedicated camera button, apps, (Store), Bluetooth, NFC, 8 GB expandable storage (microSD), removable battery, micro USB charging/cable/port, Wi-Fi, quadband 2G, 3G, 4G LTE, micro SIM. Windows Phone 8.1/10 OS. Release date: April 2015.

LG

21. **LG Leon** – 4.5 inch capacitive touchscreen, no hardware buttons, software buttons, dedicated sleep/wake button on the back, camera, video recording, no dedicated camera button, apps, (Play Store), Bluetooth, 8 GB expandable storage (microSD), removable battery, micro USB charging/cable/port, Wi-Fi, quadband 2G, 3G, 4G LTE, micro SIM. Android OS. Release date: April 2015.

Google

22. **Google Cardboard** – Cardboard headmount VR viewer for smartphones, first generation, Android and iOS app support, QR code pairing with smartphones. Official, unofficial and DIY templates. Release date: November 2014.

Appendix 3.

Mobile Operating Systems List

1. **Android** - Android is a Linux-based smartphone operating system and software platform created by Google. GSMA
2. **Apple iOS** - Previously iPhone OS, Apple's iOS is the company's own mobile operating system developed and originally released on the Apple iPhone and the Apple iPod Touch back in 2007. Several years later it was renamed to iOS and was extended to support other Apple devices such as the iPad and the Apple TV. Unlike Google's Android and Microsoft's Windows Phone, Apple does not license iOS to other manufacturers and it is the sole maker and seller of iOS devices. GSMA
3. **BlackBerry OS** - a proprietary mobile operating system developed by Research In Motion (RIM) for its BlackBerry line of smartphones. The BlackBerry platform is perhaps best known for its native support for the corporate communication environment, which allows complete wireless activation and synchronization of email, calendar, tasks, notes, and contacts. GSMA
4. **Firefox OS** - (codenamed Boot to Gecko) is an open-source mobile operating system for smartphones and tablets, developed by Mozilla.
5. **MeeGo** - an open-source Linux-based operating system for smartphones and tablets, developed initially by Nokia and Intel as a common successor of their Maemo and Moblin OS projects. GSMA
6. **Symbian OS** -an operating system designed for mobile devices. Symbian was the leading smartphone platform up from 2003 up until 2010 (even 2011 for Europe). After that Google's Android OS took the lead. The core Symbian OS originally provided no user interface. Instead, it was used as the underlying base for two major smartphone UI platforms: **S60** and **UIQ**. These can be regarded as development branches, each backed by different companies. Unlike Android OS with its different cosmetic UIs, Symbian UIs ran deeper in the code and apps written for one of these platforms were not compatible with the other directly. Visually, the S60 and the UIQ had nothing in common and UIQ was created with touchscreens in mind. GSMA
    a. **S60** (formerly known as Series 60) - one of the major smartphone user interfaces. It is developed mainly by Nokia and uses the Symbian OS as its base. Besides using it in all of its own smartphones, Nokia also licenses S60 to other manufacturers such as Samsung and LG. S60 is capable of running native third-party S60 applications as well as regular Java applications.
    b. **UIQ** (previously called User Interface Quartz) was a pen-based operating system for touchscreen devices. It was developed by a company called UIQ Technology, which was owned by Symbian Ltd. and in 2006 was acquired jointly by Motorola and Sony Ericsson.
7. **WebOS** - a proprietary operating system, based on a Linux kernel, and developed by Palm for its last generation of smartphones. GSMA
8. **Windows Mobile** - one of the major smartphone platforms and until recently the only touch-enabled smartphone platform. Windows Mobile actually has two distinct editions - Windows Mobile Standard and Windows Mobile Professional. Software

written for either of the editions is not compatible with the other. The main difference between the editions is that Windows Mobile Professional supports touchscreen and handwriting recognition. Windows Mobile is a product created by Microsoft but as the company does not produce any phones itself, it licenses the platform to hardware manufacturers. Before version 6 was released the Windows Mobile Standard edition was known as Windows Mobile for Smartphone, while the Professional edition was referred to as Windows Mobile for PocketPC. GSMA

9. **Windows Phone** - a proprietary mobile operating system developed by Microsoft. Windows Phone introduced a new design language, previously called Metro UI, but later renamed to simply Modern. GSMA

10. **Fire OS** – A highly customized variant of Google's Android mobile operating system developed by Amazon to power its Fire line of entertainment products, which includes the Kindle Fire tablets, the Fire Phone smartphone, and the Fire TV entertainment set-top box. *Differences Between Fire OS and Android* While Fire OS's foundation is Android, there are some significant differences between the two mobile operating systems. Most notably, Fire OS utilizes Amazon-specific apps and services instead of Google's, including the Silk Browser web browser rather than Google Chrome, the Amazon Appstore in place of Google Play, Cloud Player and Cloud Drive as opposed to Google Drive, and Amazon's e-mail client over Google's Gmail. WP

11. **Microsoft Windows 8.1** - an operating system (OS) for personal computers and tablet computers. Windows 8.1 runs on touchscreen devices as well as traditional computers that rely on a mouse and keyboard. Microsoft designed Windows 8.1 to address widespread complaints about Windows 8. Most notably, Windows 8.1 reinstated the Start button, a familiar navigational feature of previous OS versions. Microsoft also made it easier to open, close and multitask among several apps using a mouse. WhatIs TT

12. **Windows 10** - a major version of the Microsoft Windows operating system that was released on July 29, 2015. It is built on the Windows NT kernel and follows Windows 8. Part of the reason Microsoft decided to name the 2015 release "Windows 10" (and skipped "Windows 9") is because the operating system is designed to be a new direction for Microsoft. One of the primary aims of Windows 10 is to unify the Windows experience across multiple devices, such desktop computers, tablets, and smartphones. WhatIs TT

13. **Palm OS** - the computer operating system that provides a software platform for the Palm series of handheld personal digital assistants (PDAs) made by Palm Inc. According to Palm, Palm OS was designed from the beginning to fit into a palm-size device of a specific size and with a specific display size. WhatIs TT

14. **Apple WatchOS** - the company's operating system developed to power Apple Watch smartwatch devices. WatchOS is based on Apple's iOS mobile operating system that powers iPhone, iPad and iPod Touch devices. WP

Biografija autora

Jelena Bajić je rođena 1974. godine u Beogradu. Osnovne studije engleskog jezika i književnosti završila je na Filološkom fakultetu Univerziteta u Beogradu 1998. gde je i magistrirala 2009. godine, odbranivši tezu *Morphological Aspects of Netspeak*.

Bavi se prevođenjem i saradnik je više kulturnih institucija od nacionalnog i lokalnog značaja.

Oblasti naučnog interesovanja: kognitivna lingvistika, semantika, morfologija, leksikologija, neurolingvistika.

Прилог 1.

Изјава о ауторству

Потписани-а _____ Јелена Д. Бајић _____

број уписа _____

Изјављујем

да је докторска дисертација под насловом

Metaphors of Mobile Communications

_____

_____

- резултат сопственог истраживачког рада,
- да предложена дисертација у целини ни у деловима није била предложена за добијање било које дипломе према студијским програмима других високошколских установа,
- да су резултати коректно наведени и
- да нисам кршио/ла ауторска права и користио интелектуалну својину других лица.

Потпис докторанда

У Београду, __12. 7. 2017.__

_____

Прилог 2.

Изјава о истоветности штампане и електронске верзије докторског рада

Име и презиме аутора _____ Јелена Д. Бајић _____

Број уписа _____

Студијски програм _____

Наслов рада ___ Metaphors of Mobile Communications ___

Ментор _____ Проф. др. Јелисавета Милојевић _____

Потписани _____ Јелена Д. Бајић _____

изјављујем да је штампана верзија мог докторског рада истоветна електронској верзији коју сам предао/ла за објављивање на порталу **Дигиталног репозиторијума Универзитета у Београду.**

Дозвољавам да се објаве моји лични подаци везани за добијање академског звања доктора наука, као што су име и презиме, година и место рођења и датум одбране рада.

Ови лични подаци могу се објавити на мрежним страницама дигиталне библиотеке, у електронском каталогу и у публикацијама Универзитета у Београду.

Потпис докторанда

У Београду, _____ 12. 7. 2017. _____

Прилог 3.

Изјава о коришћењу

Овлашћујем Универзитетску библиотеку „Светозар Марковић" да у Дигитални репозиторијум Универзитета у Београду унесе моју докторску дисертацију под насловом:

Metaphors of Mobile Communications

која је моје ауторско дело.

Дисертацију са свим прилозима предао/ла сам у електронском формату погодном за трајно архивирање.

Моју докторску дисертацију похрањену у Дигитални репозиторијум Универзитета у Београду могу да користе сви који поштују одредбе садржане у одабраном типу лиценце Креативне заједнице (Creative Commons) за коју сам се одлучио/ла.

1. Ауторство

2. Ауторство - некомерцијално

3. Ауторство – некомерцијално – без прераде

4. Ауторство – некомерцијално – делити под истим условима

5. Ауторство – без прераде

6. Ауторство – делити под истим условима

(Молимо да заокружите само једну од шест понуђених лиценци, кратак опис лиценци дат је на полеђини листа).

Потпис докторанда

У Београду, _____12. 7. 2017._____

1. Ауторство - Дозвољавате умножавање, дистрибуцију и јавно саопштавање дела, и прераде, ако се наведе име аутора на начин одређен од стране аутора или даваоца лиценце, чак и у комерцијалне сврхе. Ово је најслободнија од свих лиценци.

2. Ауторство – некомерцијално. Дозвољавате умножавање, дистрибуцију и јавно саопштавање дела, и прераде, ако се наведе име аутора на начин одређен од стране аутора или даваоца лиценце. Ова лиценца не дозвољава комерцијалну употребу дела.

3. Ауторство - некомерцијално – без прераде. Дозвољавате умножавање, дистрибуцију и јавно саопштавање дела, без промена, преобликовања или употребе дела у свом делу, ако се наведе име аутора на начин одређен од стране аутора или даваоца лиценце. Ова лиценца не дозвољава комерцијалну употребу дела. У односу на све остале лиценце, овом лиценцом се ограничава највећи обим права коришћења дела.

4. Ауторство - некомерцијално – делити под истим условима. Дозвољавате умножавање, дистрибуцију и јавно саопштавање дела, и прераде, ако се наведе име аутора на начин одређен од стране аутора или даваоца лиценце и ако се прерада дистрибуира под истом или сличном лиценцом. Ова лиценца не дозвољава комерцијалну употребу дела и прерада.

5. Ауторство – без прераде. Дозвољавате умножавање, дистрибуцију и јавно саопштавање дела, без промена, преобликовања или употребе дела у свом делу, ако се наведе име аутора на начин одређен од стране аутора или даваоца лиценце. Ова лиценца дозвољава комерцијалну употребу дела.

6. Ауторство - делити под истим условима. Дозвољавате умножавање, дистрибуцију и јавно саопштавање дела, и прераде, ако се наведе име аутора на начин одређен од стране аутора или даваоца лиценце и ако се прерада дистрибуира под истом или сличном лиценцом. Ова лиценца дозвољава комерцијалну употребу дела и прерада. Слична је софтверским лиценцама, односно лиценцама отвореног кода.