SESSION: DIGITAL CONTENT & THE MEDIA OF THE FUTURE

From paperback to paperless (again?)

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About the future (in general) [1]

"Digital content & the media of the future" every time I have to think about future trends it comes to my mind the sentence due to Neils Bohr[2] "*prediction is difficult, especially if it involves the future!*"

Metropolis – Fritz Lang

A long list of evidences supports this theory. In 1937 the League of Nations commissioned an international group of leading scientists to consider the evolution of technology over the next fifty years. The subsequent report contained some predictions that actually came true, but it is interesting to note the technologies that were not predicted, including radar, jet propulsion, television, antibiotics, nuclear energy and even the Pill.

We can, however, reach into the past and consider what earlier generations thought the future would look like, and then compare their predictions with how technology actually did evolve. How did our grandparents imagine that technology would develop in the future? Looking back, which were the most significant "clues" to technological progress?

At least three predictions in the field of IT are valid:

In 1965, his prediction, popularly known as Moore's Law, states that the number of transistors on a chip will double about every two years.

In the nineties Nathan Myhrvold said, software is like a gas that expands to fill the room (i.e. computer resources).

From the nineties as well: If mechanical engineering have had the same evolution pace of electronic engineering nowadays a car might be small like a stamp, cost few dollars and go from the hearth to the moon consuming few drops of gasoline.

If we consider articles, books and movies from the past, we find that at least three aspects of future technologies are emphasised: the presence of objects with incredible features (or at least features that were unattainable at the time that the movie etc. was released), the simplification of daily activities, and finally (often the most interesting aspect of the future to novelists and movie directors) the negative aspects of technological development, the dangers posed by hardware and machinery[3].

[1] Please refer to the volume – to Alfredo M. Ronchi, eCulture: cultural content in the digital age, ISBN 978-3-540-75273-8 e-ISBN 978-3-540-75276-9, DOI 10.1007 / 978-3-540-75276-9, Springer Verlag Berlin Heidelberg 2009

[2] Neils Bohr (Niels Henrik David Bohr 1885-1962), Nobel Prize in Physics. He made fundamental contributions to understanding atomic structure and quantum mechanics.

[3] In the world of cinema, we often encounter dark visions of a technological future, including Metropolis by Fritz Lang, Modern Times starring Charlie Chaplin, 2001: A Space Odyssey by Stanley

Sometimes our predictions for the future come true, at least to some degree, and sometimes they do not (consider, for example, the evergreen prediction that by the 1970s/1980s/1990s... everyone would be using flying cars, just like those depicted in the film "The Fifth Element" by Luc Besson).

The fifth element – Luc Besson

Even relevant inventions, the ones who changed the way of life of humanity, were discovered as a sister product of the main one.

Thomas Savery[4] was an English military engineer and inventor who in 1698, patented the first crude steam engine, based on Denis Papin's Digester or pressure cooker of 1679. Thomas Savery had been working on solving the problem of pumping water out of coal mines, his machine consisted of a closed vessel filled with water into which steam under pressure was introduced. This forced the water upwards and out of the mine shaft. Then a cold water sprinkler was used to condense the steam. This created a vacuum which sucked more water out of the mine shaft through a bottom valve. Later on James Watt did the rest.

Over the course of 23 years, starting from 1909, Guglielmo Marconi[5] invented and developed wireless communication using a range of wavelengths, from long waves to microwaves. Radio communication was originally intended to provide a point-to-point private communication system, but its basic lack of privacy led to a completely new form of communication: *broadcasting*[6].

Consider the revolution resulting from the invention of the transistor, one of the most important and pervasive technologies of the last century. The first working prototype was created in 1947 at Bell Labs by three researchers John Bardeen, Walter Brattain e William Shockley[7]. It was originally developed and patented as a device to fight deafness[8].

And then we come to Sony[9], the company founded by Akio Morita and Masaru Ibuka. The company initially dealt with magnetic tapes, but the real turning point in the history of Sony was its acquisition, for $25,000, of the rights to produce the transistor outside the US and then apply it as a revolutionary basic component of the first

Kubrick, Tron from Disney, The Lawnmower Man by Brett Leonard, Johnny Mnemonic by Robert Longo (based on the work of William Gibson), The Thirteenth Floor by Josef Rusnak, The Matrix by Andy and Larry Wachowski, Enemy of the State by Tony Scott, Nirvana by Gabriele Salvatores, Minority Report by Steven Spielberg, and the off-the-wall Brazil by Terry Gilliam.

[4] Thomas Savery (1650-1715)

[5] Nikola Tesla did the first experiment of wireless communication in 1893.

[6] Wireless communication was developed in order to allow ships crossing the oceans to communicate, but a "bug" in the technology did not allow private communication (for military purposes anyway). This bug is now called broadcasting, and it provides the bedrock of radio and television services.

[7] John Bardeen, Walter Brattain e William Shockley received the Nobel prize in Physics in 1956

[8] 1948: John Bardeen and his colleagues invented the transistor, in an attempt to produce a smaller, cheaper, more efficient hearing aid. The brainstorm earned them the Nobel Prize in 1956, and Sony purchased the license for manufacture of the first transistor radio.

[9] History of Sony: http://www.sony.net/Fun/SH/. Initially called Tokyo Telecommunications Engineering Company, the name of the company was changed to Sony in the 1950s. "Sony" is a deformation of the Latin term "sonus".

consumer electronics product: the portable battery-operated radio. Almost the same happened to the next step in this field. Intel 4004 was the world's first microprocessor; it was created by Federico Faggin in 1971[10]. The invention found the first commercial application thanks to a Japanese company called Busicom. Busicom was a manufacturer of electronic calculators. The availability of MOS LSI (large-scale-integration) technology had just started a fundamental change in the calculator business from electromechanical to electronic.

Back to predictions, I once attended a presentation by a technology forecaster—a "future guru" —Paul Saffo, the director of and a high-level researcher at the Institute for the Future[11], a "think tank" based in Silicon Valley that attempts to predict trends in various sectors.

Initially I thought of another "researcher of the future" (from the movie Back to the Future), but Saffo did not have flowing white hair or a wild expression, so no time travelling (at least for the moment!). Instead he presented a talk analyzing technological potentials and current trends that could be used to predict the progress of technology over the next ten or so years.

The scenario proposed for this first decade of the new millennium was that of businessmen that are permanently flying around the world and permanently connected to the global telecommunications network while doing so. These businessmen are continually racking up frequent flyer bonus miles and credit card rewards from travelling, which then enable them to travel to places that they really do not want to visit—a vicious circle!

Another interesting interpretation of the future of technology comes from Susan J. Blackmore[12], in a discourse that, among many other topics, encompasses viruses, religions and amanuenses. She believes that the Internet functions as a replicator that is able to perpetuate content[13], just as nature makes species that are destined to survive more prolific.

Consider the interesting and somewhat alarming forecast for 2005 published by the Japanese Banks Association in 1999. The forecast was delivered by the commercial response to their I-mode system.

The study forecasted that in 2005 the vast majority of the clients of banks and telecommunications would not be human. Most transactions would be carried out between machines, while in some cases one of the actors would be an animal.

The study predicted highway telepayment systems, prepaid cards (evolutions of the credit system) that are able to communicate directly with the current accounts of the suppliers, and wearable devices for kids, elderly people and animals that are able to converse with cars, warning the driver or triggering the engine control unit or ABS system if danger is imminent, as well as the attendance of virtual video presences at

[10] The 4004, , is signed with the initials F.F., for Federico Faggin, its designer. Signing the chip was a spontaneous gesture of proud authorship. The birth of the 4004 was an intense moment witnessed by Faggin alone, working into the night in the deserted Intel labs in January 1971.

[11] Further information is available at: http://www.iftf.org.

[12] Susan J. Blackmore, University of the West of England, Bristol: http://www.www10.org/keynoters/speech/susan/Memes.html.

[13] The long-term preservation of digital content is a big challenge in the era of the Information Society; important digital information is in danger of being lost forever. The technologies required by particular types of digital content become obsolete; application versions and files formats frequently change, making data inaccessible.

ceremonies and job meetings, as made possible by three-dimensional holographic images.

However, DoCoMo is just one (although recent) wrong prediction of our technological future. Predictions in the field of technology are sometimes or usually based on hints that do not represent true trends.

Content and services: what's new

In order to adequately take into account the role and the potential of digital content and services we need to consider first of all the effects of the so called "digital revolution". What is the role and what are the effects of the digital revolution? Which opportunities and threats are associated with digital information? In the present context, the term digital information is better than electronic information because it more accurately captures the essential aspects of the topic.

From an ontological point of view, we are dealing with a new class of "*objects*". Copies are *clones* equal to the "*originals*", duplication cost is almost nothing, transmission and dissemination costs are almost zero and . . . no more physical barriers and customs, everything freely flows through the Internet. The concept of ownership of the original becomes meaningless; in the digital world access means ownership, intellectual property and copyright are reshaped.

It is not surprising that digital information and its related technologies have the potential to make a huge impact on culture and society. In addition, to ignite the innovation process one of the most significant changes to occur in the field of information technology over the last few decades has been the implementation of real-time communication and information exchange between computers: networking.

A computer was originally considered to be Leibniz's [14]"*monad*", an ultimate atom without windows and doors; a sealed entity. Intercommunication processes activated external access to these monads, allowing information and data exchange between them and thus multiplying their added value; networks of computers possess expanded functionalities and services. A number of different standalone proprietary networks were gradually merged into the network of networks: the Internet.

The Internet, the *de facto* implementation of global networking has revolutionized the worlds of computing and communications like nothing before. The incredibly fast growth of the Internet boosted the revolution and now we must consider Internet as a pillar even in social communication. This means that access to such a relevant infrastructure becomes a key point.

Accessibility issues came to the fore at the end of the 1990s, supported by technological issues related to the potential social role of the Internet. If the Internet has a "social" role, then, in order to avoid any "divide", it must be accessible by anyone, anywhere, and at any time. If access to cultural content and services has to be considered a social good it must be accessible to everybody, no matter about gender, age, richness, or eventually disabilities.

[14] Gottfried Wilhelm Leibniz (also Leibnitz or von Leibniz) was born on July 1, 1646 (Leipzig, Germany), and died on November 14, 1716 (Hanover, Germany). School/tradition: rationalism. Main interests: metaphysics, epistemology, science, mathematics, theodicy. Notable ideas: calculus, innate knowledge, optimism, monad.

Internet World Stats[15] reports that there are close to 1.5 billion Internet users today (July 2009). *comScore*[16] an Internet research/analysis organisation reported in January 2009 that the global Internet audience (defined as 15 years of age and older accessing the Internet from home and work computers) has surpassed 1 billion users (note that the *comScore* report excludes Internet access from cybercafés mobile phones and PDAs which probably represents the difference in numbers between the two reporting organisations).

Some years ago the report *New Information Technologies and the Young*[17] identified the extent of provision and access to technologies, the ways in which young people use them, and some of the opportunities and difficulties associated with each form of communication and expression. The report provides a comprehensive picture of young people as users and consumers of new technologies, but especially in terms of their creative activity, such as their use of digital audio and video, website creation, and distributing visual, musical or literary work across the Internet.

These numbers are growing rapidly and will continue to do so. The "next billion", as some authors call them, and the billions after that will be online much quicker than the first billion; this then makes the Internet an important global public policy issue.

The Internet that is taken for granted by so many needs to continue its evolution around the fundamentals upon which it was founded. These fundamentals relate to the concept of user centricity, where the Internet user and how they use the Internet should be the primary focus of decisions and developments on the Internet. The concept of user centricity characterised, perhaps for the first time in computer technology, the birth and early development of the web technology. From the beginning up to, at least, 1995 the World Wide Web technology was built based on the request of users directly from users.

Another defining feature of the Internet's success has been the open nature of the technical standards, and the innovation this has allowed. The innovation have been key to a large number of new technologies that have evolved out the Internet, and it is important that this continues so that we keep finding new ways to do some of these old things cheaper, better and faster.

Digital playground

The digital domain is populated both by native digital content and by native analogue converted to digital format content. The last one is the result of digitization processes.

The native format used to be analogue, but it has recently become possible to find "native" digital content. This means that the "original" content was created or acquired in digital format, so there is no analogue / physical original. This applies for instance to documents, images, digital video and audio recordings. Services, legal documents and signatures are increasingly belonging to this "family". Our bank account, credit card and

[15] www.internet-worldstats.com

[16] www.com-score.com

[17] The project New Information Technologies and the Young was launched by Screen Digest—General Direction Office IV of the Council of Europe. A final report on the project was published; see Council of Europe (2001).

even identity have been turned in its digital double.

Native digital content should not be confused with the so-called “digital original”. The term “digital original” used to be applied to a “perfect” digital double of the original physical “object” that is suitable for any use; research, display, etc. This means that the physical original of the digital original is available for future digitisation. In contrast, “native” digital objects are basically the only resource available. The quality, comprehensiveness and preservation of native digital objects are bounded by the digital technology utilised.

We all know that digitisation means “segmentation” into slices, such that the digitised data has defined resolution and quality. Once the standard has been defined (e.g. in terms of resolution, palette, frequency sampling,), there is no way to accurately recreate the portion of information that is lost. In other terms, when creating native digital objects we must consider the quality, comprehensiveness and long-term preservation of the content, because there is no physical reference object to go back to.

User generated content (photo Shizuo Kambayashi

Native digital content is increasing in quantity and variety, mainly in under the umbrella of user generated content (UGC). Digital documents, publications, recordings, drawings, sketches, illustrations, pictures, movies, music and more are being produced.

An incredible amount of data has moved from the original analogue format to the digital one; for example, traditional cameras are now almost exclusively used by high-level professionals or are found in collectors markets. This upsurge in computer use resulted in a tidal wave of new objects, such as playlists, SMS, podcasting, personal websites, communities, blogs, wikis, and more.

If the data we are going to use are not in digital form natively, we need to acquire these data and convert them into a digital format. Digitisation is performed in different ways with different equipment for different classes of data: images, sounds, 3-D objects, and others. We might use image scanners, sound and voice recorders, camcorders, 3-D solid scanners, etc., as equipment. But how do we deal with different classes of data: sounds, images, smells, taste, touch... and behaviour.

Analogue and digital data are fundamentally different: whereas analogue information is generally smooth and continuous, digital information consists of discrete chunks; and whereas analogue information bears a direct and non arbitrary relationship to what it represents, digital information is captured using formal codes that have only an arbitrary and indirect relationship to the source.

Thus, while an analogue image, for instance, consists of continuously varying colours and shading, a digital image consists of a set of

individual dots or pixels, each recording the colour intensity and other information at a given point.

Due to the digital structure of data, the continuum is broken into slices, a best approximation to the given analogue value, and then coded as a sequence of digits (bits). This ensures that there is no degradation of quality between the original digital dataset and any copy. The bit streams representing the information can be transferred correctly, so the information at the destination is equal to the original. While the bit stream may sometimes be corrupted, in this case the error is highlighted and sometimes automatically corrected for by control bits.

Although the specific kind of information stored varies from medium to medium (sound waves, light intensities, colours), this basic difference remains constant.

"Digitisation", the conversion from analogue to digital, thus requires that the continuous analogue information be sampled, measured, and then recorded in digital format. There are several basic factors which govern this process and which determine the quality of the resulting digital data (density of the data sampled: the resolution, amount of information recorded at each sampling, file size versus quality). The first of these is the density of the data captured from the analogue original; in effect, how often the original is sampled per unit of time (in the case of video and audio) or area (in the case of images and video). The second factor is the amount of information that is recorded during each sampling. Individual pixels in an image may contain very little information; at their most minimal, each may comprise just one binary digit to express "on" versus "off" or "black" and "white". The last one, sampling frequency (or resolution) and sample size (frequency response, bit depth) both involve a trade-off between data quality and file size.

We already know about digital communication and networking enabling instant exchange of information and data. As an extension of this, interactive virtual reality provides a powerful tool for knowledge and complex structured information transfer. Furthermore, the electronic industry is now moving from the Internet era, where connectivity and intelligence was built into certain products, to the ubiquitous network society, where everyday objects possess such capabilities.

Ubiquitous computing - Japan

After the "I" and "e" eras, we are now entering the "u" (for "ubiquitous") era. This next phase in technological evolution has been given different names: ubiquitous computing in Japan, pervasive computing in the US, and ambient intelligence in Europe. There are, as usual, slight differences between the approaches taken in these different regions: universal access and

computational power or "transparent" computer support and cooperative behaviour from the digital environment. Last but not least, we should consider the opportunities and threats caused by the implementation of the so-called e-society, as well as the increasing gap between those who are online and those who are offline.

Nowadays, there are different models, opportunities for, and types of communication: asynchronous or synchronous; mono- or bidirectional; one-to-one, one-to-many, or many-to-many; location-dependent or location-independent; immersive or non immersive; interactive or non interactive, with log file and without log file; wired or wireless. In order to develop more effective communication, we must create new recipes from these different ingredients.

The Internet era offers many benefits, including easy access to broad audience communication, and forums, blogs, wikis and Web 2.0 appeared, which are powerful tools.

Mobile communication enabled a kind of virtual ubiquity. Originally intended to be a minor aspect of mobile communication, the utility and popularity of short message service (SMS) messages were initially hugely underestimated as communication tools. As we have seen, they have enabled a new way to work and are an incredibly powerful aid to interpersonal relationships. Today they are often used as a private channel, as opposed to a public channel. SMS offers typing and paging features plus emoticons and the time dimension. The employment of text and the time delay enable the use of imagination the most powerful tool supporting communication.

iPhone users

The increasing number of wireless devices and always on terminals has catalysed the creation of new applications and services, and will continue to do so. However, up to now there has not been a proper way to use technological tools in order to exploit the real advantages of ICT in communication.

[Digital] Creativity

"*Creativity is one of the highest forms of human energy. It is a defining human trait that enables us to design and to use tools, and it gives us the ability to solve problems. In the modern world, creativity and its outcome, innovation, are credited as the greatest predictors for economic advancement, equal to or surpassing investments. Creativity can be a vehicle for empowerment and fulfilment or, if denied or abused, it can lead to frustration, apathy, alienation, and even violence. The role of creativity has been magnified by the explosive developments in Information and Communication Technologies. ICTs are the most powerful means to produce, preserve and communicate the fruits of human creativity, including information, know-how, knowledge, and works of art.*"[18]

[18] Passage from the "Vienna Conclusions" of the conference ICT and Creativity: Towards a Global Cooperation for Quality Content in the Information Society, held in Vienna, Austria, 23 June 2005

The idea of the Knowledge Society is to add value to ideas, creativity and interactions. In the new scenario of an enlarged Europe and neighbours countries there is a need to catalyse a common understanding that encourages the richness resulting from cultural diversity but also censures the unwanted effects that can sometimes arise from such diversity (e.g. clashes between cultures), thus leading to a common vision of the European Society. Young people and their special creativity could play an important role in such a scenario, particularly if supported by digital technologies.

'akustisch' is a new approach to the use of a multitouch interface for the production, control and manipulation of digital sound.

Digital technology affects our lives in so many areas, including health, security, safety, work and similar fields, and particularly in the fields of cultural interests, creativity, entertainment, communication and relationships.

Digital media have dramatically increased the possibilities available to the artist, by creating new forms of expression and by lowering the costs of producing certain art forms to such a degree that they become within the reach of individuals. As well as specifically digital media, music, still images and video are three significant areas where the costs of producing a finished work have dropped so dramatically that it has encouraged the emergence of new young talents.

Digital technology, and in particular the Internet, has completely overturned traditional ideas about distribution. Any work that can take a digital form can be infinitely reproduced at minimal cost. Young people in particular will be encouraged if they feel that others will see their efforts.

The instant global network provided by the Internet has made the building of special-interest groups unprecedentedly easy. These spaces are where artists talk, and they are excellent places to gauge the state of a scene. In recent times such spaces evolved as shared facilities enabling co-creation of artefacts such as composing and playing music, paintings, movies[19], software applications[20] and more.

Peer-to-peer technology enables on-the-fly exchange of content, and thus provides unlimited opportunities to share personal content and to activate added-value chains of cooperation.

Creativity must be encouraged, and new interactive cultural expressions must be stimulated. Knowledge is not about the circulation of information. It is about adding value to ideas. A Knowledge Society must provide people with opportunities to think in new ways.

Up to now, ICT has often led to the creation of libraries without books and highways without cars, the technological infrastructure is in place but we can't do anything useful with it, while ICT companies are still looking

[19] http://www.wreckamovie.com/ - "a place where people work together and can build trust among each other so film projects of all types get done and seen."

[20] E.g. seven scenes http://7scenes.com/, Web 2.0 applications

for killer applications. However, there are some "enabling" applications and technologies that are still at the development stage but should provide users with useful services.

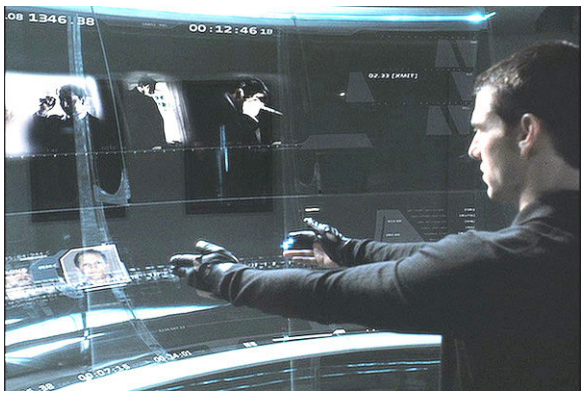
Software availability is very patchy. The least widely available software includes video/audio authorware, and software for composing music and computer graphics as well as 3-D modelling.

There is a need to channel the creative energies of young people by promoting digital literacy in the field of new ICT-enabled or empowered creativity and expression. There is also a need to create a proactive environment that enhances the overall quality of eContent products. Digital and social divides must be bridged in order to provide access and added value to citizens. Digital technologies and ICT tools provide an incredible opportunity to encourage growth and prosperity. Digital content and services empowered by broadband communications, both wired and wireless, could have a significant impact on society. One of the first steps in this direction is to promote human networking and the exchange of experiences and skills amongst different groups and communities.

Digital content and services

Let's start from what is usually considered the centre; do you remember "user centricity" or "user centred approach" terms/buzzwords?

Which target user profile is appropriate? Quoting Mark Prensky[21] "Our children today are being socialized in a way that is vastly different from their parents. The numbers are overwhelming: over 10,000 hours playing videogames, over 200,000 emails and instant messages sent and received; over 10,000 hours talking on digital cell phones; over 20,000 hours watching TV (a high percentage fast speed MTV), over 500,000 commercials seen—all before the kids leave college. And, maybe, at the very most, 5,000 hours of book reading. These are today's "Digital Native" students."



Intuitive interfaces - Minority report

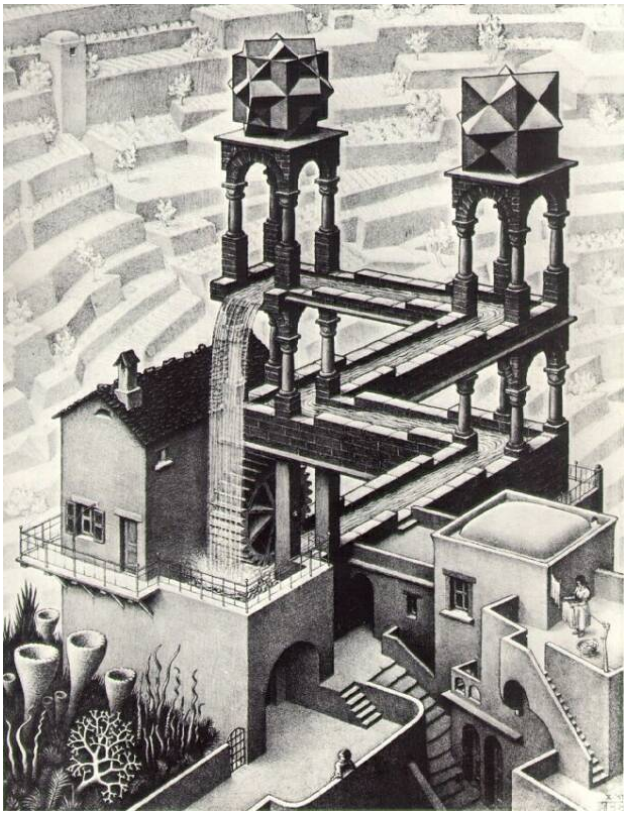
If this is the target profile, people over 40 - the so called *digital immigrants*, are to be considered mostly "digital divided". Some experts are already creating taxonomy between digital native pre and post touch and surface interfaces; people clicking and people touching and stretching; the typical *iPhone/iPod Touch* user behaviour. Nevertheless it is true that we experimented the early generations of software and hardware moving from "hardware driven applications and services" toward user/humans enjoyable application and services. Early applications required the user ability to think and communicate as a computer. Do you remember lists of unique codes or strings of machine readable

[21] Marc Prensky, Digital Natives, Digital Immigrants From On the Horizon (NCB University Press, Vo 6, December 2001)and Digital Natives, Digital Immigrants, Part II: Do They Really Think Differently? From On the Horizon (NCB University Press, Vo 6, December 2001)

characters such as “%bdc109911” and similar ones?

Here comes a new buzzword “interaction design” What is interaction design? Some authors define it as “the design of interactive products that are able to support humans in their own working activities and in everyday life”. Consider how many interactive products we deal with in a typical day: mobile phones, computers, personal organisers, remote controls, soft drink machines, coffee machines, ATMs, railway and bus ticket machines, the Web, photocopiers, alarm watches, digital cameras, camcorders, printers, media centres, iPods, eBooks, VCRs, car navigation systems, calculators, video games... the list is endless!

Now consider how usable they are. How many of these products are actually easy and enjoyable to use? All of them, several, or simply one or two? This list is probably pretty short. Why is this the case?



Waterfall - Maurits Cornelis Escher 1961

Interaction design involves defining the behaviours of artefacts, environments, and systems. Although human—computer interactions were required for the previous generation of computer applications, interaction design involves much more than just analysing human/computer interactions.

Why do these issues crop up time and time again? Is there any chance of improving the situation; of fixing major problems?

A number of applications that require user interactions in order to carry out their tasks were not designed with the users in mind—it can often seem that designers have never tried to use their own products. They are systems that are typically created to perform routine functions.

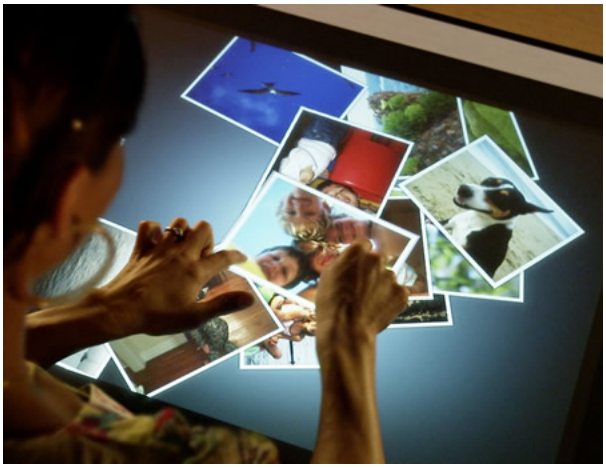
While they may work effectively from an engineering perspective, it is often up to the user to make the extra effort to bridge the gap in man/machine communication. This is not suitable for eServices in the information age.

The aim of interaction design is to close this gap by bringing usability into the design process. This means developing interactive products that are easy, effective, and enjoyable to use from the users’ perspective.

In the recent past, when it finally happened that the power of computer was more than enough to manage everyday tasks, software designer decided to invest extra power in software intelligence in order to ease users tasks. Once a word processor it was able to format in real time our document including pictures and graphs it started to check orthography and grammar in real time, amending typing mismatch and more.

More recently, refer to the virtual knob on iPods or the two fingers or hands interaction

on touch and surface computers. Sometimes so enjoyable that may create a kind of addiction, but this is a different point.



Surface Computing (Microsoft)

The "Citywall" in Helsinki

Interaction design is undoubtedly a discipline that has gained in prominence with the incredible rise in popularity of the World Wide Web and wireless communication.

Interaction design involves cognitive, social and emotive aspects, and proposed solutions are taken from various fields, ranging from psychology to computer science.

An interesting aim of interaction design is to develop interactive systems that elicit positive responses from users, such as feeling at ease, being comfortable, and enjoying the experience of using them. More recently, in accord with the trend towards emotional experiences, designers have become interested in how to design interactive products and services that elicit specific kinds of emotional responses in users, motivating them to learn, play, be creative, and be social.

In addition, in a similar way to how architecture and design traditionally relates to the business sector[22], there is currently much interest in how to design on line services that people can trust—that make them feel comfortable about divulging personal information or making a purchase.

There is a long term tradition in identifying a specific sectors or activities thanks to the look and feel of their graphic design. So we can identify the financial and banking sector, health, news, gossip...

Newspapers and magazines have their own format, shape and look, so we can immediately recognize a Times or Newsweek page. The same happens on the TV screen: news, shows, documentary, games, etc. In the domain of on line content and services, after a preliminary phase devoted to test and tune the technology, happened the same. Each sector and service found its format and look so we can easily identify news, search engines, portals or "Institutional" web.

High-quality layout and design are hallmarks of modern paper-based publications and services/products —they provide each book, magazine, product/packaging with its unique branding and visual style. This does not mean that users are more attracted to shape than substance; they simply appreciate quality standards.

There are at least two main reasons why online publications, services and products

[22] Simply consider the architecture associated with banks and insurance companies, or the shapes of their headed paper and publications—so rigorous and so consistent.

tend to look less appealing than the traditional one from a pagination design point of view:

• The traditional electronic publication process. Even when supported by ad hoc software products and languages, the online publication process is mainly based on time-consuming manual activity. Consider the amount of time devoted to tuning and refining the pages of digital documents to optimise them for printing on paper, and extrapolate this to the effort required to do the same for online documents and future updates of them.

• Current trends in viewing device production. Due to advances in display technology and emerging markets, a number of different devices will be used to view online documents. Each of these devices has its own characteristics:

screen size, ratio, resolution and palette of colours. While PSP, eBook, iPod or Archos media viewers/players are relatively popular and may become a relevant platform for the dissemination of quality content, their differing technical specifications provide a significant barrier to the multiplatform production of quality content.

The newly emerging area of interaction design is based on the concept of affective aspects. When following such principles, the designer will attempt to ensure not only that the experience of the product will be remembered by the user, but also that the experience is extended as much as possible in time and space, with the ultimate aim being continuous feed.

We will now look at how and why the designs of computer systems (e.g. Palm, PowerBook, Vaio, iPod) can cause certain kinds of emotional responses in users. We begin by looking in general at expressive interfaces, examining the effect of an interface's appearance on users and how it influences the usability (e.g. for the iPod).

Caleb Chung

I can recall, being present at SIGGRAPH '99, when Caleb Chung gave a talk in his role as a member of a panel on user interfaces. He started his presentation by showing some high-tech devices with dull interfaces, and then asking whether the designers of these dull interfaces considered the actual, everyday use of such devices.

Why is it that many designers do not seem to take their target users and the way in which their devices interact with our everyday life into account?

Based on this, we can distinguish between two main approaches to technological innovation. The first is termed *tyrannical technology*, and corresponds to the view that technology imposes its own vision of the world on the target user. This is the approach that forces humans to operate according to the needs of the machine or product: to browse long lists of items in tables, to remember complex and meaningless sequences of codes, to adapt themselves to use complicated interfaces.

Such an approach was or is prevalent in the first version of the online White Pages, when programming a VCR, when setting up telephone switchboards, and when using setup options on the first generations of mobile phones and to change the ringtone ("it is really easy, simply press CODE 1,7,3,2 Send in sequence"). Even a "relative" of a well-known family of user-friendly interfaces, Pocket Windows, had some problems with its early versions because its implementation on pocket PCs made it almost impossible to write a note or browse the schedule whilst speaking on the telephone; paper and pencil were still a useful alternative.

Car navigator user interface

Other examples include everyday devices such as car navigators or communicators, only few of which are actually equipped with touch screen displays and sometimes they still need a "tyrannical" approach.

Some of them do not even offer a real or virtual numeric pad—it is necessary to rotate a knob in order to compose the required phone number (1,2,3,... 0, Cancel).

Indeed, it is only very recently, due to the increasing popularity of "on-board computers", that we have been able to read exactly how far the fuel left in the fuel tank can take us, rather than having to guess based on the level of the fuel tank (¾, ½, ¼).

Of course thanks to the amount of technology embedded in cars these days (engine status, fuel, ABS, ESP, DHC, GPS, GPRS, maps, databases of services and other relevant issues) we can make use of a number of useful services; however, these subsystems are only rarely fully integrated.

The opposite approach is termed *user-centred*; in this case, the product design is based upon user needs and requirements.

Therefore, during product development, we must gain some understanding of not only what is required of the product, but where these requirements come from. User-centred design is a relatively new design philosophy that proposes that users should be consulted throughout the development cycle. But who are the users? And even if we know who they are, will they know what they want or need? For an innovative product, users are unlikely to be able to envision what is possible, so where do these ideas come from?

At the corporate level, this means that sales and marketing experts must be involved in the decision-making process as well as designers. In addition, product development will require psychologists skilled in human/computer interactions and test laboratories that can check whether the product fulfils the requirements of the end-user when used in the "real world". Very often users interpret the functionality of the product in a very personal way, resulting in unexpected actions.

An interaction design project may aim to replace or update an established system, or it may aim to develop a totally new product with no obvious precedent.

There may be an initial set of requirements, or the project may involve producing a set of

requirements from scratch. Whatever the initial situation, and whatever the aim of the project, the user's needs, requirements, aspirations, and expectations must be discussed, refined, clarified, and probably reassessed.

This requires, amongst other things, an understanding of the users and their capabilities, their current tasks and goals, the conditions under which the product will be used, and constraints on the product's performance.

The approach described above, although apparently more time- and resource consuming than the other approach, will yield products that will integrate easily and quickly into the user's everyday life. They will be used appropriately due to their own good design.

Such products do not force us to learn additional information; they offer a clear vision of how they work. These may be doors and handles that operate correctly, taps that mix to give the required water warmth, and panels of switches that clearly indicate which switches activate which appliances (avoiding the need for guesswork).

They also include well-designed software applications that execute their own added-value tasks without involving the user in technological problems, allowing them to focus their attention on the service itself.

In my opinion, this corresponds to the "information at your fingertips" approach to software design proposed in 1990 by Bill Gates: "the opportunity to focus on our own task assisted by a friendly and transparent (to the user) technology."

The life cycles of technological products

The life cycles of technological products tend to consist of well-defined phases. This not only applies to physical gizmos but even to applications and services

At the beginning of the cycle the "product" is taken up by the technological audience (experts and those who have a special interest in the corresponding product field), who want to get their hands on the "gizmo" and try it out, even if this means investing time and resources into debugging[23] the product. They are essentially alpha or beta-testers; forerunners. Such users do not care about reliability and usability, and even productivity is not crucial to them.

Later on, if/when the "product" reaches maturity, the customer profile changes. The product attracts many more new customers, who adopt the device even when they have to devote some time and energy to adapt to it, because they believe that the increased performance and productivity resulting from the adoption of the product will more than compensate. This is the stage in the lifecycle, for example, that computer-based drafting and solid modelling has now reached, after two decades of development.

Once this phase is over, when the technology has proved its practical worth, it is made available to the mass market. Generic customers do not tend to debate the functionality and reliability of the product; they are more interested in its style, its

[23] The origin of the term debug is often attributed to the extraction of a moth that flew into the relays of an early computer (Mark II), causing it to shut down, as reported on 9th September 1947 by scientist Grace Hopper.

design, its use as a status symbol, being part of a particular user community, etc.

In the field of physical products, sometimes deeply linked with software applications and services, simply consider small music players or mobile phones. Consumers expect them to be able to reproduce hi-fi stereo music or make phone calls, so they tend to focus on the design, the size, and the appeal of the product. The device becomes part of the large consumer market, where a device is often replaced by the consumer even when the old device still functions properly simply because the consumer likes the new device more. Such products do not usually find their way onto the second-hand market; their lives are over and there is no reason, even an economic one, to keep them alive.

It is hard to create a second-hand market for old devices, since newer ones are (usually) more aesthetically appealing, perform better and cost less than the predecessor. In addition, or as a consequence, support for the old device is dropped by the manufacturer, and technical help for it becomes incredibly expensive; it is already a vintage product! Therefore, inheriting a vintage hi-tech product is usually not a stroke of good fortune!

This aspect, which is typical of ICT, is important because it is becoming applicable to more and more areas of our lives, and it results in deep modifications to our way of life.

In the automotive sector, for instance, the increasing number of ICT components being incorporated into cars makes them safer and more reliable and easy to use, while it also turns them into consumer goods with many similar aspects to mobile phones and digital cameras.

When the technological device[24] exceeds its shelf life, it becomes completely useless for all practical purposes, and so its value is immediately erased.

Over the last few decades we have observed small- and large-scale changes in the market due to the introduction of new technologies—consider, for example, the music sector at both the consumer and professional levels.

Personal computers have become a melting pot for music: from audio sets to synthetic sounds and digital editing, and from classical musical instruments to more modern ones. Musical instruments like synthesisers (i.e. old electronic instruments) and classical musical instruments can now be replicated by a personal computer. This has produced a revolution in terms of the musician/ instrument relationship, unleashing creativity and new opportunities (e.g. “one-man orchestras”).

The world of “high-fidelity” music reproduction was once ruled by a few well-known and market-leading companies. These companies produced highly refined valve-based power amplifiers that outputted a few dozen watts of round sound, as well as preamplifiers with golden switches, loudspeakers as large as refrigerators, at prices comparable with that of a small car.

The photography market is also changing, in a similar way to that already seen in the wristwatch market. Selected sectors like these have developed a double market where the high end of the market is devoted to the evolution of traditional technologies

[24] This mainly refers to hardware devices, anyway they are often closely linked to eContent and services.

whereas the consumer market is concerned with new technological digital devices that are more suitable for the mass market. Now let us consider the world of personal computers and related applications.

The evolution of the digital species

Throughout the 1980s we suffered from a lack of hardware performance and limited software. Consider the early releases of Office Automation Suite or drafting software. How long we were seated powerless in front of our 286 PC waiting for a segment or the for the display list to be regenerated on our display?

Later on, after various generations of 486 PCs, we had almost reached Valhalla—overall performances were almost good! In the rush towards interactivity, the goal of creating two-dimensional sketches (which had been attained) was substituted for the target of three-dimensional modelling, photorealistic rendering and animation: resulting in a new push for ever-greater performance!

Once reasonably good overall performances are obtained for such applications, what is the next step in the evolution of software products? How do we keep the market alive?

One application that has reached its goal of good performance is word processing. This application, which is based on typewriter technology to some degree, initially followed two parallel development paths: the natural evolution of the original device (the typewriter) in terms of updating and upgrading, as well as the development of the same service on a general purpose device like the personal computer.

However, even though it had the advantages of a the familiar shape and very well known functionality, the original device was eventually comprehensively beaten in terms of market share by the more complex and less popular (at that time) personal computer. After a short period of development, the PC was able to offer more powerful, sophisticated and useful options.

In this way, we moved from an ability to write, amend and manage texts before printing them to more relevant options: the ability to save and retrieve documents, to specify the font, style, body, and formatting and page template used.

The number of options available increased so rapidly and to such a degree that users got lost in the jungle of menu and submenu choices!

The enrichment of menus and functions alluded to above could not proceed unchecked because it confused some users while other users began to question why it was necessary to host, for example, the Cyrillic alphabet or functions for creating hand-written letter headers on their PCs when they never used these functions.

Сто лет мы с вàми знакóмы

Such issues were solved by using modular application design, which enabled software components to be loaded and unloaded, as well as menu personalisation features and options to hide menus. This is a similar approach to that applied to TV and VCR remote controls, where covers are used to hide groups of buttons that control rarely used commands and options, meaning that only five or six buttons are usually available: those to change channels, play, stop, pause, rewind, and fast-forward.

As soon as computational power increases the focus of innovation moves onto

"smartness"—applications are starting to customise menus by themselves and to predict the needs of the user (for instance, suggesting best practices, amending spelling and grammar mistakes in real time, accepting voice commands and dictation).

User-centred design has resulted in an emphasis on the machine adapting itself to the user in general, but especially to the implicit and explicit requirements of any specific user. User profiles and adaptive components have jumped from research laboratories into the marketplace.

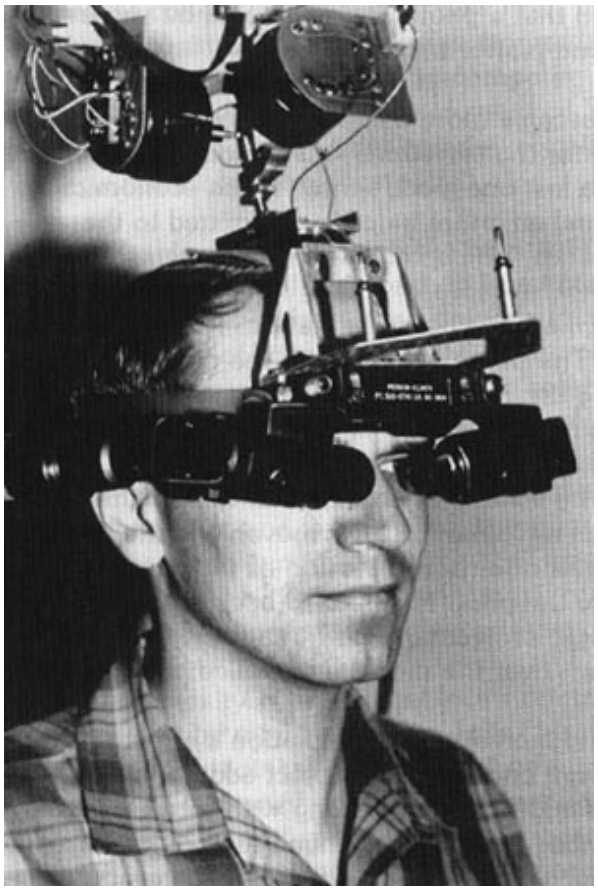
The evolutionary path of the user-centred approach resulted in early examples of fake user profiling, such as the airline lounge message of "Welcome John Smith!" that is issued upon swiping a frequent flyer card across the door handle, and then in real user profiling by credit card companies in order to tightly monitor the lifestyle and behaviour of the card holder, as well as the incredible evolution of search engines and eCommerce-targeted services that are able to offer to the registered customer not only the requested items but also a full range of related products and services, an approach that even beats methods and techniques that have been used in supermarkets and malls for a long time.

How can we expect this field to evolve in the future? On the application side, the trend is towards even more effective compatibility and application integration, improving productivity and user-friendliness. The "*virtuality*" and mobility of the working place are already issues—the migration from the Information Society to the Knowledge Society an absolute necessity.

It is over ten years since we first started to hear about the evolution of web services, the semantic web, Web 2.0, a new generation of electronic services based on ontologies that enable complex services such as "search for the least expensive Y-class flight ticket to Stockholm, flying late in the morning of 2nd September, as well as an available 3-star hotel that is close to the city hall, ...".

This is one of the many services promised by the "ontological and semantic revolution", and we can look forward to trying them.

A closer look . . . to conclude



sword of Damocles – Ivan Sutherland (1965)

Getting closer to the conclusion we refer to Content & Services in digital format as they will evolve in the future. Is there in our future an ultimate media? Some years ago, following the idea due to Even Sutherland and his "ultimate display", virtual reality was supposed to be a potential ultimate media. Head mounted displays, goggles, gloves and 3D sound, the way to fully immerse people in

the digital world using multi sensorial communication.

Digital natives in advertisement

Today we face a transition period. Digital natives are developing their own vision and life model. They consider the Internet as a kind of universal information and even knowledge repository always on and accessible. So some of them at primary schools use to say "why do I need to memorise information?" If a need to know something I simply "Google" it! Due to the transition from traditional information sources and on line sources we are still unable to rank the quality of major part of on line contents. When this sector will reach maturity it will easier to refer to quality content source as it already happened in the field of traditional content and information providers.

What[25] was originally developed in order to support scientists has been turned in a global platform supporting innovation. eServices are influencing our way of life and changing significantly our relations with a number of institutions and companies. Simply consider some basic services in eGovernment or eHealth sectors such as on line tax payment or patient electronic folder. This new approach offers a good opportunity to reshape some organisational and operational structures bettering performances and reducing costs. The mix of ubiquity, optimised work and information flow, system intelligence, personalised content and services, real time global communication makes the difference.

Planning a travel we refer to users feedbacks, best price offers, on site meteo conditions, live webcams and more. Interpersonal relations are changing as well, young and even "digital immigrants" use chat rooms, instant messages or Internet video calls. The global time - independent dimension overturned relations. New "agora" are named Second Life, Facebook, and My space.

facebook – social network

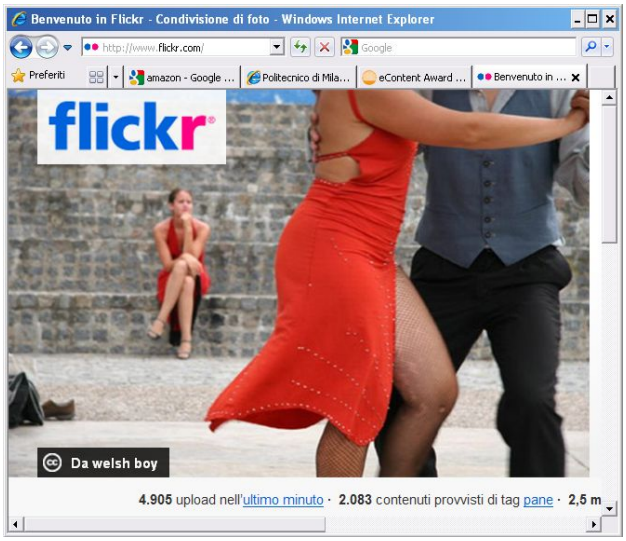
User generated content floods the Internet. The Andy Warhol's "fifteen minutes of celebrity" become reality in the on the fly publishing of sentences, pictures and videos. Facebook "addiction" force people to experience life through the viewfinder of digital cameras or HD camcorders. The most relevant part of a party is its digital double

[25] The world wide web technology developed at CERN (Geneva)

published on line. This has to look possibly even better than the real one. The “web” of thousands of “digital” friends scattered all over the world “ranks” eCitizens. Privacy and digital identities protection represent the opposite side of the coin.

We already entered the “digital native” era, content and services may be : “professional” content & services or “UGC” user generated content & services.

Internet lowered the threshold to access mass communication, web 2.0 lowered the threshold to be an “Author”. Everyone may contribute: blogs, videoclips, images , … We have enough hi tech tools or at least more than the one we are able to positively use such as: flash, blogs, wikis, twitter, flickr,youtube, facebook, etc



flickr

Collaborative products, services enabled by emerging technologies: wikipedia, google, iPhone apps, etc The perceived added value is one of the key points.

In designing applications and services we need to carefully take into account, among the others, some aspects: the overall quality of the content/service[26], the aim of the application[27], target audience[28], the choice of a proper format, the proper and “added value” use of different media, the channels and devices more suitable for the purpose, and last but not less relevant in many cases a sounding market model.

iPhone Apps

Success stories in the past demonstrate that high end media (video, realistic images, VR, etc) does not mean successful experiences, simply consider in the field of games adventures, or in telco video calls, or the incredible success of SMS[29] and emoticons.

Do you remember the incredible success of Adventures in the eighties?

“You are in a dark swamp. Obvious outputs: north, south, east, west, up. In addition you can see some cypresses, a demon who smells of mud, flaming swamp gas, floating blobs of oily sludge, and fleas.” (from Adventureland by Adam, 1979).

[26] Apart from the intrinsic value of the content/service, we enjoy different types of “eContent”: plain text, graphic images using overlapped characters, formatted text, still images, movies and animations, hypertexts & hypermedia, virtual reality, SMS emoticons, and more.

[27] On the side of “aims” we can list: communicate, transfer knowledge, train, Inform, entertain and more.

[28] Once we identified the aims we must identify target audience such as: Youth, aging people, employees, etc

[29] SMS (writing, segmentation, signs, emoticons, … and timing may activate imagination…)

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