

# OUTLOOK

Visions and research directions for the Wireless World

September 2014, No 14



**User 2020  
A WWRF Vision**

WWRF WGB Services, Devices and Service architectures

**White Paper**  
**User 2020 – A WWRF Vision**

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Version 1.0

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This contribution is partly based on work performed in the framework of the WWRF. It represents the views of the author(s) and not necessarily those of the WWRF.

## Executive summary

The User 2020 vision is of the changing needs and habits of a user in the future digital world. In order to understand the needs of the future users, we need to look at how users and technology have changed during recent years. The different generations of users are products of their own time and environment, and each has had its effect on the development of technology. The closer we come to the current generation, the bigger is the effect of technology on the characteristics of that generation. User needs guide the technology and the technology shapes the users. This WWRF Outlook analyses this evolutionary process.

The basis of this Outlook lies in studies of user generations. Although it's controversial to do so, users have been divided into generations based on their ability and willingness to use ICT solutions. Whether the users are digital 'tourists', 'immigrants' or 'natives' is mainly determined by the era in which they were born. This is due to the fact that digital natives, born in an already "fully" digitalized world with a plethora of ICT services, have a much closer relationship to these solutions than generations before them. This has also shaped the users perspectives and had an effect on their future needs.

Human needs have been studied much longer than user generations per se. Psychologist Maslow presented a characterization of human needs as early as 1943. This basic characterization was later studied with an evolving environment in mind. Although the basic needs have remained the same, the tools to achieve these goals have changed. This has shaped the users and their future needs and well as created situations in which some higher-level needs may override lower-level needs. Regardless of the time, we will always have a number of generations with differing needs for the solutions. For this purpose we have created various personas for User 2020.

The last part of this Outlook focuses on future challenges and how these challenges can be met. The user experience has played an important role in ICT services for some time and will do so in future. The evolved user and their dynamic needs require services to be dynamic and evolve with the changing needs of the user.

Index Terms—User Generations, User needs, User requirements, future services and research

## 1. INTRODUCTION

"We're changing the world with technology." Bill Gates

Without a doubt, technology changes the world. The speed of the change is becoming faster and faster. In the digital world we may see this, for example, in the development of mobile networks. In just two decades we have seen the change from 1<sup>st</sup> generation mobile network to 4<sup>th</sup> generation mobile networks and the 5<sup>th</sup> generation is already evolving. The data transfer speed has increased from kilobytes to gigabytes thus allowing faster and faster communication. This inevitably creates new possibilities but also new requirements for the forthcoming services. Bill Gates is right that the technology changes the world but it changes the world through people. For most of the things people used to do with their bare hands, there are now technical tools available. Many public services are also now on the Internet, and numerous services have only limited availability outside the Internet. This changes the how people behave and use their time. Technological evolution acts as a catalyst for higher-level changes. This was emphasized already in "Networks of the future" seminar in Japan in 2004.

"xG does not happen just by increasing capacity. We already have enough bandwidth; Users require new applications and services!" Jari Porras, Networks of the future seminar in Japan, 2004

Technology enables changes in people's life and, at the same time, it also changes people. These changes have taken place and will take place. The change of user habits can clearly be seen in Figure 1. Figure 1 shows how much time users in USA spend for web browsing, mobile applications and traditional TV watching. For the last few years the TV consumption and traditional web browsing have remained quite constant, but the use of mobiles and mobile applications has exploded. It is notable that the TV or web usage has not decreased but the time for mobile applications has been taken from other parts of life or mobile applications are consumed concurrently with TV and web consumption. Yahoo Mobile and Razorfish studied how common multitasking is while watching TV and found out that currently 80% of people use mobile devices while watching TV (Lockhorn J., 2010). This is supported by the statistics of mobile usage during the commercial breaks of Superbowl in 2013. These statistics show that 91% of people were multitasking during the commercials (Berkowitz J., 2013). This change of the user behavior is not only because new generations of networks have evolved but because there are new meaningful ways of using the network. Especially the use of various mobile apps has exploded. Based on recent statistics, 86% of mobile usage is because of mobile apps (see Figure 3, Flurry Blog, 2014).

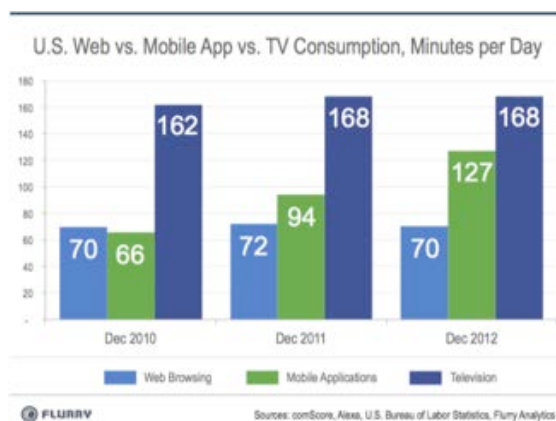


Figure 1. Changing user habits (Flurry, 2013)

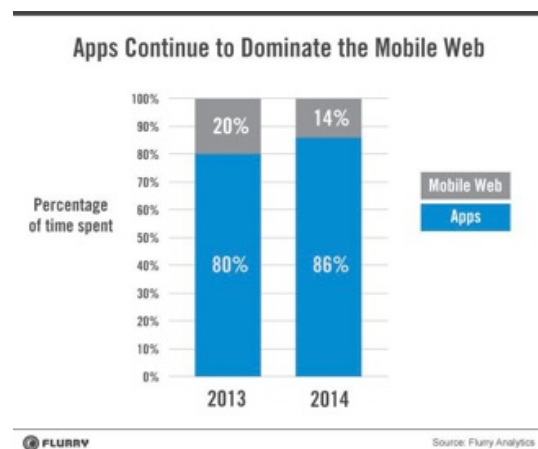


Figure 2. Mobile usage by the average US consumer (Flurry, 2014)

In tandem with changing habits, the industry and its business have changed. In 2008, the

iPhone changed the user experience and later on, in 2010, (i)tablet devices continued the revolution. Regardless of the improved user experience, the key ingredient behind all this revolution was the introduction of AppStore (or Android Market) concept. The easy installation procedure of new mobile applications made the difference; it made this change possible. Figure 3 presents how the number of available applications in AppStore and in Android Market has exploded since the introduction of the concept.



Figure 3. Explosion of available applications (Flurry, 2013)

The increased number of available applications is not the only key element of success. Both the pricing of the applications as well as the changed user behavior have affected the revolution. Figure 4 presents how the application pricing has changed during the last few years. More and more applications are free. Cheap price, increased availability and easy installation have had an enormous effect on the behavior of the users.

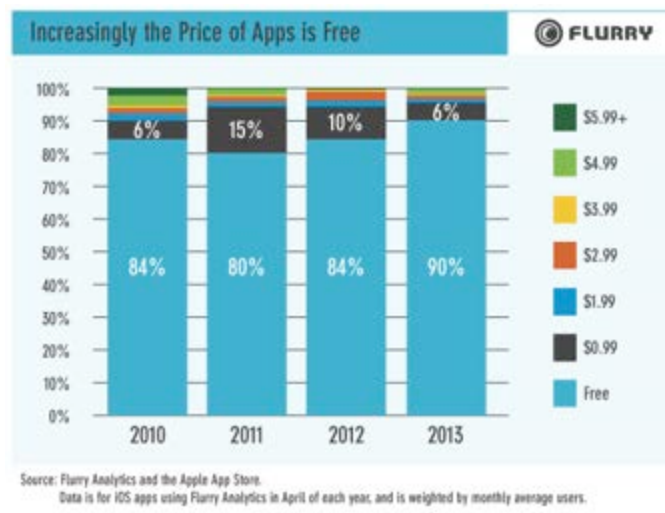


Figure 4. Evolution of application prices (Flurry, 2013)

It is evident that the technology evolves, new devices are produced, new services are offered and new business models evolve. The question arises of whether the technological evolution changes users or if the changes in user needs and behavior guide the technological evolution. In this white paper the vision of User 2020 is created. This vision is started with the characteristics of various user generations and their needs. The vision is then continued by studying the user needs, future user personas and how these needs can be fulfilled by the

technology. Finally the vision is completed by presenting challenges the changing user needs and habits will set for the future technology.

## 2. USER GENERATIONS

Marc Prensky presented in 2001, in his seminal paper “Digital natives, Digital immigrants” (Prensky M, 2001), the term *digital natives* for the first time. Although the study and the paper were based on the education sector, the concept itself is much wider. Prensky emphasizes the differences between generations, especially how these different generations process data and act according to the processed data. Prensky divides users based on their comfort level in using digital devices. It is evident that people born to the digital world use the tools of that world, not the ones from earlier generations.

The new generations have been researched extensively since the introduction of the concept, but understanding of what digital natives are still remains in its early stages. Actually, the entire concept is somewhat controversial. Originally, research on digital natives was based on the assumption that children born into the digital world and immersed in ICT since birth results in the children being, by nature, digitally literate, social and highly connected individuals (McMahon, 2005). Recently, however, researchers have claimed that it is quite misleading to talk about a generation having common characteristics related to their communication and ICT use (e.g. Bennett, 2008; Jones, 2012; OECD, 2012). Despite these doubts, the concept of digital natives is still useful, as it is also true that differences between generations exist and current children live in a very different world than their parents. To cope in the current digital world, these generations need to develop actively their communication and ICT skills from the beginning, while their parents have been allowed to naturally grow into these when the world has changed around them.

Although the term digital natives was created only in 2001, the phenomenon was discussed already some years earlier. Don Tapscott emphasized this issue in 1997 in his book “Growing up digital” (Tapscott D., 1997). Tapscott realized that in the early days of Internet, children were the ones adopting the new technology or, at least, they outnumbered the representatives of earlier generations. However, at that moment the actual consequences were not evident. Now that these first net generation users have become adults we start seeing how the digitalization has changed the world and especially the users. Digital natives and digital immigrants are just two generations we are facing now. Tienari and Piekkari (Tienari J, 2011) have divided the users into the following generations:

- Post war generation (born in 40s – mid 60s)
- X-Generation (mid 60s – early 80s)
- Y-Generation (early 80s – mid 90s)
- Z-Generation (late 90s–)

In order to understand the needs of various generations, we need to know the background of each of these generations. Post war generation is the pre-digital era generation. Most of the technological development has taken place during their working career. Digitalization and the development of networked and mobile services and applications are however truly taking place during their retirement. This group of people could be called digital tourists and will be a challenge for the evolving services. The X-generation users represent the digital immigrants. Globalization and expansion of services has happened in their youth, and they have grown in this changing world. Digitalization of services started to evolve during this generation. Y/Z-Generation users are digital natives, Millennials, as they were born to the digital world. Y-generation represents the early phases of the digital world, whereas Z-generation was born to the fully digital and highly networked social world.

Don Tapscott has published a follow-up book “Grown up digital” (Tapscott D., 2008) in which he shares research findings of his research on the net generation, i.e., digital natives, now in working life. The net generation is presented by different researchers as dumb, short sighted, x-



addicted, non-social, irresponsible, pathless, violent, etc. Based on Tapscott, they do have different values but the earlier generations need to learn from them. Like Prensky stated already 13 years ago, “*Our students have changed radically. Today’s students are no longer the people our educational system was designed to teach*” (Prensky M, 2001). As the world has changed the earlier generations also need to change to meet the needs of the current world. However, even though changes in education somewhat lag behind the change in the society, studies show that at least in Scandinavian countries the difference between generations in terms of technology use is very small (Livingstone S, 2011).

A large amount of studies can already be found related to education and working life of different generations, as these are usually seen as the biggest challenges. Diana Oblinger studied millennial students in her paper (Oblinger D, 2003) and found out that millennials gravitate towards group activity, are fascinated by technology and emphasize experiential activities, or in general, have an information age mindset as defined by Jason Frand in his paper “The information age mindset” (Frand J, 2000). The information age mindset has the following ten attributes:

- Computers aren’t technology
- The Internet is better than TV
- Reality is no longer real
- Doing is more important than knowing
- Learning more closely resembles Nintendo than logic
- Multitasking is a way of life
- Typing is preferred to handwriting
- Staying connected is essential
- Zero tolerance for delays
- Consumer and creator are blurring

Some of these attributes can be seen to be related to the pervasive phenomenon of playing video games which has spread widely in the late 20<sup>th</sup> and early 21<sup>st</sup> centuries and affects especially the younger generations but touches the older ones as well. Studies show that children learn, e.g., foreign language naturally when playing games (Peterson M, 2010). This interests researchers and educationists who strive to find new and engaging ways to learn different subjects. The persuasive nature of games has been utilized in the growing trend of gamification, use of video game elements to add user engagement also in other than gaming systems; for example, when coaxing people to move more as in a commercial HeiaHeia service ([www.heiaheia.com](http://www.heiaheia.com)).

### 3. EVOLVING USERS AND THEIR NEEDS

As the users and their behavior evolve, their needs evolve at the same time. Psychologist A. Maslow characterized user needs at various levels (Maslow 1943), starting from physiological and ending in mental needs (see Figure 5). Based on his research, a human being always tries to satisfy the basic needs first and when the basic needs are fulfilled, they look for more. There are studies that support the findings of Maslow and those that show some inconsistencies. The question lies in how the perspectives of different generations change this hierarchy – or do they?

Soren Ventegodt presents in his paper (Ventegodt S, 2003) how Maslow’s hierarchy may exist in a normal situation, but in some extreme moments, higher level needs may override lower level needs. Brice Le Blévennec writes in his blog (Blévennec, 2014) that the basic need for respect remains but the ways of achieving it have changed:

*“The way in which we strive for society’s respect and approval has drastically changed over the centuries”* Brice Le Blévennec



Figure 5. Hierarchy of human needs according to Maslow (1943).

With the technological evolution, humans, families and the society have changed from static to more dynamic:

*“Our human need for respect and recognition has thus remained, while attaining this goal has become all more difficult”* Brice Le Blévenec

His blog post emphasizes the difference of the world, not so much of the generations. Based on his writing, the generations have been forced to change to achieve the same results. Generations do have similar goals, but different tools. Vodanovich et al. (Vodanovich S, 2012) present in their paper five dimensions for designing for digital natives, and Kinnula and livari (Kinnula M, *in review*) complement their work further by adding one dimension. These dimensions – personalized, interactive (also allowing creativity), social, intuitive, attractive, and entertaining – represent those tools that allow the new generations to work with their strengths. This is also partly seen in the dynamic behavior of the users. Figure 6 presents how the dynamic behavior of the users can currently be seen. Even though the users are using more time with mobile applications, they tend to change the applications more frequently (showing the short sighted multitasking nature). Within one month the number of users of a certain application drops to nearly one third of the number of those who started to use the application.

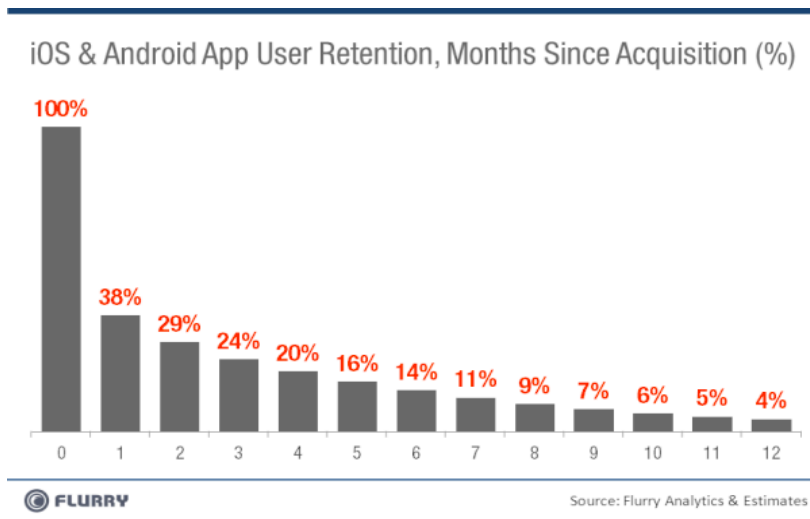


Figure 6. Dynamic users (Flurry, 2013)

Various studies have been done for finding out the needs of users. Yanxia Yang presented the needs of Chinese users in his papers. In the first paper (Yang Y, 2011), the Maslow hierarchy needs of various age groups (-20, 20-30, 30-40 and 40-50) were studied. Based on this research, the emphasis is on middle layers of Maslow's hierarchy rather than either end.



Millennials clearly differed from the previous generations in their use of apps and services. In his follow-up paper (Yang Y, 2013) various information needs were surveyed with a similar age group distribution. The results were mostly as expected between the different generations. However, the importance of the social network was, unexpectedly, highest with the older generations.

Hannu Kukka has studied in his paper (Kukka H, 2013) the differences of user needs and the real usage of services in a smart urban environment. While the survey of the needs points out maps and transportation as the most wanted services, the real usage reveals that users mostly use the smart environment for news and entertainment. This research contains participants from all generations but the needs and usage are not analyzed based on the generation. Mobile user survey 2012 (Mobile User Survey, 2012) reveals similar needs. News and entertainment are the services most used with mobile devices. The size of the mobile device causes some differences as tablet devices are used more for entertainment and mobile phones for local information. This research does not separate generations.

#### **4. OLDER USERS AS AN OPPORTUNITY**

Technology is seen as an efficient solution in various fields. “Technologies for healthy aging” or “Ambient assisted living technologies” are good examples of fields where good technological solutions might not be adapted due to the clash of generations. Thielke et al. (Thielke S et al., 2012) found out that the contradicting needs might prevent the use of some technology. Thielke analyzes the levels of need and technologies by using Maslow’s hierarchy. Based on this study, in the physiological and esteem level we should take into account the “Capacity to handle it myself approach” or “Technologies make people appear helpless and challenges their self-image” perspectives. While considering the security and belonging level, the “Little concern for safety but seek out human contact” and “Whose need are we looking at?” approaches need to be considered. Thielke found out that many existing technologies are poorly matched to the real needs of prospective users. This needs to be taken into account while defining the user 2020. Thielke proposes that while developing technology, needs need to be measured and we need to consider whose need we really fulfill. In many cases, a technological solution includes older generations while the need arises from their caretakers. Thielke also proposes that needs should be fulfilled level by level, technology by technology. Otherwise, steps might become too big.

The discussion about population ageing has traditionally been somewhat pessimistic in its interpretation. (Karisto, 2007, 102). The phenomenon has been described, for example, as “apocalyptic demography,” “age shock” or “gray wave” (Jyrkämä et al., 2009, 147) and the debate is dominated by “a burden” or even “crisis” (Karisto, 2007; Healy, 2004) interpretation: the focus is on the pension explosion and on the care burden, which is expected to become unbearable. The care burden is affected by the changes occurring in people’s health and capabilities.

On the other hand, a counter-discussion has arisen about the promising opportunities offered by the intellectual and material resources that the elderly possess, and also innovation activity related to ageing, in the form of assistive technology and various services, that has created promising opportunities for the business sector. (Karisto and Konttinen, 2004; Healy, 2004; Kunz, 2007). Studies show that today’s workers reach retirement age healthier than previous cohorts (Sihvonen et al., 2003; Martelin et al., 2004; Karisto, 2007). Furthermore, the compression theory suggests that the prolongation of age itself does not dramatically increase care costs, because illnesses seem to be mainly in the last years of life irrespective of life expectancy (Karisto, 2007; Kiander, 2009).

Older people are not a homogenous group – they differ significantly from each other regarding, for example, their health, wealth, behaviour and lifestyle, just like other age groups. The positive side of ageing of the populations is that it has meant in particular an increase in the number of years people can expect to be active in their old age (e.g. Karisto and Konttinen, 2004). The

later years can therefore be perceived as an active, autonomous and independent time of life, in which maintaining the earlier life-style or engaging in new activities are considered to be the central ways of getting old. From this point of view, the elderly are not merely consumers of the society's resources, but old people can be seen as active consumers (e.g. Kohlbacher and Hang, 2007; Kohlbacher and Herstatt, 2008) and active participants in the society (Koskinen, 2004). The new concept of "elderly care" is a wider issue than just medication and housing arrangements, and includes also the "experience industry"; for instance travel, culture and sports activities, which have traditionally been omitted when talking about products and services for the elderly (Pekkarinen, 2011). Ageing is not a sickness but part of life.

The distribution of how time is spent in the society changes as the share of pensioners grows (Kautto, 2004). Increased leisure time leads to different forms of participation, in non-public sector activities or other voluntary activities, but participation may also include involvement in the design and planning of products and services. The resources that older people possess have been discussed emphasising that older people have social, political and economic resources and strengths, as well as resources related to values, life experience, increased free-time and liberty. (Koskinen, 2004.) This is also visible in the social expectation that the elderly are increasingly independent in their daily activities with as little care as possible (see, e.g. Leinonen, 2006, 9). Old age as a resourceful time is connected to seeing old people as active, participating actors in the innovation processes. When the elderly are seen as productive, they are not only targets of services planned by professional experts, but they have resources and expertise that can be exploited when planning products and services. (see Hennala et al., 2011).

Gilleard and Higgs (2005, 153) note that "Past habits of consumption constrain future opportunities." Ageing is a generation-related phenomenon: the baby-boomers, born during and after the Second World War in 1945-1950, have different generational experiences than their parents, for example, being the first youth culture generation in the fifties and sixties (Karisto, 2005). "Those who grew up spending freely earlier in life are more likely to continue to spend freely later in life" (Gilleard and Higgs, 2005; see also Karisto, 2007). This implies that those who are used to consuming when young and healthy will continue doing so, as they get old and, perhaps, sick. From this point of view, ageing can have many positive impacts as an opportunity to create new businesses, for example. One particularly essential implication of the demographic shift is the emergence and constant growth of the "graying market" or the "silver market" that can be very attractive and promising, although still very underdeveloped in terms of product and service offerings (Kohlbacher and Herstatt, 2008, xi; Usui, 2008). Demand and new markets will be created especially for assistive devices, safety-related products, products that promote health, as well as services: wellbeing services, hobbies, leisure time products, travel and culture (Kautto, 2004, 15). The demand becomes more quality-oriented and specialised.

This implies that the baby boomer generation is projected to be more educated, healthier, wealthier, more active and more productive and used to consuming than preceding generations (e.g. Healy, 2004; see e.g. Leinonen, 2006, 9). Hjerpe et al. (1999) estimated that the pension purchasing power will grow considerably. Upon retirement age, households are typically at their wealthiest. However, studies of income and the consumption patterns in Finland show that Finns start saving instead of consuming when they retire. One explanation could be insecurity about social security and getting prepared to risks. (Kiander, 2009.) As well, it should be noted that many of those women who are over 75 year old and who live alone are at a high risk of poverty. Two thirds of those who earn only the basic pension are women. (Niemi and Ruhanen, 2006.) As an increasing number of women participate in the working life, the situation is improving. Women still outlive the men, but the gap is narrowing all the time (Vaarama, 2009) in many Western countries. Older users are in many ways a gender issue, too, which ought to be taken into account in technology and related service development, as appropriate.

Hennala et al. (2011) examined in their study the heterogeneous needs of the post war generation. They distinguished various service landscapes from the data on virtual ideation of a care centre. The first service landscape focuses on elements of slow life philosophy. According to Honoré (2005), the philosophy essentially contains valuing time, not counting it; and cherishing quality instead of speed. In this service concept, the main issues are peace,

manageability of life and self-motivated activity. The second service concept shows itself as more dynamic. At the core of it, there is active self-care, and also technology plays a more significant role. The users are aware of their needs and wish to have professional services for maintaining and improving their physical and mental abilities. Nature and culture are essential elements, but also newest ICT technology needs to be available. Safety technology is seen as a vital and forthright means to use when the functional abilities begin to deteriorate, for one reason or another. In all, Hennala et al. (2011) found that older users need strong elements of supporting a person’s individual holistic well-being. In addition to physical, social, mental and cognitive needs, service concepts ought to take into account changes in older users’ functional abilities during different stages of their lifespan. Participation and continuity of daily life are important for them.

The use of technologies and services has changed in the past decades. Although the basic needs presented by Maslow still remain, the focus is shifted more to the higher layers. This is partly because of the digital natives. Although the technology may be used with the older generations, the need may come from the digital immigrants or even from the digital natives. In order to find out the user 2020 needs we set up personas representing our vision of user 2020.

## 5. USER 2020 PERSONAS AND CHANGING WORLD

In Table 1, different interpretations and characteristics of the user 2020 (or different generations) can be found. It is based on different authors’ interpretation of different user types and is illustrated by small Personas (Cooper, 1999) and scenarios.

**Table 1. User 2020 Personas**

Generation characteristics	Scenario A/B/C/D/E
<b>Before Generation X (Before 1960s)</b> <ul style="list-style-type: none"> <li>• “Living fully without hurry”</li> <li>• Are not experts in Computer use</li> <li>• Main device to use is tablet / phone</li> <li>• Main app beside daily helpers is messaging</li> </ul>	<b>Characteristics (Ubiquity, Tacit communication, Technology around to help and cope with daily life at the background): (Scenario A)</b> Mark (75) and his wife Samantha (72) are living a vivid pension life. They are currently in Hawaii, on their 50 <sup>th</sup> wedding anniversary party with their selected friends. One of their friends owns a hotel group in Hawaii, and they have a premium place reserved for the party. Mark has been having problems with his heart and has a medical capsule embedded to his left arm which monitors and medicates his heart on-the-fly. Mark and Samantha are also freelance educators, as they educate younger people on the importance of tacit knowledge transfer. However, the pedagogy behind this is not the current mainstream, instead they prefer discussion and group work without any technical tool, only paper and pencil are allowed. The day has been successful, and as their children and grandchildren could not participate due to heavy workload, they have got their 3D UHDTV messages on their personal tablet.
<b>Generation X and Y (60’s, 70’s and 80’s)</b> <ul style="list-style-type: none"> <li>• “Companys’ profit is my gain”</li> <li>• Are experts in Computer use</li> <li>• Main device to use is laptop, though tablet, phone and smart-tv at home are in use</li> <li>• Main app is e-mail and corporate apps for work related data, such as dashboards, data visualizers, information panels etc.</li> </ul>	<b>(Turbulent) knowledge sharing (Scenario B).</b> Nicholas (52) has a big role in a big ICT company. The company produces smart spaces to different places, from schools to factories etc. Nicholas has been an innovation manager for the last three years and thinks he is at the top of his career (he has been branding himself for the past 30 years, and thinks he is greatly valued as an expert in this field). He might still want to start a new spin-off but it rather seems that it is now the time for the next generation to do the starting of the new entrepreneurial act. He is continually connected to the company’s different divisions through different software, which enables him to see every single part of lifecycles of the products (either mature products, or products at an idea level). Through the software, he can guide (manipulate) the product development; if needed, he can make hands-on-work through the wall-UI (either at home or at the office). He is aware that today is his parents wedding anniversary, and feels slightly annoyed of their request to come to Hawaii, as there is currently a new product in its critical phase. In his opinion, this product is the “killer” and would make a dressing for his career. Thus, he has de-linked all family-related messages from the information panel.
<b>Generation Z ( 1990’s and born in 21<sup>st</sup> century)</b> <ul style="list-style-type: none"> <li>• “First female in Andromeda”</li> </ul>	<b>Calm school and workplace (Scenario C).</b> Sara (14) is an extraordinary student. She has been taking university courses already two years. She sees herself as the future Nobel prize winner. School and studies are her life. She has virtually no real friends; if the other two advanced girls in India and Brazil

<ul style="list-style-type: none"> <li>• Are experts in Computer and smart space use</li> <li>• Main device to use is 'wrister', though tablet is in a lot of use</li> <li>• Main app is messenger (like What's app but more graphical) and for school work augmented apps are used</li> </ul>	<p>are not included, respectively. They compete daily against each other beyond the school hours. As Sara has been granted an exceptional status, she can choose her courses at the elementary school as she wishes. She focuses entirely on STEM (Science, Technology, Engineering and Math) topics. Currently she studies the theories of time travelling and space signalling in subspaces. She rarely goes to the actual school, as the environment is too old-fashioned, as the tablets and smart walls are top-notch there. At home she has full room 3D ambient learning space which she can guide either with voice commands or gestures. With the environment she can explore the subjects she is studying. A large part of her studies consists of playing different learning games, sometimes on her own, sometimes with a large group of unfamiliar students from all over the world. She rarely sees her parents, and well, to be honest, doesn't really care either. Her parents are separated, and his father works as an innovation manager at some ICT company. To be honest, she has seen her grandparents more often, usually when she teaches them to use some new cool gadgets; or the smart wedding anniversary costumes she made for their anniversary in Hawaii. She sent them a 3D holograph message to congratulate them.</p>
<p><b>Next wave (Born today)</b></p> <ul style="list-style-type: none"> <li>• "Life is full of experiences"</li> <li>• Computers have disappeared for them (are in the background)</li> <li>• No 'real device' to use, communication is sensed</li> <li>• No 'real app' to use, spaces interpret needs</li> </ul>	<p><b>Safe and secure hosting (Scenario D).</b> NurseryRoom_232 is located in a small village, some 50 miles north from New York. It is connected with the super-high speed trains to the big cities. The village is an eco-village and the pollution winds do not affect the air quality. In other words, it can be described as a mini-society. This village is specialized in childcare. Rich families send their children here for their early years before the elementary school starts. The nursery employs the current top notch pedagogy for safe development for the children from social inclusion to personal skill acquisition. The nursery's practical work is supervised with ambient tools and technology, from robots to toys that collect and guide the flow of the days. Children have visiting hours on their daily schedules if the parents, grandparents or older siblings wish to interact with them.</p>
<p><b>Excluded</b></p> <ul style="list-style-type: none"> <li>• "Living like in the past is the way we should live our lives"</li> <li>• Are novices in computer use or do not want to use computers (purposefully excluded)</li> <li>• No electric devices</li> <li>• No apps in use</li> </ul>	<p><b>Privileged exclusion by choice (Scenario E).</b> The Matthews family lives in Area 92, which has been given by the government to families which want to exclude themselves from the society. They also want to protest against unsustainable lifestyles and technology. Area 92 is a community, where the daily life resembles the daily life of the early 19<sup>th</sup> century without technology present. The only calm technology in the area is the environmental high-tech that safeguards the community from pollution. The community supports its own lifestyle and the pace of a day is much slower than in the globe in general. The products created are mostly used in the area.</p>
<p><b>Decent fragility</b></p> <ul style="list-style-type: none"> <li>• Technology in the background</li> <li>• Technology enabling to be connected to other times and other places</li> <li>• Safety technology</li> </ul>	<p><b>(Scenario F)</b> Martha (90 years) lives in sheltered accommodation. She is bed-ridden, and her relatives live in another area and cannot visit every week. She has had a long career as a dentist. She has severe memory problems and can hardly speak or hear any more; those things used to make communication almost impossible. Her life was really meaningless and miserable until a big display was installed on the ceiling above her bed, and now she can watch slow films of old times, sceneries of the season from where she used to live, listen to her favorite music, and get in touch with her loved ones. She can see them, hear them talk to her and smile at her grandchildren and grand-grandchildren. It doesn't diminish the hardship of the end of life, but it makes her calmer and the time of extreme fragility more decent. She is also easier to care for as she is less in anguish, and her close ones are happier. She can control the display with very simple voice commands and gestures or even eyesight if she is really tired.</p>

All personas' descriptions of daily life in 2020 fit in Ihde's (Ihde D, 1990; Verbeek P.P, 2006; Kaptelinin V, 2013) classification of human relationships with technology: i) *embodiment* relationship, where people act through technology without realizing the existence of technology, ii) *hermeneutic* relationship, where people are aware of both technology as well as of the world they act in through the technology, iii) *alterity* relationship, where people interact with technology (not through it), or iv) *background* relationship, where people are not interacting through technology and are not even aware of it; as well as encompass five current phenomena identified by Harper (Harper, 2008), namely i) the end of *interface stability*, ii) the growth of *techno-dependency*, iii) the growth of *hyper-connectivity*, iv) the end of the *ephemeral*, and v) growth of *digital engagement*.

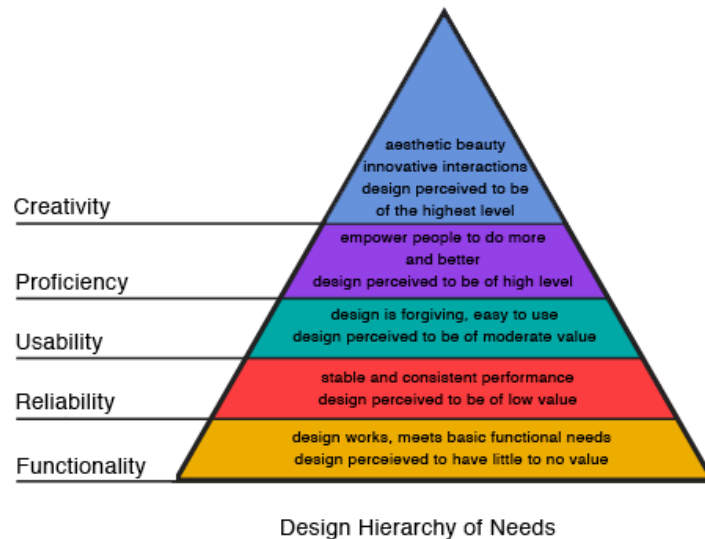


By 2020, we cannot say that we interact solely with one interface, neither do we interact solely with keyboard, gestures etc.; we interact through multiple means and those interactions are through different interfaces, not necessarily known today. In contrast to today, we have become very much dependent on technology around us, and it is rather the norm to have “devices” with us all the time. Furthermore, these technologies around us have become smarter and will do some of our tasks for us, sometimes in the background. Also, by 2020, we have become hyper-connected, and the ubiquity of connectivity is also a norm in our daily lives. This can give us (already) benefits to separate from the masses, but, at the same time, it can root reasons to become excluded. Technologies can also store more data, and in fact the life of a person could be stored on a small memory disk (as a video). This means also that whatever we do or do not do, can be tagged and digitally stored. Finally, by 2020, new technologies can potentially be used by masses and have enabled us to better engage if we have obtained the right skills.

## 6. FULFILLING THE NEEDS OF USER2020

The change of user behavior and evolving user requirements are reflected to the whole business field from manufacturing of the new technologies, devices and services to business models of their usage. Technologies as such different telecom generations take typically a decade to change, devices a few years and services like those presented above a few months.

Steven Bradley presents in his article (Bradley S, 2010) a categorization of user needs according to the Maslow’s hierarchy. The idea of this design hierarchy of needs rests on the assumption that in order to be successful, a design must meet basic needs before it can satisfy higher-level needs. Before a design can “Wow” us, it must work as intended. Figure 7 presents the hierarchy, dividing needs into functionality, reliability, usability, proficiency and creativity.



**Figure 7. Hierarchy of user needs for design (Bradley S, 2010)**

Functionality need emphasizes the ability to function before anything else. The number of features is irrelevant if the basic functionality is missing. Reliability need emphasizes consistent operation. It is not enough that the basic functionality is met once but it needs to be met time after time. After the basic functionality is persistently met, users emphasize the usability, i.e. the ease of using the function. Proficiency need focuses on the effect of the usage. If the design enables users to do more and more efficiently this need is fulfilled. Finally, creativity need expands the product into new innovative directions and uses.

In the end the user experience plays an important role in the use of current and future mobile

technologies, devices and services. Lyndon Cerejo has analyzed the main elements of mobile user experience in his article (Cerejo L, 2012). He finds out 12 different elements and their effects. The bottom line of his analysis is that the multitude of elements sets challenges for the developers and developing tools.



Figure 8. Elements of mobile user experience.

Jun Wang (Wang J, 2012) presents an approach for how the evolving user needs are transferred into service and application development. Figure 9 presents how the user requirements evolve towards new variants. Figure 10 presents how the new evolving requirements extend the basic services towards new and/or evolutionary services. The first set of vague requirements produce the first variant of the service or a set of basic services. While new requirements appear or old ones evolve, the set of services extends correspondingly. This way the user needs shape the available service landscape. As users become more and more dynamic the service landscape continues to change. However, every user also has a lifespan, which causes changes, too.

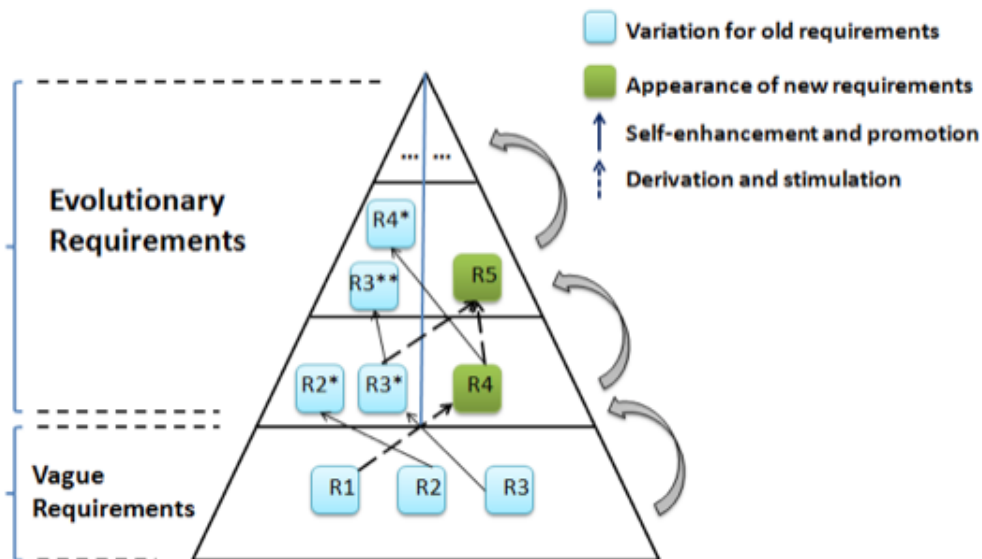


Figure 9. Evolution of user requirements (Wang J, 2012)



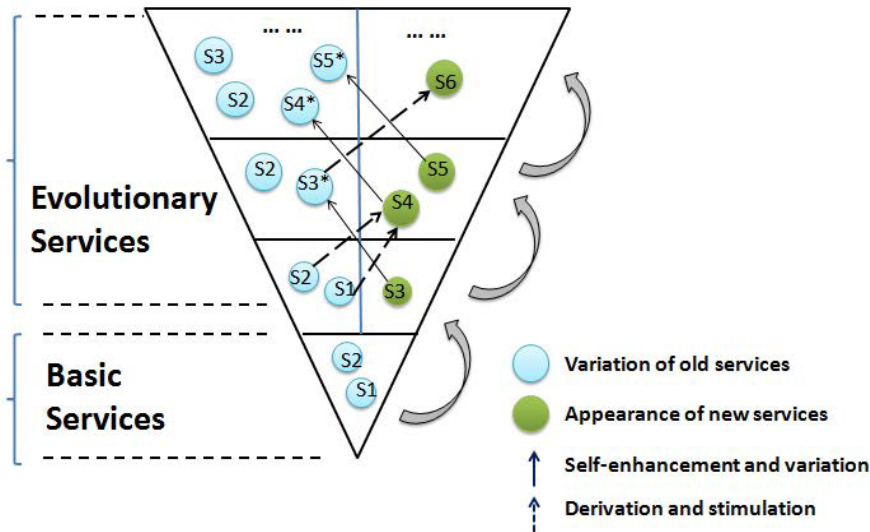


Figure 10. Evolution of services (Wang J, 2012)

Regardless of all the effort on user experience and fulfilling of user needs, the statistics show (see Figure 6) that the average retention time of an app is a few months. Figure 11 shows what the users use their time for. Entertainment and social networking type of activities follow the trends that the new user generations have set. Almost 80% of time spent on mobile devices is due to games, social networking or entertainment.

WW iOS & Android Smart Device Time Spent per App Category

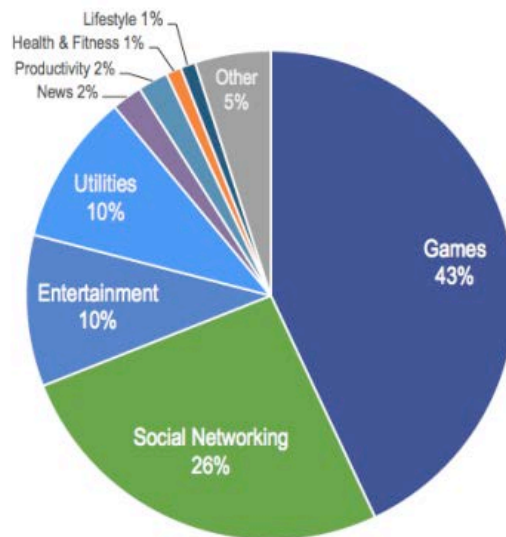


Figure 11. Time used for different app categories (Flurry, 2012).

The dynamic behavior of users can also be seen in Figure 12. Figure 12 presents how loyal the users are for different categories of applications and how often these categories are used. Quadrant I represents applications that are used intensively and in a loyal manner. Communication as the main task of mobile is in this quadrant. The categories in gaming, social networking and entertainment (dominant categories due to previous figure) can be found in quadrant II and partly in quadrants III and IV.

Fulfilling user needs is not an easy task. The service providers need to adjust to the highly dynamic nature of the new generations, business is never static and the services need to evolve with the users. However, at the same time the service providers know that there will be usage as the new generations create new ways of utilizing the services. New generations will also be part of the service production landscape by using tools to participate in user generated service creation. The service landscape will be broader than ever.



Figure 12. Loyalty of users in different application categories (Flurry, 2014)

## 7. USER 2020 – CHALLENGES

The challenges with the evolving user have clear implications for technology as well as for services and their business models. Figures 6 and 12 presented the dynamic nature of the user. This will hardly change even though in a couple of decades the post war generation as the elderly has changed to X-generation. The X-generation will insist technical solutions, like smart homes, and services for their well-being. This will however be only a small part of all services provided. As the new Y/Z-generations will become the majority, their needs govern the service landscape.

One aspect to be considered is the usage of the services. As presented by Kari Heikkinen (Heikkinen K, 2013), the user interfaces to the services will evolve considerably in the near future. This will have direct consequences to the requirements of the technology. Gerhard Fettweis presented in his paper (Fettweis G, 2012) requirements that these new user interfaces set to the technology.

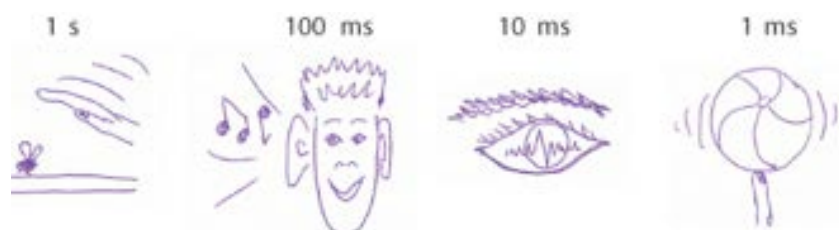


Figure 13. Physiological real-time constants (Fettweis G, 2012)

Figure 13 presents the muscular, audio, visual and tactile constants Fettweis has defined as the real time requirements. The use of these approaches in the user interface requires the system to fulfill these time constraints.

In addition to user characteristics, the world around us will change in the foreseeable future. The changes occur at many different levels, not only at technological; major changes will take place also at societal, environmental and individual level. Table 2 below summarizes some of the implications (the list is not exhaustive by design).

**Table 2. Changes at different levels**

Dimension	Implications
<b>Technological and scientific</b>	<p><b>Example breakthroughs (3D printing, Nanotechnology, Smarter machines).</b> 3D printing devices and materials used for printing have likely become so cheap that it will likely radicalize the mass industrialization of many products; many objects can be manufactured in homes at prices cheaper than in “factories”. This will change the behavior of users. Nanotechnology will likely creep deeper into our lives. The scientists have already shown that we can implement things on atom level. The implications and possibilities of this are huge. Our living spaces will be embedded with smart machines that will be rather learning and doing it on a proactive manner than today’s “dummer” machines that can only react. Also, wearable technology brings sensory data available about device owners as well as their surroundings: automatic collection of fitness and wellness related data (heart rate, blood pressure, level of noise, eating habits, how much the owner moves, etc.), providing this data for the owner’s personal use but also to doctors, other healthcare specialists, and larger national databases. Many health-related problems can be predicted based on this data, and thus they can be either prevented or treated in an early phase. Obviously in many sciences new breakthroughs will take place; maybe personalized medicines through advancement of medical science are the most important for our lives.</p>
<b>Societal</b>	<p><b>Example changes (Urbanization, Globalization, Concept of workforce).</b> Current megatrends such as urbanization and globalization will further proceed. The concept of workforce will likely change - people work longer than before; blue collar work is getting robotized; less work might lead to societal problems and unrest; the concept of work itself might change to being more individual, more short-time perspective; most work will concentrate on urban centers and a lot of areas will “fade away” from growth. Technology has blurred the boundaries of work and private life for information workers as employees use their personal devices to access business information systems and use social media for both private and work related purposes anywhere, anytime, thus being more effective workers but also more immersed in their work, snatching time from their families. Other changes at societal level might be political instability and volatility, erosion of trust (e.g. the NSA example), ideology-based ideas get more steam, etc.</p>
<b>Energy and environment</b>	<p><b>Climate change as a megatrend, energy as global need.</b> The changes in energy technology with climate change in the background will both guide and affect some changes mentioned above. However, in the global scale the scarcity of “energy” resources will both drive the research and guide the development (e.g., maybe many people have their own solar cells on their roofs by 2020). Thus a lot of micro-level issues take place in this area. Protectionism of own energy “resources” might become an issue. Under climate change, the events that take place on this planet are further in discussion, such as extreme weather phenomena, worse erosion, more acid oceans, etc. At the same time, e.g., agriculture will likely become more and more precise due to development of technology.</p>
<b>Individualism / personal</b>	<p><b>Personal life will likely change being more connected but yet being more alone.</b> Urban living and changing work culture will make us better connected but yet we will become more individualized; the amount of single person households will likely be bigger, fertility (or willingness to raise children) in developed countries will go further down. Also at individual level the brand of selfishness will become a norm due to competition and personalization. At the same time a sort of a digitalized identity “is for sale” whether it is for work or other activity. Also, the real world and virtual worlds are hard to differentiate, to some extent. On the other hand, due to climate change and other sustainability problems, social responsibility and sustainability thinking may rise affecting the selfishness. As people live longer, their need for being connected and less</p>

## 8. CONCLUSION

In this white paper we have looked at the changing user habits and needs and tried to create a view towards the User2020. It is clear that the characteristics of new Y/Z-generations will eventually become more prevalent. However, the generations are far from homogeneous, each individual also ages, the world changes; User 2020 is not a constant.

When we consider how technology has changed us and the world around us so far, and what kind of changes we predict now for example in this paper, we should always ask whether these predictions are something we want to become true. Changes will happen, that is inevitable, but we can always ask how technology affects human mind and how we should design technology so that it best serves our needs and, in Don Norman's (1993) words, "*makes us smart*", not only slaves of technology (cf. Kaptelinin, V, 2013). Policy-makers should understand how technology necessarily shapes and steers our lives and that actions of technology designers have also public – practical, moral, and ethical - consequences, and thus should not be left for individual designers to decide (Verbeek, P.P, 2008). Technology expertise is increasingly broken into smaller pieces that drift further apart. We thus need more holistic, systemic views, responsibility, and users themselves – as technology co-creators.

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## Imprint

Wireless World Research Forum  
c/o Format A AG  
Pfingstweidstrasse 102b  
CH-8005 Zürich

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The WWRF is a non-profit organisation registered in Switzerland

Chairman of the Forum:  
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The WWRF **Outlook** Visions and research directions for the Wireless World

ISSN 1662-615X is published non-periodically by the Wireless World Research Forum <http://www.wwrf.ch>

Responsibility for the contents rests with the Steering Board of the Forum.