MEGATRENDS
A WAVE OF CHANGE IMPACTING THE FUTURE
MARKET ANALYSIS
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EXECUTIVE SUMMARY

Alcatel-Lucent and the ENPC School of International Management have completed a joint research project created to identify and investigate megatrends that have the potential to fundamentally transform society in general and the information and communications technology industry (ICT), in particular.

A megatrend is defined as a gathering wave of change that is slow to form, nearly impossible to reverse, significantly influences the future, has an aura of inevitability and has a far- and wide-reaching impact on society.

Megatrends result from the confluence of underlying trends. A megatrend typically traverses, transcends and transforms the industries it washes over while catalyzing the formation of new industries. The identification of megatrends as they are evolving is valuable in terms of providing guidance for decision-making regarding future development and investment.

This research initiative identified seven megatrends:

• 168 (24x7 Connectivity), refers to the “always on” generation of people, but increasingly of objects too, which are connected to the “net”. In a world in which technology is nearly ubiquitous, connectivity is now the expected norm and non-connectivity carries a price (real or imagined, social or professional). The blurring of lines between work and private lives fueled by wireless access combined with the proliferation of devices like smartphones and tablets is driving the demand for universal internet access, increased wireline and wireless broadband strength/availability and access to the cloud.

• Digital native acceleration, refers to the recent mainstreaming of generations who have grown up with digital technology and the rapidly rising percentage of these “Digital Natives” who will hold key management and leadership positions. To these Digital Natives, “Internet time” and “network speed” are the new normal and this is also the expected speed of change. In addition to speed, this generation expects to always have internet/broadband access, to communicate in short 140-character bursts and to spend much of their time and concentration in a virtual as opposed to a physical world. Educational institutions and the workplace will need to adapt to this generation’s expectations.

• Ed-you-cation, refers in part to the on-going shift, facilitated by ICT, from institution-based learning to individual-centered learning by which each individual has increasing control over the choice/timing/scope/depth of skills he/she wishes to acquire throughout their lives. The proliferation of online learning can have a positive impact in reaching remote populations where traditional schools are not practical. One challenge is assuring that online education, especially at the primary and secondary levels, provides an experience truly equivalent to that of traditional classrooms.

• Netizens to Government (N2G), refers to the new ways in which citizens are using digital media to interact with elected officials, governments and the public sector to induce or oppose change, and as was seen in 2011, sometimes in extremely impactful ways. Beyond giving citizens a powerful tool to express their views, the impact of the internet, broadband and mobile communications on how government operates has also been significant in other ways such as providing online services and managing emergency situations. Governments have been active forces in driving internet/broadband connectivity to previously remote areas to foster an improved quality of life and wealth creation opportunities. Increased use of the cloud will bring greater efficiencies to government operations and information sharing.
• Neo-urbanization, describes the mutations that are changing the face of urbanization as we know it, and considerably blurring the boundaries between traditional definitions of urban, suburban, and rural regions. Global trends such as the continued expansion of megacities, the development of previously rural corridor regions between large cities and the creation from scratch of relatively small but sustainability trendsetting smart cities will all employ new technology for communications and transportation on a massive scale. Development of large urban projects will require active collaboration between governments and ICT providers.

• Rejuvenaging, refers to the frontiers of aging and rejuvenation, as well as the far-reaching implications of rapidly-increasing life expectancies in many parts of the world. The expectation of a life trajectory of education, career and retirement is changing as people have multiple careers and work much longer than previous generations. As life expectancy increases so do the demands on global health care systems. ICT can play an important role in enabling remote services such as 24/7 monitoring of patients, diagnosis and surgical coaching in order to stretch limited health care resources.

• Sustainable by design (SBD), refers to the accelerated transition from “sustainability” as a source of competitive advantage to a competitive imperative that must be included in most aspects of modern business across all industries. Without engaging in a sustainable approach the growing numbers of global consumers will soon deplete the world’s resources. The trend toward the use of smart devices and the creation of smart cities is a direction in which the ICT industry can dynamically support the Sustainable by Design movement. “The next challenge for ICT lies not in making our lives easier, and more integrated but in making our lives more sustainable.”

All of the megatrends in this study were found to have a significant impact on many aspects of our world, including politics, government, economics, society, technology, environment, and regulation. More pronounced is the noticeable convergence of economies and communities: the over-riding impact of these megatrends is that they are rapidly narrowing the divide between developed and developing economies.

The ICT sector is increasingly at the nexus of all of these developments, as a catalyst and a beneficiary, as well as a potential victim of the rapid change ICT has induced across all areas of the economy and in modern lifestyles. It appears more important than ever that the stakeholders in the ICT sector dedicate time, efforts and resources to continually stay abreast of these megatrends and their ramifications.
1. INTRODUCTION

Alcatel-Lucent and the ENPC School of International Management have completed a joint research project created to identify and investigate megatrends that have the potential to fundamentally transform society, in general, and the information and communications technology industry (ICT), in particular. By anticipating changes in lifestyles, consumer behavior and end user expectations the primary objectives of this research were to articulate these megatrends for the Alcatel-Lucent community, as well as external audiences, and foster debate and the exchange of ideas.

The ICT industry has been at the forefront of tremendous transformations in the way people, businesses and governments the world-over communicate and interact. Despite the continuous need for innovation and investment in products, technologies and services, this highly competitive industry is also faced with the risk of its offerings becoming "commoditized", with associated reductions in profitability.

This observation was presented by Keith Willets\(^1\) as “the telecommunication’s industry paradox”. He noted that, from the outside, the communication industry is an innovative, highly profitable and successful industry. But from the inside it feels like a commodity because market saturation, substitution, consolidation, competition and regulation combine to squeeze revenue and margins. Therefore, industry players must continually “look beyond the horizon” to help ensure that the right innovations are brought to market at the right time, in accordance with changes in consumer behavior and consumption.

Most communication service providers (CSPs) are constantly looking at how to stay competitive, generate new sources of revenue and rethink their business models. The question is where to invest and in anticipation of what. The analysis and discussion of megatrends should help CSPs articulate important questions, identify possible responses and align visions in view of formulating strategy.

Paraphrasing Hiroshi Tasaka\(^2\), even if predicting the future is nearly impossible today due to increasing non-linearity (i.e. complexity), discontinuity and the pace of change, we can, and should, attempt to foresee the future. While we cannot predict “specific changes” we can perform “directional foreseeing”, i.e. foresee the “major trends” that will occur in the future. This, in turn, will help us to see and understand the trends that manifest themselves in society and to better apprehend the direction in which the world is moving.

The study of megatrends includes thinking about the future, applying “directional foresight” and as such it is not, and cannot be, an exact science. Megatrends analysis relies on deductive reasoning based upon a wide range of difficult-to-generalize empirical evidence. The development of a megatrend does not have distinctly delineated phases. Rather, it is characterized by a continuum of transitions, which are more clearly identifiable after the fact than as they are unfolding. Regardless, the identification of megatrends as they are evolving is valuable in terms of providing a foundation, scenarios and guidance that can be used in decision-making regarding future development and investment.

\(^1\) From Keith Willets, co-founder and Chairman of the Board of Directors of the TeleManagement Forum. Financial Times, February 17 2011

\(^2\) Hiroshi Tasaka (2009). Invisible Capitalism. Toyo Kezai, Tokyo, Japan
In this study, various research methods were used, including the filtering of a large number of research papers, analyst reports and publicly-available information. This secondary research effort was supplemented by sessions with leading consultants and industry watchers, as well as a creative workshop hosted by ENPC School of International Management and Alcatel-Lucent with participants from a wide range of disciplines — marketing, strategy, web, branding, IT, media, telecom, mobile telephony, consulting, and e-business. The objective was to brainstorm, identify and rank major megatrends that have far-reaching implications for society and the ICT sector.

Each megatrend was analyzed using a “Megatrends Framework” (Figure 1), which deconstructs each megatrend into underlying trends and trend drivers, on the one hand, and identifies the impact of each megatrend in terms of regional, industrial and political, economic, social, technological, environmental, and legal (PESTEL) impacts, on the other. The analysis of Megatrends serves as a framework for Alcatel-Lucent Consumer and Marketing Insight research for 2012.

Figure 1. Megatrends framework

For the purpose of this research initiative seven megatrends were identified:

- **168 (24x7 Connectivity)**, which refers to the “always on” generation of people, but increasingly of objects too, which are connected to the “net”. In a world in which technology is nearly ubiquitous, connectivity is now the expected norm and non-connectivity carries a price (real or imagined, social or professional).

- **Digital native acceleration**, which refers to the recent mainstreaming of generations who have grown up with digital technology and the rapidly rising percentage of these “Digital Natives” who hold key management and leadership positions. To these Digital Natives, “Internet time” and “network speed” are the new normal and this is also the expected speed of change.

- **Ed-you-cation**, which refers to the on-going shift, facilitated by ICT, from institution-based learning to individual-centered learning by which each individual has increasing control over the choice/timing/scope/depth of skills he/she wishes to acquire.

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4 Developed by Sarvani Vempati, Rebecca Meurice-Carlucci and Mamati Tembe in March 2011.
• **Netizens to Government (N2G)**, which refers to the new ways in which citizens are using digital media to interact with elected officials, governments and the public sector to induce or oppose change, and as has been seen this year, sometimes in extremely impactful ways.

• **Neo-urbanization**, which describes the mutations that are changing the face of urbanization as we know it, and considerably blurring the boundaries between traditional definitions of urban, suburban, and rural regions.

• **Rejuvenaging**, which refers to the frontiers of aging and rejuvenation, as well as the far-reaching implications of rapidly-increasing life expectancies in many parts of the world.

• **Sustainable by design (SBD)**, which refers to the accelerated transition from “sustainability” as a source of competitive advantage to a competitive imperative that must be included in most aspects of modern business across all industries.

Each megatrend is amplified by many trends and the net relationship between these trends and megatrends is shown in (Figure 2).
2. MEGATRENDS

The phenomenon of megatrends has attracted considerable attention in recent years and has generated various definitions. Frost & Sullivan defines megatrends as “global, sustained and macro-economic forces of development that impact business, economy, society, cultures and personal lives thereby defining our future world and its increasing pace of change.”

Paraphrasing the work of Frederic de Meyer, of the Institute for Future Insights, a megatrend can be characterized as follows: long-lasting (5-10 years), amplifying (widespread adoption), strongly impacting society across political, economic, technical, and legal dimensions, and having a feeling of inevitability.

For this project a megatrend is defined as a gathering wave of change that is slow to form, nearly impossible to reverse, significantly influences the future, has an aura of inevitability and has a far- and wide-reaching impact on society.

Megatrends result from the confluence of underlying trends. A megatrend typically traverses, transcends and transforms the industries it washes over while catalyzing the formation of new industries.

A trend, in comparison with a megatrend, is usually easier to identify, forms relatively quickly and does not have as far-reaching an impact. It could be said to induce evolution, whereas a megatrend would induce revolution.

2.1 Megatrend life cycles

With the benefit of hindsight, megatrends can be analyzed using a similar model to the widely-used Product Life Cycle (PLC) model. While the two life cycles are not perfectly analogous, it appears that megatrends follow a cycle, with stages corresponding to the four main phases usually identified in the PLC: introduction, growth, maturity and decline. The equivalent four life cycle phases for megatrends as presented in Figure 3 are:

• **Phase 1** – Emergence, which is the convergence of related trends that give rise to a megatrend
• **Phase 2** – Prevalence, which is the rapid manifestation of the megatrend and the spread of its effects on business, industries, and lifestyles. Legal frameworks strive to catch up to the manifestations of the megatrend and first-mover advantages go to the competitors who are able to “ride the wave” successfully.
• **Phase 3** – Predominance, which refers to the megatrend’s effects in all areas of society and on a far-reaching demographic/geographical scale. At this point in the life cycle, legislation has been able to catch up to the phenomenon and its externalities while competition moves to lobbying and influencing/establishing industry standards.
• **Phase 4** – Evanescence, which is the point at which the megatrend is so widespread that it begins to dissolve into a ubiquitous “new normal”.

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This report strives to define each megatrend, identify some of the underlying trends that have converged to foster the emergence of the megatrend, discuss its impact on society in general, and conclude with the potential impact it will have on the ICT sector in particular.

### 3. 168 (24X7 CONNECTIVITY)

168 refers to the modern phenomenon of “always on”, or 24x7 connectivity. This refers both to people and, increasingly, to net-connected objects and media platforms. In a world in which ICT has become ubiquitous, connectivity has become the norm. It is expected in private, professional and social lives, and blurring the previous lines of distinction and non-connectivity often carries a price (real or imagined). Paradoxically, as society rushes to reduce the connectivity divide, disconnecting, for many, has become more challenging than connecting.

#### 3.1 Megatrend overview

As a majority of the planet’s population is now “online” (via a growing array of devices), ICT has become an integral part of everything. Permanent, regular and even passive connectivity have become pervasive. Whereas only a decade ago “getting connected” required an effort, today a similar effort is needed to get disconnected — especially for the new generation of knowledge workers.

With the rise of the “Internet of Things”, by which objects, appliances and machines are net-connected, the phenomenon of 168 connectivity will transcend personal interactions and virtually all aspects of our lives and the physical world around us will have varying (and increasing) degrees of connectedness.
3.2 Underlying trends

The ability and propensity to stay connected 24x7 has been facilitated primarily by the proliferation of mobile phones and Internet usage, as well as an increase in fixed and mobile high-speed Internet availability. These trends have also been facilitated by government policies that support technology adoption, such as regulations and expenditure in the ICT sector.

The mobile planet

With 6 billion mobile users in 2011\(^5\), usage of mobile phones has become a truly planetary phenomenon. Ease of access and usage, even in remote areas where fixed phone line infrastructure is not available, has driven a substantial increase in the adoption of mobile phone usage.

Mobile connectivity is well-established (118 subscribers per 100 inhabitants in 2011) in developed countries and cellular penetration in developing countries is on a rapid upward trajectory. The leaders in this trend are Europe, Asia and the Pacific, with South Korea leading the way with over 90 percent mobile broadband penetration.\(^6\)

On top of this, Africa is expected to continue increasing mobile broadband subscriptions, reaching 4 percent penetration in 2011, compared with less than 1 percent for fixed-broadband penetration.\(^7\) Globally, Ovum forecasts that global mobile connections will reach 7.6 billion in 2015.\(^8\)

In addition to the growth of mobile subscribers, the continuous evolution of wireless network architectures and the acceleration of mobile broadband infrastructure enabling higher speeds and capacities also contribute to the increase in connectivity. In addition to the growth of mobile subscribers, the continuous evolution of wireless network architectures and the acceleration of mobile broadband infrastructure enabling higher speeds and capacities also contribute to the increase in connectivity. The cumulative total of Base Transceiver Stations (BTS) deployed worldwide will be 6.8 million by 2016, according to forecasts by ABI Research.\(^9\) More than 140 countries were offering 3G services commercially, compared with just 95 countries in 2007. And countries like Norway, Ukraine, Sweden and United States have already started offering services at higher broadband speeds by moving to next-generation wireless platforms, such as 4G Long Term Evolution (LTE).\(^10\) By May 2011, there were over 400 third-generation networks commercially launched in 161 countries and 154 LTE network commitments in 60 countries.\(^11\)

The proliferation of devices, such as smartphones and tablets, also continue to drive a higher degree of connectivity beyond simple voice contact everywhere. In 2011, the estimated number of smartphone shipments was estimated at 476 million, and this will more than double by 2016, reaching 1.07 billion shipments.\(^12\)

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\(^7\) 2011 Key ICT Indicators (ITU), October 2011
\(^8\) Ovum “Global Market Outlook” March 2011
\(^9\) ABI Wireless Infrastructure Market Data, ABI, October 2011 (Jim Eller, Principal Analyst, Wireless Infrastructure)
\(^10\) The World in 2011 ICT Facts and Figures report - International Telecommunication Union (ITU)
\(^11\) GSMA Global mobile Suppliers Association, May 2011
\(^12\) ABI Smartphone Market Data, ABI, February 2012 (Mike Morgan, Senior Analyst, Mobile Devices)
The Internet is rapidly bridging the Digital Divide

Internet usage doubled between 2005 and 2010 and rapidly changed the way people communicate, work, learn, play, purchase, obtain and share information. Despite the feeling that the Internet is everywhere, there is still room for growth. Penetration in developed countries was estimated at 73.8 percent by end of 2011, with wide discrepancies among regions. Internet penetration in Europe is at 74.4 percent, while it is at only 56.3 percent in United States. In developing countries, the penetration rate is estimated at 26.3 percent. In Africa, it is only at 12.8 percent. However, this represents an increase of 533 percent from 2006 to 2011, compared to an increase of 156 percent in the United States over the same period.  

The combination of growing availability of Internet access, falling connection costs, increased accessibility to high speed Internet, and improved mobile accessibility has increased the convenience of use and helped drive consumer/user dependence upon and preference for constant connectivity.

Broadband connectivity is also improving as a result of the increasing adoption by telecom operators of new fiber infrastructure for Ultra Fast Broadband (UFB) to better support the rise in demand for bandwidth in the home due to the simultaneous use of new devices and applications on the Internet.

Availability of fast broadband access in rural areas is becoming an important concern and many governments in both advanced and developing countries around the world are engaging with the private sector to implement UFB. According to IDATE, in June 2011 there were more than 112.6 million Fiber to the x (FTTx) subscribers around the world, with Asia being the most dynamic ultra fast broadband market. (FTTx is any broadband network architecture that uses optical fiber.)

3.3 Impact on society

The 168 megatrend has had a major impact on society. It has affected social interactions in personal and professional lives, and interactions with governments and public affairs, as well as technology and innovation, business and economics, and legal and environmental issues.

A highly visible social impact of a “168” connected world is the blurring of the boundaries between the physical and virtual realms. The proliferation of social networks has changed the social spectrum and social dynamics; people now need to manage physical as well as virtual (online) relationships in their personal and professional lives. It has become normal for people to develop and sustain long-term friendships online. Social network or blog web sites are visited by 4 or 5 internet active users, and 25 percent of time spent online is on these sites, with 40 percent of those users accessing social media content from their mobile device.
Constant accessibility to the Internet has created the ability to never “switch off”. Cell phones are rarely, if ever, turned off, and battery life seems to be the biggest hindrance to 360 degree (GPS, wireless and 3G) connectivity in developed countries. This has contributed to a blurring of professional and personal worlds — work is not limited to the office and personal lives are not limited to the home. Images of people answering work-related e-mails on their smartphones outside of work are as common as those of people making private purchases or connecting to social networks at the office. Further reinforcing the ongoing fusion (or confusion), mainstream consumer applications are starting to (willingly) show up at work as companies are increasing their use of social networking tools for employee collaboration and to connect with customers and partners.

Mobile broadband connectivity and the interaction between various types of communications, such as e-mail, voice, instant messaging, and real-time conferencing, is also changing the workplace landscape, allowing it to expand from offices to homes or other public places. This presents many benefits for both employees and employers, such as an improved lifestyle, lower transport costs, lower operational costs for employers, better employee retention and productivity. According to a Yankee Group study, productivity increases by as much as 40 percent when workers are provisioned with mobile form factors such as tablets, smartphones and netbooks, while mobile e-mail and voice are the most important technologies that enable workers to remain productive when they are away from the workplace.

The economics of 99.999
In many business sectors and industries, most daily activities rely on remaining connected. Disconnection not only becomes the exception, it also makes many businesses and transactions grind to a halt. The cost of disconnection is so high that 99.999 percent connectivity has become the default service level companies and consumers expect and demand.

3.4 Impact on ICT
The increased quality and mobility of Internet services, as well as the spreading use of smart mobile devices (smartphones and tablets) have enabled high usage of social networks anywhere/anytime, and a significant rise in data traffic. According to Bell Labs research mobile data traffic will grow 30-fold over the next five years. This shift from predominantly voice to increased data traffic requires superior network performance and dramatic increases in capacity.

This heightened level of data traffic is exacerbated by the fact that the end user has become both a consumer and generator of content (e.g., YouTube), spiking an increase in data-devouring video. The growth in data traffic will most certainly increase with the improved network speed provided by 4G technology.

Emergence of a new ecosystem
This change has also introduced new players in the value chain, such as streaming video content providers that include both traditional entertainment entities like television and movie producers, as well as new entities. As a result, service providers must adapt their business models to capture as much value as possible within the value chain, and there is a need to offer more personalized services to extract that value, because the mobile Internet has become a commodity, leading to further price pressure.

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16 Yankee Group’s 2011 US Enterprise Mobility: Employee Survey, December 2011
18 Putting broadband in the palm of people’s hands, Alcatel-Lucent and World Economic Forum
More capacity and better coverage to support mobile data services
There is increasing pressure on service providers to increase capital expenditure on broadband and wireless infrastructure to support the increase in mobile data growth and improve coverage to allow real-time connectivity anywhere. Service providers in emerging countries will have to invest in network growth and modernization. More advanced markets will build up LTE/4G networks. This has already started. According to the Global mobile Suppliers Association (GSA), 26 LTE networks have been commercially launched in 18 countries, and the GSA forecasts that at least 81 LTE networks will be in commercial service by 2012.

Explosion of mobile devices unifying all communications
New devices that are technology agnostic and integrate telecom (wireless, Wi-Fi®, wireline), Internet, TV, GPS, and PC, will support technology convergence and higher speeds and capacity. They will replace multiple existing devices and will become the central communications, content consumption and control devices for home, offices and vehicles, allowing the connected citizen to multitask on the go. Opportunities for new ecosystems will emerge, bringing together devices or machines offering new product experiences (e.g., laptops, tablets, smartphones, game consoles, connected devices or TVs).

Converged devices are already driving accelerated adoption, with the recent introduction of the Apple® iPad® representing the most rapid introduction of a new device in history. Apple sold 15.43 million iPads during Q112, a 111 percent unit increase over the same period last year. 19

Technology convergence
As demand for 168 connectivity increases so will the demand for more integrated communications.

Consumers expect and assume a consistent and high level of connectivity wherever they are, which will drive the further interconnection of mobile broadband, fixed broadband and cloud technologies. Service providers will need to evolve and expand their offers to tap these market needs.

Cloud services are rapidly increasing and the “cloud services model” is becoming a fundamental underpinning of IT Services. An Alcatel-Lucent study on perceptions and attitudes towards the cloud concluded that forty-four percent of information technology decision makers (ITDMs) in the U.S., U.K., France, India, South Korea, Taiwan, and Hong Kong expect to use the cloud more extensively three years from now. 20 However, the cloud itself can’t provide the ubiquitous, high-quality connectivity expected with the 168 phenomenon. By combining cloud computing platforms with ‘cloud access’ networks CSPs will be in a strong position to enable the capacity, speed and quality of service required to support more complex communication services. According to a study by Frost & Sullivan, wireless intelligence in many forms will be integrated in 80 percent of IT infrastructure and other services by 2020. 21

19 Apple www.apple.com
20 Soaring into the Cloud, Alcatel-Lucent, 2011
21 Frost Sullivan, The Impact of trends in the ICT market on Project Management
3.5 Food for thought
How long would your business survive without Internet access or without current IT and telecoms platforms? How much work could you get done without broadband? How efficient can your business or life be without connectivity? Can you foresee the future of business without connectivity? What will the world of business look like when 168 is the reality for 75 percent of the world’s population?

4. DIGITAL NATIVE ACCELERATION

Digital native acceleration, refers to the recent arrival into the business world of individuals who have grown up with digital technology and their increasing migration into key management and leadership positions. “Internet time” and “network speed” are the new normal for this group and this is also the expected speed of change. The people of this generation are integrating technology holistically into all aspects of their lives and everyone else’s — education, work, leisure, politics, relationships and entertainment — making the boundaries between these aspects of life increasingly blurry.

4.1 Megatrend overview
Digital Natives — those born with digital technology as part of their world — bring a whole new set of expectations to technology and its integration in all aspects of their lives. This “next generation” (also known as the “net generation”) will induce a re-evaluation of the ways various processes and activities were conducted by predecessor generations: the “analog” (who grew up prior to digital technology) and the “hybrids” (those who adopted technology as young adults).²²

According to Marc Prensky who coined the term “Digital Natives”²³, the net generation thinks at “twitch speed”, where the mind needs to process more than 100 images per minute. Driven by interests in entertainment (including video games and movies), online social media networks and generation of online content (especially video) for the purpose of information sharing, Generation Z, as they are also called, perform a multitude of tasks simultaneously, apart from their education, communicating with peers and friends, entertainment and spending time with their family. The new way of thinking this next generation brings will shape our future in many ways.

4.2 Underlying trends
Digital native acceleration has been further expanded by technology advances. The proliferation of easy to use devices, compelling content and applications, and social media, together with increasing connectivity are some of the trends that drive this megatrend.

Proliferation of technology – Connected homes
The number of connected homes is increasing. According to ITU analysis there are 1.8 billion households worldwide, and one-third have Internet access, compared to only one-fifth five years ago.²⁴

²² Based on the terminology and ideas developed by Marc Prensky and later Pip Coburn et al.
As children born in “digitally connected” homes, Digital Natives are not only at ease with using the Internet for their day-to-day activities, but also seek out opportunities to use the Internet and cannot imagine a world without it. A study by Ipsos highlights the increasing digital presence of youngsters in Asian countries. According to this report, youth spend an average of 2.7 hours a day on the Internet. When asked about their habits, the young Asians responded as follows:

- 24 percent cannot live without the Internet
- 19 percent cannot live without mobile phones
- 28 percent cannot live without television
- 1 percent cannot live without newspapers

The usual mix of online activity observed includes social networking, e-mail, instant messaging, music, online games, finding product/service information and sharing media.

**Rise of the mobile – A world without boundaries**

Digital natives have access to an increasing diversity of connected devices, from laptops/netbooks and tablets, to smartphones and video game consoles. These devices combine more powerful capabilities with simplified user interfaces and enable access to thousands of applications, transforming the user experience. In July 2011 Apple announced its 15 billionth application download, while Google announced the 10 billionth application download in December.

Teen mobile phone users in the United States are expected to reach 86.5 percent of the total teen population by 2015 and teen mobile Internet users are expected to be 50 percent of those mobile users (11.1 million). Sixty-four percent of youth in the Asia Pacific region use text messaging regularly and 49 percent use their mobile phones to listen to music. The youth of today eat, sleep and breathe mobile thanks to the plethora of devices and applications offered for mobile services.

**4.3 Impact on society**

**Social**

- As Digital Natives are more at ease with the “always on” approach (or “168”), the practice of being connected everywhere, even while sleeping, has become increasingly widespread. At the same time virtual communication appears to be preferred over face-to-face communication. Teens seem to prefer text messaging over talking on the telephone. Results of a study on the U.S. market ad text messaging show that mobile phone owners between the ages of 18 and 24 exchange an average of 109.5 messages on a normal day (more than 3,200 texts per month).
- The Power of NOW: Having been born at a time of easy access to information through technology, Digital Natives feel the need to have everything instantly, be it information or services. The element of “entitlement” accentuates a natural adolescent tendency to self-centeredness and impatience and has the potential to pervade general society, where any sign of slow service or a service that requires a wait will be heavily penalized.

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25 Ipsos Young Asians 2010, The rise of digital Natives, 12,302 people aged 8 to 24
28 eMarketer, Demographic Profile – Teens, March 2011
29 Synovate, The rise of digital Natives, 11,886 people aged 8 to 24
30 eMarketer, Demographic Profile – Teens, March 2011
32 Ranadive, Vivek (1999), The power of Now
• Virtual-real crossover generation: As a generation at ease with avatars — through social media sites, online gaming, virtual communities (e.g., Second Life) — the boundaries between the real world and virtual worlds is becoming increasingly porous with relationships, activities and economic activity spilling over in both directions. From Second Life’s Linden dollars (an online currency off-line exchange rate) and World of Warcraft romances that lead to off-line weddings, to off-line promotion of online purchasing of off-line goods and services, the notion of “real world” becomes difficult to define.

• “Alone together” expresses the ambiguity of the socializing aspects of increased connectivity. Technology has made it easier to interact with others, but it has also made it easier to replace physical interaction with its virtual form. A Google search on “social media addiction” returns 95 million hits. Psychologists now see loneliness, anxiety and boredom as symptoms of social media withdrawal, while others see the increased online togetherness as a mask for off-line loneliness.

Digital Natives now have access to more means of communication than ever before. This increased breadth of options seems to have come at the expense of the depth of the message. With the continued rise of 140-character monologs (e.g., Tweets, Facebook® wall updates and LinkedIn status updates) as a means to convey information to others, one-way broadcasting (also called narrow-casting) is challenging the two-way exchange of information most people implicitly include in their definition of communication.

4.4 Impact on ICT

The increasing use of technology by Digital Natives will impact many areas of ICT industry, including service providers, media and content suppliers and governments.

The Digital Native Acceleration trend amplifies the need for improved ubiquitous connectivity (capacity, speed, coverage) and innovative applications, creating vast opportunities for different industries across all sectors. For Digital Natives, being always on is their natural state of being and that condition drives many expectations in terms of service availability, immediacy and quality.

These Digital Natives are a driving force in the market, and many industries are adopting and transforming their business around the Internet, embracing new enablers such as mobile technology, the cloud, and social media to address the demands of Digital Natives.

The speed at which Digital Natives grasp things will solicit a redesign of current education systems to fit digital learners who are more active and experiential learners, proficient in multitasking, dependent on communication technologies for accessing information and for interacting with others.33 New forms of education will emerge, incorporating technologies such as wireless to enable ubiquitous access to learning (e.g., m-learning applications) and also incorporating immersive environments into education, such as virtual reality, video, gaming and gesture-based computing.

33 British journal of education technology, Review of digital natives debate, Feb 2008
Digital native acceleration also impacts the workplace. Digital Natives are already using technologies in their personal lives and they want to use their devices in the office, using similar tools for interacting and collaborating within an enterprise environment. This megatrend will drive transformation in enterprises, not only by transforming an enterprise’s internal operations but also its efforts to address the needs of connected employees. This opens many opportunities for mobile applications, cloud computing, collaborative social media tools and IT infrastructure. A Yankee Group research report indicates that global revenue from enterprise cloud services is expected to reach U.S. $22.3 billion in 2014, more than double 2010 revenue (U.S. $9.2 billion).34

4.5 Food for thought
How will this shift in consumer behavior affect your markets, operations and supply chains? How will new business/education models impact current ICT ecosystems? How are digital natives impacting the workplace and driving transformation of corporate IT infrastructures?

5. ED-YOU-CATION
Ed-you-cation refers to the on-going shift, facilitated by ICT, from institution-based learning to individual-centered learning through which each individual has increasing control over the choice/timing/scope/depth of skills he/she wishes to acquire. Together with the open education movement, the Internet and new peer-to-peer-based learning models, it is now possible for a motivated individual to become highly-knowledgeable and well-informed, in nearly any domain, for free.

5.1 Megatrend overview
Today’s ICT technology allows both asynchronous and anywhere connections. Therefore, learning is being liberated from location and time-specific constraints. As it evolves, it is becoming de-correlated from age, life stage, traditional institutions and means.

Technological and business innovations are moving at an unprecedented pace, and the demand in skill adaptability can no longer be sustained by the traditional education system where individuals obtain most of their qualifications prior to entering the job market. The existing workforce needs to remain current with the latest job skills or upgrade its basic skill level to adapt to continuous change. Hence many people are learning on the job, and furthering their formal or informal education while still working in their current profession/occupation.

The proliferation of online education gives people time flexibility and also allows them to receive high quality education from anywhere in the world, particularly in emerging countries without a developed traditional education infrastructure.

5.2 Underlying trends

Various trends are having an impact on the Ed-you-cation megatrend, including initiatives in online education, the digitalization of content, the use of emerging technology to deliver curricula, integration with social networking, re-packaging of media content, merging education with gaming and entertainment, and developing new collaboration tools while leveraging developments in the social and mobile realms across the globe.

Millions in online education

Online education has increased tremendously in the past decade. A survey of online learning in more than 2,500 colleges and universities in 2010 revealed that, in the United States alone, enrollment rose by almost one million students from a year earlier to 5.6 million, a 21 percent growth rate that far exceeds the two percent growth in the overall higher education student population. The survey also found that almost two-thirds of not-for-profit institutions now say that online learning is a critical part of their long-term strategy. And more than one-third of public university faculty members have taught an online course, while more than one-half have recommended an online course to students.

Online education in the form of video or text is offered by traditional institutions as standalone courses combined with face-to-face classes. New education business initiatives offer predominantly online education. This system of education is not only revolutionizing the way content is delivered, but it is also having an impact on business models and institutional collaborations. The accessibility of online education is allowing for a separation between learning and accreditation. In some cases people can access any content online and learn remotely for free, and only pay if they need accreditation. One example of a non-academic learning platform is Fitango, which offers hundreds of ‘how to’ programs in a combination of free/paid plans through a platform that uses social network and education integrated with a smartphone application. Another is WEAVAC University, which also offers university accreditation within a matter of days based on life and work experience.

A major contribution of online learning is that institutions or individuals without resources can have access to quality educational materials from top schools for free through collaborative efforts by institutions in all corners of the world. These organizations offer a wide range of educational formats including webinars, self-learning programs and workshops that can lead to certificates and diplomas. For example, Khan Academy, offers over 2,400 videos and self-paced exercises. Academy Earth, a collaboration of nineteen institutions, offers video education from top school faculties. And MIT Open CourseWare (OCW) Consortium offers probably one of the most extensive collaborative online education initiatives.

The ability to offer education online, has led to the emergence of virtual institutions around the world, such as African Virtual University and China Open Resources for Education. Online education has also led to the creation of a new category of one-stop business organizations, which provide databases of schools that offer online education and provide information about the schools, facilitating access/interaction and other relevant services.

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35 Allen, Elaine & Seaman, Jeff, Class Differences - Online Education in the United States 2010 http://sloanconsortium.org
37 http://www.khanacademy.org
38 http://www.ocwconsortium.org/en/aboutus/whatisocw
39 http://www.avu.org
40 http://www.core.org.cn
Furthermore, the development of online education methodology is becoming a solid sector in its own right, with dedicated research, innovation and industry-wide efforts to find easier ways of promotion, growth, and development in the online education field. Education transformation is further accelerated by the availability of new pedagogical forms and mechanisms to deliver content enabled by emerging technologies such as mobile technologies, smartphones, social networking, using media content and immersive environments (gaming, augmented reality, and virtual worlds).

5.3 Impact on society
The changes in educational models provide flexibility in formal and informal learning. Moreover, they also have significant impact in many spheres of society.

Politics/government
In the area of public education, governments will be able to address the lack of teachers in remote areas or the difficulty of transporting students to physical schools through the use of online video systems, which will allow teachers to reach students virtually.

Because of the potential for fraud in online education (e.g., difficulty validating the identity of the ‘student’, virtual diploma mills and the offering of courses/programs/degrees of dubious value), it is very important that governments support a strict accreditation process to ensure that online institutions comply with national/international standards (quality assurance).

By providing funding for programs, governments also have a role to play in technology development and transformation to improve education services. There are many initiatives at the country and regional level to support mobile education. For example, in the U.K., MoLeNET is a collaborative initiative to introduce and support mobile learning in education.41

Economics
Investment in technology for education is an important driver for economic growth, ICT is critical to the delivery of better education especially in isolated rural areas in emerging countries where people have little or no access to education or have to walk miles to get to schools. Improved education levels enables citizens to use their enhanced knowledge to leverage ICT.

For the individual, improved education can lead to better job opportunities and better income that stimulates access to more goods and services, which can lead to wider economic benefits. For governments, it can provide more income from taxes as well as a lower need for social benefits. According to a study by the Organization for Economic Co-operation and Development (OECD) on the impacts of education across OECD countries, “the average total benefit for a man investing in higher education (U.S. $129 000) is almost four times the total cost (U.S. $34 000)”, which means there is a strong incentive for governments to encourage improved education opportunities.

41 http://www.molenet.org.uk/
Social
The Ed-you-cation megatrend will lead to a more educated population thanks to the rise of informal education and the flexibility/accessibility of formal education. Even people in areas with poor education systems or facilities will have the opportunity to pursue high quality education. The Teacher Education in Sub-Saharan Africa (TESSA),\(^\text{42}\) is a good example of an online network that provides open educational resources for teachers in Africa. Over 20 universities and organizations from 12 African countries offer online resources to teachers that have little, or no, other options.

Environment
Reduced travel requirements to get to learning facilities or to access educational materials will reduce carbon emissions. Through the use of collaborative online learning activities that promote discussion and sharing of information, there will be an opportunity for students to participate in meaningful exchanges without having to be face to face with their fellow students.

Legal/regulation
Regulatory bodies must adapt to changes in the education environment that accommodate and promote learning online while also protecting against potential abuses.

5.4 Impact on ICT
The ICT sector has provided the platforms that enable Ed-you-cation. Its participation will accelerate as emerging technologies are implemented. For example, ubiquitous wireless access changes the dynamics of learning both in and out of the classroom by enabling new ways of learning, opening many opportunities for service providers to offer applications and solutions for mobile learning (m-learning).

Research developments on immersive environments for education (gaming, augmented reality, and virtual worlds, gesture-based computing) will enable more participative applications where learning with books can be complemented with simulated interaction with objects. Good examples that integrate education, augmented reality and wireless technology are MIT’s Teacher Education program and The Education Arcade, which are working on a number of augmented reality games that use handheld devices.\(^\text{43}\)

There will be opportunities for service providers to offer mobile learning services and the provision of high quality and reliable network services with integrated managed services. An analysis published by the GSM Association (GSMA) the “Mobile Education Landscape Report” estimates that the mobile learning market will grow from U.S. $632.2 million in 2009 to U.S. $1,464.8 million by 2014.\(^\text{44}\)

5.5 Food for thought
Will more industries follow the ICT companies and generate their sector certification as well? If yes, how does ICT enable that? How can society assure that online education is truly equivalent to the classroom experience? Can digital education, online learning, mobile learning expand education opportunities in emerging markets?

\(\text{42}\) http://www.tessafrica.net/
\(\text{43}\) http://education.mit.edu/projects/mitar-games
\(\text{44}\) http://www.gsmaembeddedmobile.com/mobile-education/
6. Netizens to Government (N2G)

Netizens to Government (N2G) refers to the new ways in which citizens are using digital media to interact with elected officials, governments and the public sector to induce or oppose change, participate in or influence a debate, support or reject proposed legislation, and, as we have seen recently, even go so far as to encourage or resist regime change.

6.1 Megatrend overview

Increasingly governments around the world are taking initiatives and being pressured into taking action to give people a participatory role that goes beyond voting on election days. Globally, government actions and decision making are being increasingly challenged with the help of technology. Online polls, discussion boards, broadly disseminated petitions, Facebook pages, YouTube videos, Tweets and other social media are all contributing to what looks to some like a modern version of “power to the people” and to others like the agora of ancient Greece. New forms of e-activism have radically expanded the notion of “constituency”.

Since their introduction in the early 1990s, electronic government applications have been adopted by governments around the world. Many governments have been using information and communication technology with the aim to provide better information and public services, and a more efficient administration to the people.

According to the United Nations, the number of government web sites grew from fewer than 50 in 1996 to more than 50,000 in 2001. The rise of e-government has spawned its own jargon of new relationships, transactions and interactions including G-to-G (government to government or administration to administration), G-to-B (government to business/es) and, G-to-C (government to citizens or government to consumers/constituents).

E-government applications are becoming a popular mechanism for governments to engage and empower citizens. The United Nations E-Government Survey 2010 assessed how governments are engaging with citizens using popular Web 2.0 tools (blogs, chat rooms and Short Message Service (SMS)) in addition to social networking tools (Facebook, Twitter, etc.), to determine the e-participation index. The top five countries leading in e-participation in 2010 were the Republic of Korea, Australia, Spain, New Zealand and the UK.

The rise of this so called e-democracy appears to be signaling a shift to a proactive form of citizenry in which the general public has a real-time say on a wide-range of issues.

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45 In ancient Greece the agora was a public open space used for assemblies, markets and debates.
46 United Nations, 2006
47 United Nations E-Government Survey 2010
6.2 Underlying trends

Increasing technological advances and the use of Internet and mobile broadband technologies have been largely supported by governments, driving major capital investments in the telecom industry all over the world. In addition to connectivity, this megatrend is further amplified by the increasing availability of mobile devices and social media.

Increased governments capital investment in telecom sector

Trends are showing that higher broadband penetration is linked to increasing GDP and improving quality of life. Many governments around the world are implementing broadband connectivity projects to improve economic growth. For example, the Broadband Technology Opportunities Program in the U.S was given a $7.2 billion grant, in 2010. In April 2010, China approved a $22 billion stimulus plan for fiber networks that will establish more than 80 million fiber broadband ports by the end of 2011 and Europe’s Digital Agenda’s goal is for all EU countries to adopt national strategies for universal broadband access, 30Mb/s connections for 100% of households by 2013, and half of all EU citizens connected at 100 Mb/s by 2020.

Public spending can be used as a catalyst to boost both Internet usage and the ICT ecosystem. Countries that have the highest public investment in the Internet as a share of GDP tend to also gain the greatest contribution to GDP from the Internet. For example, the United Kingdom, the U.S., Sweden, and South Korea posted the highest average levels of investment in the Internet between 2000 and 2009, and each rank among the highest on the McKinsey Internet Supply Chain Leadership Index and in contribution to GDP from the Internet. Sweden has pushed the development of e-government services and was ranked first in the e-government advancement index in 2008 by the United Nations.

At the same time, establishing online communication channels of direct communication with citizens may pose some political risks. It is possible that political representation could be displaced by disruptive “crowds” such as cyber organizations with an adversarial relationship with the public sector.

Internet advances and exponential use of mobile technologies

Increasing technological advances have made it possible to deliver personalized services, faster. For example, every governing body has a public web site that is accessible all over the world, enabling open contact to citizens via an online presence 24x7. Some Governments are also trying to have globally readable web sites in the largest range of possible languages. These sites have given rise to new ways to communicate the voice of people and are helping citizens reach their governments.

Popular demand

The broad exposure of the public to private sector products and services has caused the rise of similar expectations with regard to the delivery of government services. Government agencies are finding that connected citizens expect the same level of service available at the commercial business level.

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48 Datamonitor report on Social trends, 2010
51 Institute for International Management and Technology, Enabling E-Governance Through Citizen Relationship Management – Concept, Model and Applications, 2004
The public prefers instant access to services, advice and information. Governments can serve citizens much more quickly and at a much lower cost with the development of e-government and m-government services, such as online tax statements, e-voting, e-visas, etc.

The evolution of mobile technologies, mobile devices and applications also facilitate the delivery of many m-government communication services. There are already many government initiatives using mobile devices to deliver emergency services, public services, health services, among others.

6.3 Impact on society
Introducing ICT changes the way various stakeholders interact, and it affects institutions and society at large in far-reaching and increasingly profound ways.

Political
Governments are attempting to get constituents to be part of the “value chain” and the administrative decision making process through the creation of online communities.

M-government services are highly promising enabling civic action campaigns and engaging citizens to provide input on civil initiatives or to political decision making, for example m-vote services, poll monitoring, etc.

Technology is empowering “netizens” and allowing them to inform, monitor and modify government action in real time. For example, during the aftermath of hurricane Katrina, private citizens spontaneously collaborated to share information, help reunite families and pick up the slack when they weren’t getting the government support they wanted. The early riots in 2011 showed the rolling impact of citizens using technology to come together and express their feelings in headline-generating ways.

Economic
Through mobile services local governments can have a greater impact on empowering citizens and create effective opportunities for local economic development, especially in emerging countries where population and ICT capacity are growing fast.52

Social
While mobile government is seen by many as the next paradigm of public services delivery, many countries are still lagging in the implementation of these services, especially to rural areas and disadvantaged people who are increasingly the main “victims” of the digital divide.

Legal
Governments look to protect consumer privacy and security (e.g., “do not track” initiatives).53 The collective-action problems of cyber security have led to several new initiatives at the national, regional, and international levels by government and non-government agencies, often in public-private partnerships. They range from government-led international thrusts, such as the Cybercrime Convention, promulgated by the Council of Europe, and the London Action Plan (LAP), to national legal and regulatory initiatives, such as the Australian Internet Security Initiative (AISI). Also, proliferation of smartphones, cloud services and social networks is increasing the exposure of huge amounts

52 Gianluca C. Misuraca, 2009, Technology Analysis & Strategic Management
of personal data such as address books, location, relationships, habits, etc. Consumers are becoming more concerned about the privacy of their personal data stored in many cloud-based applications and shared through mobile applications. Gartner study indicates that “growing concerns over privacy and security could slow down the adoption of new cloud-based offerings and other forms of personalized/targeted services”\(^\text{54}\). Governments and Industry associations are staring initiatives to address data privacy in order to safeguard consumers trust on mobile applications. In January 2012, the GSM association launched the Mobile and Privacy initiative\(^\text{55}\) to address some of the data privacy concerns through a ‘privacy by design’ approach across the mobile ecosystem. Governments have also announced their initiatives, the European Union announced the EU data protection regulation and the U.S. President proposed a Consumer Privacy Bill of Rights. At the same time some Service Providers in Europe have announced their plans to implement data privacy guidelines in their own applications stores and vendors like Amazon, Apple, Google, Microsoft, RIM, HP have signed an agreement offer privacy disclosure to users when downloading mobile apps.

**6.4 Impact on ICT**

**Government ICT transformation**

Governments must invest more in ICT to modernize and integrate government infrastructure particularly with emerging technologies like the government cloud, open source public sector, vertical applications, and mobile applications, such as m-government (mobile government using wireless and mobile ICT services for government applications), as well as enterprise management, smart governance.

Cloud computing solutions once deployed — in public, private and hybrid forms — will provide government new levels of economies of scale, agility and flexibility compared with traditional IT environments.

Economic crises and cost reduction will also drive government spending on ICT to improve efficiencies. Government sponsored projects will include automation, investment in cloud services, outsourcing, IP services, teleconferencing, shared web hosting, use of tools and devices to improve productivity and efficiency, such as smart phone applications.

**Business Process re-engineering**

Governments must update their IT infrastructure and adopt wireless technologies for mobile applications, but will also need to re-engineer or re-think their processes to be able to accelerate decision making and customer service.

New operating processes will radically change how governments and their jurisdictions operate, and how they manage information. Tighter integration, control, interoperability and information management systems will be required to improve efficiency.

For example, in Dubai the government launched an initiative called m-Dubai, to provide information and services to the citizens on mobile phones. In Luxembourg the city government has launched the e-City initiative deploying mobile payment for governmental services and aiming at creating a virtual city based on a sort of Wireless Internet Area Network, for the overall city.

\(^{54}\) Market Trends: Industry Scenarios for CSPs, Worldwide, 2020, 5th March 2012, Gartner

\(^{55}\) GSMA Association Mobile and Privacy http://www.gsma.com/mobile-and-privacy/
ICT supporting government engagement with citizen

Politicians have increased the use of social networking tools for immediacy with citizen engagement. It is likely there will be a rise in the use of social networks like Facebook, Twitter, YouTube or Flickr® by government but more focused on the person than the institution, for instance in the U.S. Barack Obama (@BarackObama) on Twitter had more than 11 million followers as of October 2011.

By adopting mobile application and social networks within Government organizations, public employees can become agents of transformation and innovation. “Since Web 2.0 is about people more than about organizations (people read a person who blogs, or friend a person in Facebook, or follow a person on Twitter and so forth), the only way for governments to leverage these technologies to produce value is by empowering their employees.”56

There will be a proliferation of m-Government applications, such as m-voting, m-tax, m-consultation; available 24 hours-a-day, 365 days-a-year, that will help government to deliver public services more efficiently while facilitating a more participatory political process. This will provide many revenue opportunities to many industry players from devices, government content related applications, and IT platforms, among others.

6.5 Food for thought

What innovative mechanism could be used by the public to engage in consultations with policy makers, government officials and one another? How will citizens directly influence decisions in the future, for example by voting online or using a mobile telephone? How are governments addressing security and privacy issues and the control/protection of personal information? How can ICT players take advantage of the expected growth/demand for innovation in this segment?

7. NEO-URBANIZATION

Neo-urbanization refers to the transformations that are changing the scope and look of urbanization as we have known it, considerably blurring the boundaries between traditional definitions of urban, suburban, rural and region. New concepts, such as corridors, megacities, connected cities and rural conversion are now needed to describe this on-going phenomenon. The very notion of ‘city limits’ is being stretched to the point of dwindling relevance.

7.1 Megatrend overview

Urbanization is no longer a phenomenon limited to the movement of people from rural areas to the cities looking for improved employment and living conditions. Today cities are getting bigger and smaller, self-contained or linked, suburban or neo-rural, to the point that neologisms are necessary to try and pinpoint these various manifestations of the “city”.

56 Hype Cycle for Government Transformation, July 14, 2011, Gartner
Mega-regions and megacities, such as Shanghai, continue to expand especially in rapidly-emerging markets. On the other hand, smaller self-contained cities like Masdar City in Abu Dhabi are being conceived from scratch. This trend will drive a significant rise in the number of “tier 2” and “tier 3” cities in the shadow of, or encroaching on, “tier 1” cities. This blurring of boundaries raises the need to redefine city demarcations, in terms of jurisdiction, local governance, control of trading zones, local taxes, local services, etc.

Furthermore, as technology now allows for “on-the-grid” quality of life in non-urban areas, “remote” no longer implies disconnected, thereby encouraging people to stay in such areas, or move away from big cities. This has led to the phenomenon of rural conversion, which describes the availability of quality services (health, education, etc.), as well as local economic development in rural settings through technology without traditional urban infrastructure.

7.2 Underlying trends
Some underlying trends driving the phenomenon we call neo-urbanization include: globalization, unprecedented economic growth in emerging countries, increase of regional political and trade harmonization, the drive for sustainability, the rise in connectivity and ease of access to information.

These driving trends have combined to fundamentally impact the dynamics of urbanization and create the phenomenon of neo-urbanization. The common underlying factor in this megatrend is that urban areas, large or small, are becoming networked hubs planned around smart functionality and sustainability.

Mega-Hubs: 10 million people – Just one networked city
The existence of large cities continues to dominate the urban landscape. In fact, this phenomenon is expected to expand further. Mega-hubs are shaped primarily in three forms:

• Megacities, which have a minimum of ten million inhabitants, such as Greater London, New York, Metropolitan Paris, Shanghai, Sao Paulo
• Mega Regions, which combine with suburbs to form regions, such as the combination of Johannesburg and Pretoria with the surrounding suburbs to create a population of over 15 million
• Mega Corridors, which connect two major cities or mega regions, such as Hong Kong-Shenzhen-Guangzhou in China (Population 120 million).

Future developments will be through both expansion of the existing cities and cities built from scratch. These new cities are expected to be predominantly smart cities. It is estimated that by 2020, there will be over forty global smart cities, with over fifty percent located in Europe and North America in 2025, while China and India will have approximately 50 new sustainable cities.58 Alcatel-lucent research on smart cities identified 18 ongoing smart cities projects during 2011.59

57 Frost & Sullivan, Mega Trends That Will Shape the Future of the World, May 2011
58 Frost & Sullivan, Mega Trends That Will Shape the Future of the World, May 2011
59 Getting smart about smart cities, Alcatel-Lucent Market and Consumer Insight, November 2011
Table 1. Smart city projects researched

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Small hubs but efficient

Increased environmental pressures and the drive for sustainability have given rise to the need to consider sustainability from the design stage, rather than just focus on renewing and recycling products. This and the advancement of the Internet of Things (connecting objects rather than people) are leading to the emergence of smaller self-contained cities. These cities, whether built with assets of existing ones or conceived from scratch, are mainly built around sustainability, with strong government support. Some examples of such developments are:

- **MASDAR City in Abu Dhabi**, a walled and highly planned city that will be a clean-technology cluster (solar energy and other renewable energy sources), with a sustainable zero carbon and zero waste ecology. It is planned to be finished by 2025, within six square kilometers and supporting between 45,000 to 50,000 inhabitants. Commuting within the city will be by electric public transport, personal rapid transit systems, and freight rapid transit with roads and railways connecting with locations outside the city.\(^{60}\)

- **Eco-Island (Isle of Wight/England)**, which was started in 2008 with the aim to have the lowest carbon footprint in England by 2020. It will drive the development of ecological infrastructure and employment and generate capacity of over 100Mw of electricity by 2020.\(^{61}\)

- **Tianjin Eco-City**, which is planned for 2020 153 km from Beijing. It is designed for 350,000 inhabitants in a thirty square kilometer area, and will showcase green technologies, powered mainly by solar and geothermal energy.\(^{62}\)

Rural conversion

Increased technology availability in remote areas has enabled improvement of the standard of living in those places. This is beginning to drive migration back to rural areas and provide economy diversification and increased economic activities outside traditional agricultural segments. The weight of agriculture in rural economies in many OECD countries has declined, employing less than 10 percent of the rural workforce and accounting for two percent of GDP.\(^{63}\)

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\(^{60}\) http://www.masdar.ae
\(^{61}\) Isle of Wight’s Sustainable Community Strategy can be found at http://www.eco-island.org.uk/vision/
\(^{62}\) Sino-Singapore Tianjin Eco-City project website – www.eco-city.gov.cn
\(^{63}\) OECD Rural Conference 2007 - Innovative Rural Regions: The Role of Human Capital and Technology
The building of road infrastructures and a rise in foreign or local investment has led to unprecedented levels of property development driving conversion of farms and small holdings into urban areas. A good example is the physical combination of Pretoria and Johannesburg in South Africa to form a mega region in which vast areas of rural land that separated the two cities were converted into urban environments.

It has been shown that significant investment in rural or small villages drives economic growth and leads to urban development. In addition, the Internet has delivered substantial economic growth and created jobs on a large scale. Research has revealed Internet maturity correlates with wealth creation, and the Internet is one of the biggest drivers of global economic growth.

The availability of communication networks that connect the population to the outside world has allowed for advancements in education, medical care and other social aspects in previously remote areas. For example, Tele-stroke treatment through Telemedicine (two-way broadband video connections) in small towns/rural areas in the United States is achieved by enabling doctors in larger cities to diagnose and recommend suitable treatment remotely. Another example is the use of mobile phone technology to control availability of malaria medicine stocked by pharmaceutical companies in remote areas of developing countries.

Remote is no longer Disconnected – A government imperative

The development and availability of technology in rural areas and small towns is a result of efforts by both government and business. Joint initiatives include:

- **Australia** announced in 2009 that it would build a National Broadband Network in partnership with the private sector. The aim is to provide infrastructure to enable broadband connectivity with schools and businesses to more than ninety percent of the country’s houses.
- **China Go West** campaign (2000) was created to encourage local and foreign investment of Western region and Go Inland (2006), a foreign Investment Promotion Plan for Central China, 2010-2015. Both campaigns aim to stimulate development and reduce continued migration to large cities, such as Shanghai.
- **Germany** integrated programmed regional growth, which subsidized small enterprises and reduced interest rates in rural and peripheral areas to encourage local economic growth.
- **Sweden** is encouraging Internet usage by individuals, businesses, and public bodies, and has Invested approximately U.S.$730 million to bring broadband Internet services to small towns and low population density areas.

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64 Carlos Nuno Castel-Branco and Nicole Goldin (2003)
65 McKinsey Global Institute, May 2011 - Internet matters
66 Technology can aid health issues in rural areas. Wisconsin State Journal
67 Can be found on the Novartis Corporate Citizenship website www.corporatecitizenship.novartis.com
68 Department of Broadband, Australian Government
69 Information can be found at http://www.fdi.gov.cn/pub/FDI_EN/News/Investmentupdates/t20100513_121629.htm
70 OECD Rural entrepreneurship
71 McKinsey Global Institute, May 2011 - Internet matters
The United States plans to promote broadband availability and economic drive in rural areas through programs such as:

- Broadband Plan 2010: Connecting America, which is a 360 page plan with government financial backing to develop broadband accessibility in America
- Rural Opportunity Zones Bill, which provides tax incentives for those investing in 50 counties in Kansas and repays loans for students moving to those areas
- Farm Bill Broadband Program, which provides loans for construction, improvement, and acquisition of facilities and equipment to deliver broadband service to eligible rural communities
- Broadband opportunity for rural America, which is a joint initiative of FCC and USDA

7.3 Impact on society

Environment

The creation of well-networked neo-urban units will enable efficiency and increased sustainability while reducing the need to travel outside of the “city” because resources and communication will be readily available locally.

Legal

Many regulatory bodies will need to become more agile to drive legal changes to promote innovation and investment in different vertical solutions driving growth in many industries. Defining the notions of ‘local’ and ‘jurisdiction’ may increasingly challenge future lawmakers.

7.4 Impact on ICT

Neo-urbanization will have a significant impact on the ICT sector. Cities, in any form, are the heart of the ICT sector, and it is in the neo-cities of the world that ICT companies must adapt most radically and quickly if they are to gain a competitive advantage.

Increased collaboration between ICT players

The implementation of smart solutions in smart cities creates new ways of collaboration and each city could be seen as a separate network. Government and/or new manifestations of the municipality are likely to increasingly become key customers or partners. The complexity of these cities calls for collaboration between service providers, particularly in areas where governments have regulatory requirements in favor of local resource development. A study on smart cities conducted by the Alcatel-Lucent Market and Consumer Insight team indicates a variety of ecosystem players. These players include government, small private firms and large multinationals. The level of engagement of each player varies based on the nature of each player’s business and the smart city’s goals. There will be a transformation of businesses into business networks industry-wide, especially with small and medium enterprises (SMEs) and larger enterprises for revenue sharing. There are opportunities for smart solutions that support economy, buildings, mobility, energy, information, communication, technology, planning, citizens, governance, sustainability, education and health.

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72 The National Broadband Plan: Connecting America – found at http://www.broadband.gov/plan
73 Kansas Department of commerce
74 USDA Rural Development
75 Federal communications Commission: Broadband opportunity for rural America
76 Getting smart about smart cities, Alcatel-Lucent Market and Consumer Insight, November 2011
Technology and ecosystem convergence
There will be more technology and ecosystem convergence, with collaboration and partnerships among many stakeholders from different industries, such as energy and infrastructure, IT, telecoms and government, to deliver integrated services that drive growth in vertical industries.

Early adoption of recent ICT innovations
ICT can help developing countries manage a life cycle of connectivity evolution with or without leapfrogging. The choice will be either a life cycle management approach (2G > 3G > 4G) or a leapfrog approach to bring everyone up to the same speed.

The neo-urbanization trend drives new developments in megacities, new cities and corridors, which are more likely to be built using the latest technologies that are more efficient and attainable at a lower cost, (e.g., cloud networks, unified machines, devices, and heterogeneous networks, with mobility embedded in all).

Increasing demand for smart devices – machine-to-machine (M2M)
In the case of smart cities, machine-to-machine complex ecosystems will be prevalent, and there will be a high potential of opportunity for commercial customers and industries, in particular with energy, transportation, public safety, robotics, artificial intelligence, healthcare, retail, infrastructure, telecoms, and home automation. An analysis of 18 smart cities conducted in 2011 by the Alcatel-Lucent Market and Consumer Insight team revealed a large number of ecosystem players involved in the realization of smart city projects.77

Advanced and sustainable transportation systems
There will be increasing advances in transportation infrastructure to connect cities. According to Frost and Sullivan, Spain, China and United States will drive major investments in new rail infrastructure with a total value of $263 Billion in the next 10 years.78 Next-generation, high-speed trains will integrate wireless technology, enabling always on connectivity and will be more energy efficient as well.

Better IT infrastructure
New emerging IT architectures capable of managing the volumes of information and demands of usage for both businesses and individuals within a hub will be important. It will be necessary to provide enough access networks where wireless connectivity and the IT cloud are critical enablers.

7.5 Food for thought
Will the emergence of megacities create local monopolies or increased competition? Will the convergence of LTE and megacities drive exponential demand for bandwidth? Will the growth of smart cities move the value in the value chain to new players and/or a converged ecosystem? How will rural conversion contribute to economic growth in emerging countries? Will neo-urbanization acceleration help address or further exacerbate the digital divide?

77 Getting Smart About Smart Cities: Understanding the Market Opportunity in the Cities of ‘Tomorrow’, Alcatel-Lucent, January 2012
78 Mega Trends That Will Shape the Future of the World, Frost & Sullivan, May 2011
8. REJUVENAGING

Rejuvenaging refers to the frontiers of aging and rejuvenation as well as the far-reaching implications of rapidly-increasing life expectancies in many parts of the world. This not only implies that the “elderly” will make up a growing part of the population, but also that the organization of the typical adult life cycle into mutually-exclusive “chapters”, typically education-employment-retirement, is being challenged.

As people live longer, and expect to live longer, their focus on maintaining an active and engaged quality of life, for as long as possible, will increase. The concept of a quiet retirement in a rocking chair will be pushed further and further out as methods to manage and overcome the ravages of age that in the past forced people into a sedentary decline, will be actively sought and engaged.

8.1 Megatrend overview

Medical breakthroughs particularly in genetics-related diagnosis and treatment are making longer lives a reality and significantly longer lives highly probable in the near future. A forty year-old today may now have an additional 40 years of life expectancy only to discover at 50 that this life expectancy has increased by another ten years and at 60 that it has further increased by another 10 years. If we measure by the expected years we have to live, this could make it seem as if we are getting younger as we age. The notion of life stages and of retirement will have to be rethought. Concurrently, the 60+ generation will have growing political influence to shape the “radically new” social contract that will have to be investigated, designed, debated and legislated.

8.2 Underlying trends

Life expectancy increase
Life expectancies globally are coalescing at approximately 80 years old and rising as advancements in medicine and pursuit of wellness exert their influence.79

In 2010, the senior population in the U.S. — consumers aged 65 and older — comprised 13 percent of the total population. By 2030 these 40 million seniors will have increased to an estimated total of 72 million, which is 20 percent of the projected total population.80

In Europe, between 2008 and 2060, the population of the 27 European Union member states aged 65 and over is projected to increase by 66.9 million, and the group of people aged 80 and over will be the fastest growing segment of the population.81

A United Nations study on World Population Aging shows an increasing proportion of aged persons and a steady decline in the proportion of young persons over the next 50 years by almost one third. By 2050, the share of persons aged 60 or over in the population will, for the first time in history, match that of persons younger than 15 (Figure 4).82

79 Evolving Consumer Landscapes: Key Socio-Demographic Trends Driving Consumer Choices, Datamonitor, Sept 2010
80 Frogatt, Mike, Demographic Profile Senior, eMarketer, February 2011
81 Frogatt, Mike, Demographic Profile Senior, eMarketer, February 2011
82 World Population Aging 1950-2050, UN
Increased need for healthcare
A rapidly expanding elderly population will drive the trend for continuous care. Healthcare has increased and its role changes at various stages of people’s lives, depending upon their individual needs and desires. In general, some people are just interested in maintaining and extending their overall wellness, while other groups of the population use technology to control and monitor manageable illness, and people with chronic and debilitating illness take advantage of technology to make themselves as comfortable as possible as they face the inevitable decline and end of life. This increase of aging population reflects increases in the costs associated with healthcare. According to World Health Organization (WHO) in the U.S. the percent of GDP spent in healthcare has increased from 13 percent in 2000 to 16 percent in 2009. In Europe, the average GDP expenditure reached 8 percent in 2009 compared to 6 percent in 2000.83

Increase in use of rejuvenaging products
The portion of the aging population that wants to extend the “active” years is driving the market for facial rejuvenation products. The rejuvenation product market will increase by 13.7 percent annually through 2015, with the filler and botulism segment leading the way.84 Since 1997, the number of cosmetic procedures for Americans 65 and older jumped from nearly 121,000 to more than 425,000 last year.

Dr. Sheldon Sevinor, a plastic surgeon based in Boston, said he had at least 30 patients last year who are older than 70. “We’re living longer and feeling more vital,” he said, “Age 40 today is what age 30 used to be like.”85

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83 World Health Organization, The global health expenditure database
Baby Boomers, who control about $2 trillion in spending power and 50 percent of all discretionary income, have an overwhelming desire to retain a youthful appearance and are driving the growth for rejuvenation products and services.

### 8.3 Impact on society

**Political**

In the U.S. “Gray Power” — the power of older people with Social Security — represents the most politically active age group, at least as measured by voting rates. This group also tends to vote more than younger people, which leads to increased political clout. This trend is reflected in other countries as well.

**Social**

A generational shift is being observed where the elderly are healthier and have more energy to pursue their activities and take care of themselves, a trend which is particularly significant since the ratio of young to older people is decreasing.

The education system is also impacted, which will have to adapt to provide the skills to maintain an up-to-date work force capable of keeping up with the modern economy as older people remain in the workforce longer, either through desire or because they need the income of full-time employment.

**Legal**

As life expectancy increases, governments will need to review regulations relative to retirement age and provisions for pensions, because it will be no longer be economically feasible for people to retire at ages that were in the past considered elderly and today are perceived more as late middle age. Government-subsidized retirement for people in their 60s will likely become a thing of the past.

**Economics**

Patterns of late-life leisure have important implications for the economy in an aging society. Americans over the age of 50, also known as “silvers”, represent a huge and growing market. They command more than half of the discretionary income and account for 40 percent of consumer demand. It is no longer the 20-50 year-olds who are dominating the workforce. As mentioned earlier, careers will lengthen and as older people work longer and younger people may have reduced opportunities to enter the workforce and advance.

### 8.4 Impact on ICT

**Technology is relevant – Use of technology among the seniors**

Spending on technology is one area where the older segment is ahead of its younger counterpart. The 46 to 64 year old group now spends more money on technology than any other demographic, according to Forrester Research’s annual benchmark tech study.

In the U.S., the number of senior Internet users will climb steadily from 19.3 million in 2011 to 26.2 million in 2015. Seniors are particularly interested in communicating and accessing news online, as well as finding information about travel, health, and banking. By 2015, 30 percent of U.S. seniors will use mobile internet, which was at 11 percent in 2011.

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87 Frogatt, Mike, Demographic Profile Senior, eMarketer, February 2011
88 www.retireandconsult.com
89 Frogatt, Mike (2011), Demographic Profile Senior, eMarketer, February 2011
“The tablet is a good tool for the elderly because it’s very forgiving of mistakes, something the seniors fear when dealing with computers,” said researcher Takahiro Miura of the University of Tokyo, whose team is working with a company in the ICT sector on using computers to help senior citizens rejoin the workforce. “Unlike the PC, it doesn’t require prior knowledge.”

The key for marketers to reach the aging segment is not to dismiss technology as irrelevant to them, but rather to figure out what technology they prefer and which is appropriate for their age, desires and stage of life. An active 60 year-old will use technology in a very different way than a homebound person in his/her 80s.

Older adults have different educational needs than the general population

The education needs of seniors may require simpler explanations of technical terms supported by visual aids. Some seniors may have physical impairments requiring adapted devices, such as mobile phones that are compatible with hearing devices or computers with an integrated web cam for visual assistance. Educational telephone conferencing is another learning tool for seniors, especially those who have little mobility and are largely confined to their homes.

Frost and Sullivan has found that devices aimed at helping older adults live safely at home or in retirement facilities earned revenues of approximately $154.92 million in 2009, a number that will likely rise to $525.58 by the end of 2015.

Technology enabling advanced health solutions

Mobile broadband is a key enabler for telehealth and m-health solutions. These solutions require more reliable and faster networks with the ability to prioritize data. For example, a solution that sends reminders to take a specific medication at a specific time could be done via a standard mobile SMS, and consequently put little demand on the network. A telepresence solution where a remote clinician follows a surgery procedure requires a network that is capable of transmitting relatively high levels of data in both directions, with minimum latency, and high reliability.

Increasing demand for health applications at home or on the go (remote diagnostics or patient monitoring), as well as helping people manage medical conditions that in the past would have been very confining or fatal, offer opportunities for the ICT sector and create market opportunities. Service providers can take advantage of these opportunities by offering e-health or m-health applications and services to consumers looking to benefit from easy-to-use applications and devices that are customized to their level of technical literacy.

The IT industry can also help national health organizations to update their IT platforms and directly influence many other players to create components and equipment supporting health applications.

A wider ecosystem

The emergence of a new type of ecosystem resulting from more collaboration between the health industry, service providers and device manufacturers to leverage platforms capable of delivering intelligence for medical applications, for example highly-integrated with software and clinical decision support.
It is crucial for ICT actors to understand the healthcare ecosystem and the stakeholders, to better understand their needs and provide relevant products and services to improve health services while reducing cost.

8.5 Food for thought

How will solutions be prioritized to meet the needs of both “active and healthy” older citizens as well as those with chronic conditions requiring constant care? What can be done to prevent a class divide between those who have more resources and access to better health care technology? How will businesses adapt their services, segmentation and staffing as consumption, career and life spans lengthen?

9. SUSTAINABLE BY DESIGN (SBD)

Sustainable by Design (SBD) refers to the accelerated transition from sustainability as something that was “nice to have” or a source of competitive advantage to sustainability as a “need to have” and competitive imperative that must inform most aspects of modern business across all industries. As SBD goes “mainstream”, it will also encompass all things “smart” and accelerate their proliferation.

9.1 Megatrend overview

In the past, adopting sustainable practices was a source of competitive advantage. It is now a necessity for companies across most industries. Consumer awareness has achieved critical mass, and green-thinking consumers increasingly vote with their wallets. For many companies sustainable is no longer an option — it is expected to be a part of everything they do. For many consumers, sustainable has become a way of life and a factor that informs consumption.

Sustainable design (also called environmental design) is the philosophy of designing physical objects, the built environment, and related services to comply with the principles of economic, social, and ecological sustainability.95

The achievement of sustainable development requires the integration of economic, environmental and social components at all levels.96

9.2 Underlying trends

Population growth

The world population reached 7 billion in October 2011 and will continue to increase. According to the U.N. it will rise to 9 billion by 2050.97 This has many implications for urbanization, health, consumption of many goods, demand for energy and particularly for the environment, increasing the significance of sustainability.

95 Wikipedia
Also, the U.N. estimates that most of the world’s population growth is coming from emerging markets. These countries represent 80 percent of the world’s population and have different challenges and demands in terms of infrastructure, food, and access to rural areas.

**The active consumer class is growing**

It is expected that during the next 10 years, approximately 800 million consumers of the so-called BRIC countries (Brazil, India, Russia, and China) will enter the formal market.\(^8\) Myers and Kent\(^9\) propose that the environmental impacts of consumption “are becoming all the more important now that the 850 million long-established consumers in rich countries have recently been joined by almost 1.1 billion new consumers in 17 developing and three transition countries.”\(^10\)

In 2007, humanity’s footprint exceeded the earth’s bio capacity by 50 percent. If current trends continue, by 2025, we will need the equivalent of two planets to sustain the consumption patterns of global citizens.\(^101\)

**Acceleration of Industrialization**

As the world has become more industrialized, environmental pressures have also increased. At the local level we face urban air pollution, contamination of soils and rivers and land degradation. Regionally, we face acid rain and water and coastal zone contamination. At the global level challenges include climate change, ozone layer depletion, loss of biodiversity, increased movement of hazardous waste and increased land-based marine pollution.\(^102\)

According to Michael Braungart and William McDonoug,\(^103\) “products need to be made fully recyclable so that, once they are discarded, each part can be turned back into itself again”. Justin McGuirk goes further and gives new meaning to the well-known “less is more” quote from architectural master Mies van der Rohe. McGuirk extols the notion that simplicity and clarity lead to good design.

In the coming decades, social and environmental changes will drive the demand for more sustainable solutions impacting society and businesses. There are many global initiatives driving sustainability programs. For example, The Division for Sustainable Development (DSD) has been supporting the elaboration of a 10-year framework of programs on sustainable consumption and production (SCP). The DSD goals are present in three dimensions, global, business, and social. They aim to assist countries in their efforts to green their economies, help corporations develop greener business models and encourage consumers to adopt more sustainable lifestyles.\(^104\)

For consumers, it is still not an easy thing to know if a product is sustainable or not. As Stephen King points out, “You have to know the objects’ past and future — whether it’s made of renewable or recyclable materials, how much energy went into its production, how it’s going to be disposed of. It’s not objects that are unsustainable, it’s the systems that produce them”.\(^105\)

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10 Schäfer, Martina, Jaeger-Erben, Melanie, Dos Santos, Aguiarldo Leapfrogging to Sustainable Consumption?
11 University of St. Gallen Switzerland - http://www.unisg.ch
13 http://www.guardian.co.uk/artanddesign/2011/feb/03/justin-mcgurik-sustainable-design
15 King, Stephen (2010) Scarce resources should give all governments’ serious food for thought, 6 September 2010.
Environmentalism
Environmentalism has changed from yesterday’s passive concern into today’s will to achieve tangible results. This shift is the result of unprecedented energy prices, a long economic boom and an aging population concerned with its legacy. New environmentalism describes an attitude that includes the perception of environmentalism as a predominantly global issue.106

9.3 Impact on society

Economic
Industry plays a critical role in technological innovations and research and development activities, which are crucial for the economic and social development of any country. It is also key to the development, diffusion and transfer of environmentally sound technologies and management techniques, which constitute a key element of sustainable development.107

Political
To achieve the objectives of sustainable development, governments must integrate economic, social and environmental concerns in their policy-making and promote economic growth and international competitiveness of industry through macroeconomic policies.108

Social
The overriding policy challenge is to promote the positive impacts while limiting or eliminating the negative impacts of industrial activities on social development. Industrialization has the potential to promote, directly and indirectly, a variety of social objectives, such as employment creation, poverty eradication, gender equality, labor standards and greater access to education and health care.109

Legal
To promote the positive impacts of industrialization, governments should review their regulatory policies and systems of economic incentives and disincentives. They must also undertake specific actions, such as capacity-building, environmental data collection and enforcement that support the environmental protection efforts of industry and civil society.110

9.4 Impact on ICT

Sustainability impacts all segments of ICT. The ICT sector is critical for both enabling infrastructure and broadband connectivity and enabling resource efficient products and solutions, particularly as businesses start to recognize that reducing their environmental footprints also helps them reduce costs.

Technology innovation for green IT and telecoms
IT is heavily dependent on energy, most of which comes from non-renewable resources, such as fossil fuels. In 2007, IT accounted for roughly the same quantity of emissions as aviation. Current growth in energy consumption and carbon emission puts IT in an unsustainable condition. ICT contribution to the global carbon footprint is about 2%, with an expectation of multiplying by a factor 3 between 2002 and 2020 however, ICT can contribute to a 15% reduction of global emissions (7.8 Gtons CO2e) in 2020.

106 Anderson, Doug, Senior Vice President Harris/Decima Most established Canadian Market research company
Many companies have drastically reduced power consumption by adopting efficient technologies, efficient processors and virtualization of equipment proactively, considering life cycle analysis (LCA) of their products and innovating to reduce environmental impact.

Suppliers are investing in Green Telecosms and Green IT initiatives to offer more energy-efficient network infrastructure, devices and IT platforms. The main focus is on designing equipment that reduces footprint, such as hardware design for smaller components (chips) integrating multi-functionality to support converged technologies and higher speeds. Also, there is a focus on low-energy consumption and the use of alternative energies.

Pike Research, says capital investment in energy-efficient network equipment will reach $122 billion by 2014, representing 46 percent of the total network infrastructure market. The Asia Pacific region will lead the way in green mobile network spending, representing nearly half the total spend by 2014. European operators are also highly focused on energy efficiency, and the region will amount to an estimated 26 percent of total green mobile CAPEX by 2014.

**Use of smarter devices for better energy management**

From the software point of view, sustainability is driving innovation for more functionality that manages and controls energy consumption adapted to real time usage. Between 2006 and 2010, the proportion of companies using software to track their sustainability performance rose by 50 percent, according to a survey released in January by the Global Reporting Initiative (GRI). McDonough and Braungart, the authors of “Cradle to Cradle”, write, “when designers employ the intelligence of natural systems — the effectiveness of nutrient cycling, the abundance of the sun’s energy — they can create products, industrial systems, buildings, even regional plans that allow nature and commerce to fruitfully co-exist”.

This trend provides opportunities for growth of smart device solutions and energy applications that enable better energy management (buildings, materials, meters). Some examples include smart metering for automatic collection of consumption, diagnosis and state information data from water or energy metering devices, and consumer managed applications to monitor usage of electricity for personal appliances. These types of energy applications can use a combination of technologies, such as home area networks, power line communications, and wireless and wireline networks. A good example of implementation of these applications is the Singapore’s Energy Market Authority “Smart Energy, Sustainable Future” which has been operating a pilot smart grid. It also envisions electric vehicles being used as a distributed storage system, which could be tapped into at peak periods.

“Technology is going to be a game changer (...) The only way we can make smart changes to our planet is by using technology to manage, monitor and control... natural resources”.

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111 Technology has potential to retrofit the world, FT Special report, Sarah Murray, Wednesday March 30 2011
Designing building infrastructure
The world needs facilities that are more energy efficient and that promote conservation and recycling of natural and economic resources. With building thought to contribute some 40 percent of the world’s carbon emissions, energy use is a big consideration. The American Institute of Architect’s (AIA) and International Union of Architects (UIA) signed a “Declaration of Interdependence for a Sustainable Future.”\(^\text{112}\)

Their members are committed to placing environmental and social sustainability at the core of practices and professional responsibilities, educating the building industry players about the importance of sustainable design and working to change policies, regulations, and standards in government and business so that sustainable design will become a fully supported standard practice.

Today, with our growing knowledge of the living earth, design can reflect a new spirit. “The next challenge for ICT lies not in making our lives easier, and more integrated but in making our lives more sustainable”.\(^\text{113}\)

9.5 Food for thought
Is Design for Sustainability getting all the support it needs to turn the tide? In a sustainable by design world, what kind of penalties will be levied on unsustainable business practices? What is your business doing to make sustainability the rule rather than the exception?

10. RECOMMENDATIONS
An analysis of megatrends is an attempt to put a name and description on forces, trends and changes that we see at play in today’s world. This analysis of seven key megatrends reveals that all share a common aspect — an on-going blurring of boundaries of phenomena previously considered distinct. The patterns of change induced by each megatrend are not discretely incremental, rather patterns are distinguishable, with hindsight, in the form of a series of transitions (similar to the venerable product life cycle). This is slightly paradoxical when considering that this study attempts to discern the megatrends that will significantly impact our future. As such, we will only be able to validate the quality and pertinence of our work when we can look back and see how our attempts to identify emerging patterns play out in the years and decades ahead.

The above disclaimer notwithstanding, all of the megatrends in this study were found to have a significant impact on many aspects of our world, including politics, government, economics, society, technology, environment, and regulation. More pronounced is the noticeable convergence of economies and communities: the over-riding impact of these megatrends is that they are rapidly narrowing the divide between developed and

\(^\text{112}\) http://www.uia-architectes.org
\(^\text{113}\) Sustainable Homes conference - November 17-19 2010 - http://ict-sustainablehomes.org
developing economies. A case in point, the Ed-you-cation megatrend details the growth of Internet-based learning which will progressively grant access to quality education irrespective of geographical boundaries and socio-economic considerations, while making international collaboration commonplace.

In addition, all the megatrends selected for this study have a significant impact on the ICT sector. Interestingly, it is often ICT-related developments over the past decade that have, to a great or lesser extent, contributed to the rapid emergence and evolution of significant aspects of each of these megatrends. The result is a DNA-helix-like spiral interaction among these different megatrends, which is also contributing to the further blurring of boundaries between otherwise separate domains — demographics, design, government, health, sustainability, technology, et al.

The ICT sector is increasingly at the nexus of all of these developments, as a catalyst and a beneficiary, as well as a potential victim of the rapid change the sector has induced across all sectors of the economy and in modern lifestyles. It appears more important than ever that the stakeholders in the ICT sector dedicate time, efforts and resources to continually stay abreast of these megatrends and their ramifications.

The study of megatrends, illustrates that it is rarely the dominance of one particular driver, but the combination and interplay of a number of different drivers that lead to the emergence of a particular megatrend. Similarly, as megatrends take shape, the impressions they make also tend to overlap at certain points in time, amplifying their force and often forming new trends.

Possibly, the best example that illustrates this “positive feedback loop” is the intersection of the megatrend 168 (24x7) and always-on connectivity with the other megatrends in this study. This megatrend has significantly facilitated communication of people and things, which, to a certain extent, has facilitated or accelerated the unfolding of the six other megatrends. In other words, the prevalence of this megatrend has hastened the evolution of the others.

Figure 5. Relationships among Megatrends
Looking more closely, the proliferation of connectivity, gave rise to the digital native generation and the Digital Native Acceleration (DNA) megatrend. The evolution of Neo-urbanization (the rise of smart cities, as well as neo-urban and mega-regions) is also being facilitated by the opportunities digital connectivity offers. Increased connectivity also helped shorten the time necessary to reach the critical mass required for citizens to directly, actively and spontaneously impact governments. The lifestyles of the “rejuvenated”, as outlined in the Rejuvenaging megatrend, are increasingly connectivity-based, while both the Ed-you-cation, and Sustainable-by-Design (SBD) megatrends leverage digital connectivity to a greater or lesser extent to drive the megatrend and/or amplify its effects.

This report does not purport to offer all the answers about these megatrends and what they portend. However an analysis of the emerging patterns, dynamics and impacts of each, while considering the questions and challenges they raise is a valuable activity that can assist decision makers in their efforts to make sense of an increasingly complex and rapidly changing world, while contributing to a debate of ideas about the future — our future. And the one thing we can be sure of is that the future will arrive, whether we are prepared for it or not.

11. ACKNOWLEDGEMENTS

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Market knowledge sharpens your business edge
Market and Consumer Insight (MCI) investigates links between consumer behavior, market and technological trends to help Alcatel-Lucent and its clients, communication service providers, make more informed and impactful business decisions.

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• Global and regional, urban and rural, insights
• Research on consumer, market and technological trends

For more information related to planning, strategizing and executing adeptly for smart cities, please contact the Alcatel-Lucent Market and Consumer Insight team at mcinsight@alcatel-lucent.com.

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