

Mobinets: Post-Information Society Reality with Wireless/Mobile e-Technologies

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Abstract

Because there is no information without communication, there is no society without some form of communication. Thus, information society dominantly relies on communication. This notion asks for general shift from computer technology based information society to universal post-information society based on computerless (invisible computers) communication of information. The recent developments in information and communications technologies accompanied with the new form of computerless information appliances pose the new forms of information and communications activities on individual, company, national and global scale. The new vision of unified communications with strong mobility of network users heralds the end of the information age and outlines the structure of the mobinets society as the form of the post information society. The paper covers the basic background on information society paradigm, the current e-technologies development and the process of reshaping social activities to new forms of individual behavior towards consuming information through universal, mobile platforms. Further, post-information society readiness issues are expressed in short with the opening of new scopes for further research.

1. Introduction

The recent developments in information and communication technologies open up the new forms of services, social activities and cultural values. We are exiting the information society that began almost 50 years ago. We assume that much of the social angst that we live with today is a result of moving from the industrial to the information age. In reality, it is about moving beyond the information age and the definitions of the institutions of life change when we move from an industrial to an information society and from an information society to a post-information society. It is important to emphasize that we should suspend judgment regarding the effect of these changes on concepts of relation, new forms of international identification, and the notion of responsibility.

Many believe that one is currently witnessing a revolution comparable to the industrial revolution with a transition to a post-industrial information society. The degree of exploitation of material resources like steel, coal, and oil was the critical parameter for the industrial revolution. This is now replaced by a multitude of manifestations and transmissions of valuable information in the form of commercial, communication within

organizations and between individuals, and entertainment in the form of movies, music, and television. It is a straightforward calculation to see that the limits to growth of an industrial society do apply to an information society. Besides the theoretical argument, there are also a number of very practical reasons why growth in the information sector is much less coupled to growth in material or energy consumption. For instance, tele-commuting can reduce a large fraction of the transportation needs of a society. Therefore it is not surprising that a majority of innovations in the last decades were related to smart e-technologies that allow fast processing of increasingly complex information. Prominent examples are transportation, communication, and media technologies. The more people will have access to information and to networks, the richer will be the information society. Without ensuring open and easy access to people, we may see emergence of info-elitism or two-tier society of info-rich and info-poor. Two major obstacles to access are of a social and geographical nature.

From a social point of view, exclusion already exists in our society under various forms: The information technologies and teleworking provide handicapped people with possibilities to integrate a working process. Telework can help introduce new flexibility into employment and reduce social exclusion by a better exploitation of existing niches [2]. Access to information infrastructure for already excluded people need to be developed to create motivation and decrease the gap between the computer-literate and others. Distance learning facilities can accelerate people's integration and provide new educational opportunities including long-life learning. The new information infrastructure may encourage social groups sharing the same interests, the same characteristics, to create their own electronic identity and to communicate via electronic means. These groups will improve the social cohesion and reduce isolation by facilitating contacts between people from their homes. Handicapped or elderly people may correspond from home with doctors, hospitals, administrations.

From the geographical point of view, we observe a tendency in some regions that businesses and people abandon remote areas to locate nearer to the major cities and towns, reducing the potential for development. This trend also puts pressure on the social and economic structures of cities. By removing the spatial constraints, the information infrastructure has a direct impact on geographical exclusion. The development of decentralized company structures, of teleservices and of

teleworking could help to redistribute economic activities and revitalize community life, encourage regional development and redirect resources away from large centers. Citizens and administrations can benefit from access to information resources normally only available in large towns and cities. Some education and health services could be provided locally with the help of telematics and on-line multimedia programs and services. Small hospitals or medical facilities in rural areas, which are today endangered, can be revitalized by high-speed connections to big hospitals, sophisticated equipments. Some companies and service activities (telesecretariat, electronic publishing, accountancy etc.) have already moved from big cities to rural areas where renting costs and sometimes salaries are lower.

Although many e-technologies from the beginning of the computer age are dealing with information processing and handling, the most important factor in information society development toward post-information stage is communication. Modern philosophy also took the communication as the basic tool of building society. Even more, individual cannot be personal being without any form of communication. The roots are in Jaspers work who stated that every human being begins in communication [9]. Communication has role in forging our identity and humanity, it is the source of what comes to be "true" for us. In the same time, the post-information society needs authentic communication. The individuals, groups and nations as the seekers of wisdom pursue unreserved communication in order to progress in illumination of self, other, and Being. In the area of information technology and networking, Castells based his thoughts on the concept of the network society, and he use the expression the mobile network society, to emphasize the diffusion of the networking logic in all domains of social life by means of wireless communication technology [4]. For an understanding of the post information society, it would be more proper to cope with the term of mobinets based on wireless networks environment. This approach took into consideration many new forms of wireless communications and mobile services but keeping in mind the overall strategy of post-information society development. The proper strategy is needed because of living in an information society we in fact reside in an age of the surprising lack of information. When we talk about the fact that we live in an age of total communication, the mass mediafication comes down to two channels of information – the audio and the visual. In addition, when we speak of the information society, we are in fact verifying that nowadays these channels are hypertrophied, inflated beyond all proportion. They have repressed all other channels for receiving information. Moreover, consequently, the post-informational society is not a rejection of information, but a radical restructuring of the significance of various

forms of information and the recognition of the growing value of non-audiovisual information. In the post-informational society, displaced and repressed means of receiving information and communicating with the other will be reincarnated.

Mobile and wireless communications have created unprecedented possibilities for people to communicate and have been instrument in generating economic growth. This process reshapes the information society with the domination of computer technology into post-information society with the domination of the information appliances and communications technologies that enables people to access content everywhere and to communicate with the content and others from anywhere and with various form of enabled e-technologies. Besides the communications, the content is the next major factor fostering post-information society. Development of the information society will depend on the ability of distributors to develop new service products based on appropriate content from the production side. It is to be recalled that the media and content sector is a growing and significant sector, not only comprising global players but also many thousands of small companies around the globe.

2. Background on Information Society

Writing as dominant information technology was invented for practical purposes. Moreover, why else would it have been invented? It was invented for recording human memory. However, its essence is not recording, but communicating. First people record and then they discover that they can communicate. In other words, without written language, we would revert to a society of hunting, gathering, and primitive agriculture. The same cannot be said of any other single technology. Modern, complex societies can exist without various single technologies, but not without written language. Until McLuhan, no one thought of seeing language as technology. Technology by definition is the conversion of something we have learned into something that we can make practical for use. We use information technology and tools to help us become more skilled in using this technology. The use of ideas, images, or other symbols to stand for objects or events is called symbolic representation. In the context of human language, symbolic representation is achieved using words. Thus, the use of language enables humankind to develop advanced cognitive abilities. In the same time, humans experience and display feelings, emotions, and moods. Every human language enables people to communicate both intellectually and emotionally because words and phrases convey both cognitive and affective meaning simultaneously. The importance of the emotional component in communication looms large, and grows rapidly. As Jensen stated, we are in the twilight of a society based on data. As information and intelligence becomes the domain of computers, society will place new value on the one human ability that cannot be

automated: emotion [10]. The language of emotion will affect everything from our purchasing decisions to how well we work with others and to how we communicate.

Information society could be accepted as development of environment that took place in the late 1970's and during 1980's. This was post-industrial society era, when service industries grew, and there was a market for new industries in industrial societies. The typical characteristics of these industries, information industries, are that they are technologically developed high-tech industries, they involve high-level of R & D input, and they are sold in mass markets. The modern society reached a turning point in the 1970's, when industrial state had reached a certain saturation point. There are at least two schools of thought in the analysis of post-industrial society. One looks at the post-industrial society as a continuation of an industrial society, the other as a new form of society. This latter school of thought has further been divided into (1) analysis of post-modernity that looks at the society after the modern as a completely different kind of society and (2) information oriented society that finds information important in the development of society and economy.

As Negroponte stated, the post-information age is the customization of information [15]. We are creating computers to filter, sort, prioritize and manage multimedia on our behalf. Where information is fast becoming synonymous with knowledge, whereby the realities of the world are tailored to our desires and preferences will generate structural blindness and xenophobia. We will see and know only that which we wish to see and know. Attention has to be drawn to the cultural dangers of being subjected to any monopolizing strategies by information providers, as well as to the dangers of editing our world in accordance with our needs and desires.

Information economy is about the information products and services [6], about the institutions providing these services, infrastructure and the hardware and software of information. The nature of information makes it complicated to analyze information economy. One way is to look at information industry production, information services, and information product services markets. Post-modernity looks at the development of a society as something passed the modernity. It rejects the modern society, and emphasizes new ways of thinking and categories and genres. The post-modernity also looks at the culture and the nature of society more than the economy as a leading model of society.

The phases of information society could be divided into three stages.

(1) The first age was characterized by the technology optimism where information technology changes the society and economy.

(2) In the second stage, information society through technological change produces new modes of production process, where technology replaces labor and capital, and this has effects on every domain of the society.

(3) The third stage brings the globalized and integrated world economy and a global society that is made possible through information networks and time and space separation of information (information can be simultaneously shared by people around the world, regardless of where information is produced and who produced it).

The last phase of information economy and society is the concept based on the global village-idea advocated by Marshall McLuhan [12]. The global village has been frequently used as a slogan for global info-community. The global village idea has been criticized with the question can we talk about a village when people connected through the network do not know each other. The information (products, services) may be global but use-environment is local. As for the post-modern analysis, the technology is an important issue for change of institutions, the ways to communicate, and forms of new connections, networks. The information technology has been looked at in the context of other institutions in society, not as it is per se. On the other hand, information society has looked at the information technology as a driving force for change, determining the change of society or economy. Information society and information economy analysis have looked at the development of society as a normative development, determined by, among other things, information technology and building an economy based on production, processing and distribution of information and communication.

Enchantment with technological innovation has created the desire to integrate information technologies into society [21]. This increasing integration of technology has been heralded as facilitating a new age in human history through the information society model. With the information and communications technology entering our lives with new, amazing innovations everyday, one starts to need less and less people around herself. The best friend becomes a voice on the phone or an e-mail screen through the Internet. Both the mobile phone and the Internet are crucial devices in the information society. Many countries in the world are going towards the ideal information society. The main idea is to introduce information technology to every domain in the society from public services to educational system, from public politics to electronic commerce, and from administration to health services. Information society may well be facilitating faster communication between people within electronic infrastructure, however it cannot be claimed that information technology is bringing the world outside of this infrastructure closer together

[19]. In the same time, there is a general acceptance that within information society, information itself is a commodity available universally.

The *information society paradigm* has looked at the development of society as a continuous development from industrial to post-industrial and information economy or society [13], but the *post-modern paradigm* looks at the development as discontinuous from the modern (industrial) society. For paradigms, information and communications technology is important. The post-modern approach 'liberates' information technology to multiple uses, and for the information society paradigm, it is 'determining' the development of society.

The year 1978 could be the real starting point of the information society's last minute. In response to the questions raised by what is referred to as the crisis at the time, the Nora-Minc report [16] replies that the growing computerization of society lays at the heart of the crisis. It may aggravate or help to resolve it. The computerization of society that is the solution of solving social and economic crisis stems from the convergence of information technology and telecommunications. This work actually opened the way for the telecommunications as the vehicle of the modern society and as the predecessor of post-information society. In the same time, Nora and Minc invent the neologism telematic [16] to give an idea of this process. With e-administration and e-democracy, we are witnessing a historic process, similar to that of the transition from the feudal to the modern society. We are switching to the networked society.

Information-communications systems strengthen the notion that communications is the must for information society. Licklider and Taylor foresaw the need for networked computers with easy user interfaces [11]. These notions are considered ideas of graphical computing, point-and-click interfaces, digital libraries, e-commerce, online banking, and software that would exist on a network and migrate to wherever it was needed. Networks predominantly open new social interactions, and on the global scene, many computers and information appliances are wired or wireless interconnected globally. This would allow all users to access data, software/services, and information/content in a short amount of time and from any place. All of the communication that is actually between communicators must be interactive especially in post-information society - the active information participant always is bringing something to communication through his/her interaction with it.

Murdoch [14] has emphasized the role of communication in the development of society. He looks at the role of communication as an essential part of social development. For Beniger [3], the information technology is the key agent of social development. Beniger coined the term the Control

Revolution as one of the major societal transformations of our time. He described a shift in our society towards better communication and information technology, which will lead to the growth and progress of the economy. Since the two major words in the title could prove to be misleading, he takes great pains to explain the context in which the words "control" and "revolution" are used. Some important questions Beniger asks are why information dominates economic statistics, and why it has replaced industry to represent a country's development. He also questions why computers and microprocessors are so important today, as he examines the relationship between information processing and control. Beniger has in no way discovered this change in society. He is merely elucidating the fact that the society has been transforming gradually ever since the Industrial Revolution. However, Murdoch's point to look at the communication as key element in the development of society, it is perhaps the first one directly pointing to the study of the communication industries and information industries in the development or change of post-modern society.

3. Wireless/Mobile Environment: Mobinets

Since the beginnings of telecommunication technology, we have witnessed a number of major shifts in the application of communications to the needs of our society and industry. In that process, we have seen the marriage of wireline and wireless technologies, of analog and digital technologies, of voice, data, video, image, fax, graphics, etc., to create a computer communications.

Most people function in a world where their desktop-computing appliance is connected through a corporate or private network to a server located somewhere. It is usually assumed that the connectivity provided by this network is reliable and of high bandwidth (typically megabits per second). Nevertheless, in fact, most of us are nomads, moving between office, home, airplane, hotel, automobile, branch office, conference room, bedroom, etc. In so doing, we often find ourselves decoupled from our home-based computing and communications environment. As we move around, we find enormous variations in the computing platform to which we have access (advanced workstation, Pentium-class PC, laptop, palmtop), in the quality of the printers and displays that are available, in the communication device we use. In addition, we may choose to do computing and/or communicating while we are on the move.

Telecommunications has reshaped communication with three major changes. The first was digital that made multimedia communications possible, the second was packet switching (read this as Internet) that opened uninterrupted (always on) access to communications services, and the third was wireless that strengthened mobility. Mobile technologies became familiar part of the lives of most people in

the world. They take it for granted that they can communicate with other people at any time, from wherever.

The actual fact of the current information society stage is that total physical mobility rates have declined. The idea of an increasingly mobile society is a widely held but untrue fact [20]. People travel more, they travel greater distances to work, but they do not change the entire place of living. This notion asks for mobility with the information technology. Thanks to digital networks, data will be shared between different pieces of equipment and their functions merged: the television can become a telephone and vice versa. Personal communicators open the new way of information technology trend with an entirely new set of principles built around intelligence, built around communications, built around complete *intuitiveness*. As Castells stated, diffusion of Internet, mobile communication, digital media, and a variety of tools of social software have prompted the development of horizontal networks of interactive communication that connect local and global in chosen time. The communication system of the industrial society was centered around the mass media, characterized by the mass distribution of a one-way message from one to many. The communication foundation of the network society is the global web of horizontal communication networks that include the multimodal exchange of interactive messages from many to many both synchronous and asynchronous [5].

Mobile communications were fully anticipated information society paradigm with the mobile telephone networks. The mobile phones go around the whole globe with over the billion of mobile phones in use. This notion opens the way for the forth video-communication revolution, since the mobile phones become a ubiquitous screen to the world. It came up after the first revolution made by film, the second one with the television and the third one with the personal computers' displays. After the several years of trying to bridge the gap between personal computers and mobile phones, the personal digital assistance has generated popularity. However, the current convergence with the second display –television – creates the new wireless/mobile environment. We are confronting with the mobile television, the medium that revolutionized our societies that with widespread use of personal computers become information society. As the consequence of such convergence, the current environment in which more people watch television than have mobile phones will be transformed soon in the opposite scenario where more people watch television on the move with the mobitelevision asking for new kind of interactivity.

Early wireless interactivity standards, like WAP, will begin to look like CP/M, an early operating system that was used before the adoption of CGA and windowing computing environments that

propelled the adoption of DOS and Windows. Thus, WAP loses steam, and it is replaced by a "3G/OS", an emerging multimodal user interface that will support rich graphics, high bandwidth communications, and DWIM (do what I mean) interactivity via a voice recognition-based point devices. In the same time, these devices widely used activate the process of decoupling applications from wireless network service providers, completely and irrevocably interlinking the Web with wireless browsers.

Applying the concept of ubiquitous computing to cell phones means not only acknowledging the pervasiveness of the technology, but also viewing the mobile phone as a type of computer, which includes Internet connection, personal organizer, ability to send and receive emails and instant messages, besides helping community formation. Moreover, although mobile phones are not invisible, their popularity in today's world transforms the device into the most pervasive technology in contemporary society [18]. As we enter that next stage of Internet development, we face the challenge of maintaining the Internet's expansion and achieving seamless, global, high-speed, efficient and economic access solutions [17]. Web information and services will soon be accessible from a wide range of devices, including cellular phones, palmtop, and other small mobile devices. Moreover, emerging broadband and third generation wireless technologies will serve as efficient and economic Internet access alternatives for developing countries lacking a sophisticated communications infrastructure. Needless to say, wireless plays an integral role in the post-information society. We are speaking about Mobinet and no more about Internet. The variety of portable computers is impressive, ranging from laptop computers, to notebook computers, to personal digital assistants, to smart credit card devices, to wristwatch computers, etc. In addition, the communication capability of these portable computers is advancing at a dramatic pace from high speed modems, to PCMCIA modems, to email receivers on a card, to spread-spectrum hand-held radios, to CDPD transceivers, to portable GPS receivers, to gigabit satellite access, etc. The new personal information appliances will have most of converging technologies built.

Various wireless mobile network technologies and their synergies are experiencing rapid development and deployment. The advancement of this technology enables ubiquitous infrastructure that supports a range of mobile services in addition to mobile Internet access. Driven by the equally rapid advance of mobile terminals, end-user demand for mobile handsets to run heavier applications is increasing. One recent trend is effectively run desktop PC-oriented heavier applications on mobile unit. Novel offloading services can seamlessly offload some of the tasks of a mobile application from a mobile device to nearby, resource-rich desktop computer. The application of offloading mechanisms in the

domain of resource-constrained mobile Internet computing has started attracting attention in research communities. Balan [1] coined the concept of cyber foraging for mobile devices and described it as a mechanism to augment the computational and storage capabilities of mobile devices through task distribution. Cyber foraging thus becomes the transient and opportunistic use of compute servers by mobile devices.

The actual development of wireless networks is about wide deployed Wi-Fi protocol 802.11b (and the supplemental c,d...). An increasing number of business and services are benefiting from the effectiveness, mobility, scalability and productivity advantages of Wi-Fi, and are looking for more new services. New powerful technology is poised to revolutionize wireless communications – it is about Worldwide Interoperability for Microwave Access (WiMAX). WiMAX combines the familiarity of Wi-Fi with the mobility of cellular that delivers personal mobile broadband that moves with users. WiMAX as a broadband wireless technology, supports fixed, nomadic, portable and mobile access. To meet the requirements of different types of access, two versions of WiMAX have been defined:

- 802.16-2004 WiMAX based on the 802.16-2004 version of the IEEE 802.16 standard and on ETSI HiperMAN. It uses Orthogonal Frequency Division Multiplexing (OFDM) and supports fixed and nomadic access in Line of Sight (LOS) and Non Line of Sight (NLOS) environments.

- 802.16e WiMAX based on the 802.16e amendment optimized for dynamic mobile radio channels. It provides support for handoffs and roaming. It uses Scalable Orthogonal Frequency Division Multiplexing Access (SOFDMA), a multi-carrier modulation technique that uses sub-channelization. This version is designed to support portability and mobility.

These two flavors of WiMAX will coexist and address a growing demand for wireless broadband access in the fixed and mobile environment. This new e-technology can be used for a range of applications, including high-speed connectivity, as well as last-mile connections. All of these notions about wireless are deeply connected with the availability of radio spectrum. Spectrum today is managed as real estate carefully parceled out by government. Recent high-priced auctions have established enormous and unrealistic prices for these properties. Yet, new ways of running the pond are emerging, because we can pack more and more intelligence into the water lilies and frogs. Using less power and at lower prices, wireless spectrum can be employed far more efficiently. Particularly interesting are areas set aside as freely usable by anybody, for anything, without a license. These relatively small chunks of bandwidth, sprinkled across different frequencies, are considered more or less junk. This unlicensed

spectrum is used for cordless phones, garage door openers, microwave ovens, and all sorts of other innocent but unforeseen applications that reshaped post-information society. This notion is based on femtocells and picocells utilization in wireless environment.

Coping with the wireless networking, the backhaul plays a vital role in mobile networks by acting as the link between Radio Access Network equipment and the mobile backbone network. This means that backhaul is able to transport mobile data from the end user to the Internet (or similar network), mobile networks and traditional telephone networks. In this new situation backhaul networks with many cell sites have become the bottleneck offering insufficient capacity to support higher bandwidths and often expensive to upgrade. The solution is in migrating from existing separate, legacy ATM and TDM backhauling networks to a more cost-effective, converged, MPLS-enabled, and multi-purpose infrastructure. In addition to reducing operational costs, MPLS-based networks will also lay the foundations for the delivery of next generation mobile services, such as location-based services, mobile gaming and mobile TV, and for the use of future technologies such as Long Term Evolution (LTE) and mobile WiMAX. Ultimately, this fully consolidated network will be able to handle many different types of traffic on a single network cell. Third-generation mobile networks have become a reality, and by the end of 2007 there were 190 3G networks in commercial service across 83 countries worldwide with over 800 different types of 3G devices launched into the market available from around 90 suppliers (source: Global Mobile Suppliers Association, Dec 2007). The new backhaul infrastructure must therefore meet three main criteria: it must be flexible (to support both legacy and IP services), scalable (to support emerging future technologies) and cost-effective. It also needs to be a converged network. As network speeds continue to improve, the environment for innovative new data services will also prosper. These new data services will encompass many elements: location-based services, mobile TV, social networking, mobile gaming and many more. One way to solve the backhaul problems is in implementing MPLS technology that reshapes Wi-Fi networks deployment.

What people have learned with Wi-Fi, and recent experiments with spread spectrum and CDMA, is that we can rethink how we allocate spectrum, because the spectrum is a nation's asset with its own limitations so it must be managed in a planned and useful way. Short-range, last-mile IP broadband wireless (most likely a secure form of Bluetooth and/or 802.11b) is on the move, and deeply influence the way that we connect. For example, if you meet someone at a business meeting, you will be able instantly share not only your business card, but also the personal information and media that matters to

you. In fact, this trend will drive the adoption of identity servers as the key point for growing identity services that are the core services for most of the m-commerce applications. These identity service providers will manage personal database of preferences, contacts, calendars, behaviors, speaker dependent voice records and vocabularies, etc. However, today's users want open standards, access to a combination of systems and platforms - access, inevitably, to everyone at any time. This makes the room for OpenID concept that anyone can identify himself or herself on the Internet the same way Web sites do with a Unified Resources Identifier (URI). Since URI is at the very core of Web architecture, it provides a solid foundation for user-centric identity. In that context, the Universal Identity agent will manage and distribute this information based on privacy requirements and security parameters that a person controls.

The combination of portable computing with portable communications is changing the way we think about information processing. We now recognize that access to computing and communications is necessary not only from one's home database, but also while one is in transit and when one reaches one's destination. Even without portable computers or communications, there are many who travel to numerous locations in their business and personal lives, and who require access to computers and communications that are available at their destination when they arrive there. Indeed, a move from one's desk to a conference table in one's office constitutes a nomadic move since the computing platforms and communications capability may be considerably different at the two locations. A fundamental way in which nomadic computing differs from conventional operation is the huge variability in connectivity to the rest of one's own computing environment. That level of connectivity often includes extended periods of low bandwidth or no communication at all. Since many users and programs make intermittent, but nevertheless essential, use of "offmachine" information and services, they will be unable to operate effectively unless extraordinary steps are taken.

Fixed-mobile convergence is the trend towards integrating wireless and wireline networks and services to create a unified telecommunications system. There are four aspects of the convergence: commercial, service, network and terminal. All of these aspects are consider IP network connectivity and functionality. One crucial component for development of new services applied to post-information society paradigm is IP Multimedia Subsystem (IMS) as the new way of all-IP networks convergence. IMS is ideal platform for delivering a range of value-added services in timely manner. IMS is the new model for creating the integrated core IP network. It allows a range of

devices to access the same services within the IMS-based all-IP networks, and it brings total mobility to users. Users can be connected instantly with each other over packet networks, and IMS using session initiation protocol (SIP) forces fixed-mobile convergence guarantying full quality of services. IMS is also a solution to dismantle the barriers that people are frustrated across current networks and applications. Thus, the communications evolution for service providers is based on delivering personalized, easy-to-use multimedia services that allows individuals to communicate instantly and naturally without restricting location, access type or media. In the same time, people confronted with many e-technologies want only to communicate and they do not care about these high e-technologies. Thus, these e-technologies should be invisible to the users making a virtual networking environment.

The goal of transparent virtual networking is precisely to permit users and programs to be as effective as possible in this environment of uncertain connectivity without changes to the manner in which they operate. That is, transparent virtual networking makes the sometimes connected computer operate in the same way and as effectively in standalone operation as when it is connected to the organization's information network. Many people think of wireless communications as the enabler, or even the characterization, of nomadicity. The view we take is far broader than that. It is true that wireless communications may be a component of nomadicity, but it is not a necessary component. When people travel across the country and check into a hotel, they have made a nomadic move as they attempt to connect their laptop via a wireline analog modem to the network infrastructure; no wireless communication is there involved. Indeed, we emphasize that much of the action for nomadic computing takes place at the middleware level of the commonly accepted layered architecture.

All of these notions consider various types of access and services, and evolution of open transparent network is on the move towards the development of multi-service access networks (MSAN). A MSAN is a single piece of access equipment that can provide multiple types of services to a range of different customers. This concept brings the reduction in devices utilized for network access enabling users with single or several devices to access all network services. It is undoubtedly the forerunner of ubiquitous network scenario. Nevertheless, many of these appliances that encompass us into post-information society will not be useful if it would not be well designed to anticipate not only the access to network but also the communication between the user and appliances. The keyword is usability that incorporates an entire range of design issues, ranging from access to user cognition. The current need is to design usable e-technologies that ease people into the post-information society to ensure equal opportunity within our societies.

4. Ubiquitous Network Environment

Ubiquitous computers, networks, information, and services make the road towards a smart environment created on both real and cyber spaces. A smart environment is mainly characterized by ubiquitous intelligence or computational intelligence pervasive in the physical world, filled with ubiquitous intelligent or smart things that are capable of computing, communicating, and behaving smartly with some intelligence. One of the profound implications of such ubiquitous smart things is that various kinds and levels of intelligence will exist ubiquitously in everyday objects, environments, systems and even ourselves, and possibly be extended from man-made to natural things. A smart thing can be endowed with different levels of intelligence, and may be context-aware, active, interactive, assistive, adaptive, automated, cognitive, autonomic and/or thinking.

The core is a network that makes ubiquitous networking in any sense. A ubiquitous networking is a federated network technology that supports various enablers such as 3G mobiles, RFID tags, sensors, actuators, etc. It has enough capability to deal with huge number of IP packets generated from enablers. At the same time, a lot of broadband contents are requested to be delivered with perfectly controlled QoS. Efficient and scalable routing and transport mechanism for supporting such various traffics is fundamental requirement on the network. Ubiquitous technology comprises of various components. Thus, no single key technology has been identified while ubiquitous target is still ambiguous. Ubiquitous networking brings together just about everything and anything

the mobile user/nomad could want telecom-wise everywhere, the true Internet of everything. On this model, all applications are portable to any device, any user, in any location. It brings together computing and networking, mobility, entertainment, and intelligent sensors (Figure 1.).

The concurrent evolution of computing, microelectronics, wireless data technologies and the Internet have given rise to data mobility, too. These notions lead to the direction of nomadic wireless services that will be boosted by WiMAX, an extension of Wi-Fi wireless technologies. There has been too much expectation on ubiquitous network society. Important thing is to build up valuable ubiquitous services/applications step by step, no matter how small they might be. A truly ubiquitous and universal network is something that most surely will emerge, but not as quickly as we might like. Certainly, we can reach a degree of ubiquity reasonably soon (though not universality) with regard to devices and appliances, we are all currently familiar with today. That is, a practical ubiquity using PCs, pagers, PDAs, etc., and both wireline and wireless capabilities. Everything we all do today in using the Internet is not unlike the transactions we have always performed - in one fashion or another.

We used to do these things through the mail or telephones - or we got in our car and drove to a retail store, a library, a museum, etc., and made our transaction or otherwise did our business. However, when one considers all of the elements that may utilize computer chips and wireless networking in the future, universal and ubiquitous networking is a ways off. We are only at the beginning of the true networked society. Today we are using new

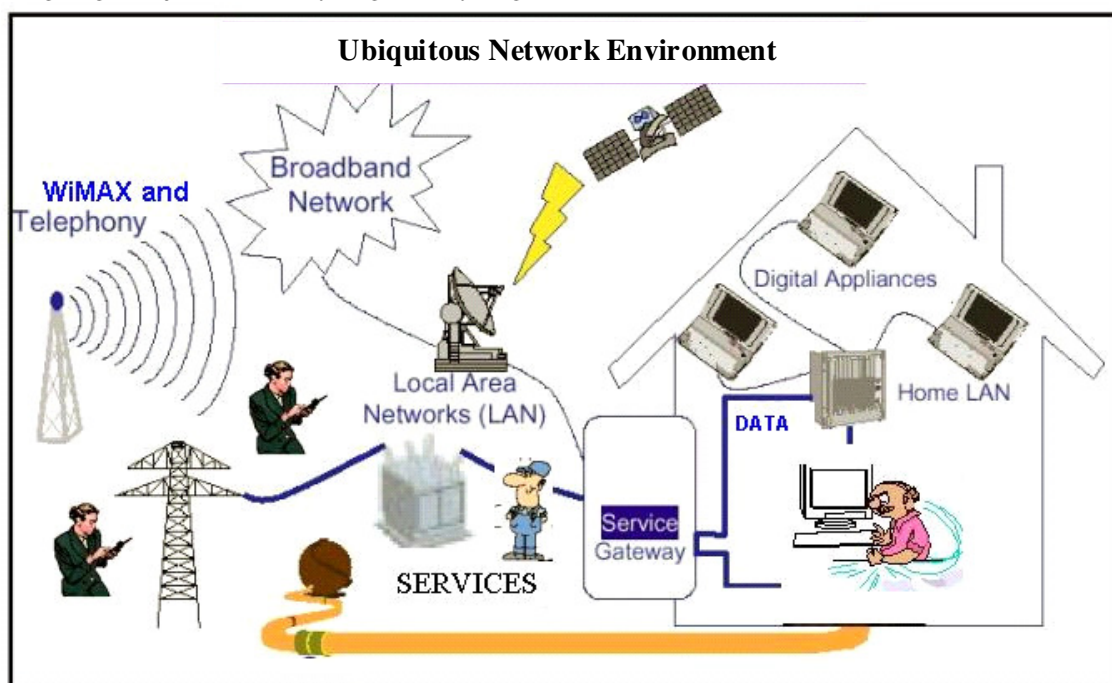


Fig 1. Ubiquitous Network Environment

technology to do those things we have always done, only doing them better, faster, and cheaper. When we fully integrate this emerging technology into everything, and we use it for our day-to-day tasks, then we will have reached a pretty fair degree of ubiquity and universality.

5. e-Mobility Platform

Nomadcity is clearly a newly emerging technology with which users are already surrounded. It is a paradigm shift in the way computing will be done in the future, and information technology trends are moving in this direction. □Nomadic computing and communications is a multi-disciplinary and multi-institutional effort that has a huge potential for improved capability and convenience for the user. At the same time, it presents at least as huge a problem in interoperability at many levels.

Access to wireless communications provides two capabilities to the nomad. First, it allows him to communicate from various (fixed) locations without being connected directly into the wireline network. Second, it allows him to communicate while traveling. Although the bandwidth offered by wireless communication media varies over an enormous range as does the wireline network bandwidth, the nature of the error rate, fading behavior, interference level, mobility issues etc., for wireless are considerably different. Hence, the algorithms and protocols require some new and different forms from that of wireline networks. For example, the network algorithms to support wireless access are far more complex than for the wireline case; some of these are identified below. Whereas the location of a user or a device is a concern for wireline nets as described above, the details of tracking a user while moving in a wireless environment add to the complexity and require rules for handover, roaming, etc.

The current fixed-mobile convergence is the trend towards integrating wireless and wireline networks and services to create a unified telecommunications system. There are four aspects of the convergence: commercial, service, network and terminal. The unified communications concept means breaking down barriers so that people using different modes of communication, different media, and different devices can still communicate with anyone, anywhere, anytime. The current technologies in mobile environment also use the L-band and potentially Band III spectrum to deliver television and radio services to mobile phones and information appliances using the WorldDAB Eureka 147 standard, T-DMB application and the enhanced packet IP based variants. Eureka 147 is a standard for digital radio broadcasting originally developed in Europe, but now being deployed in many countries around the world. It is more commonly known as Digital Audio Broadcast (DAB). The Eureka-147 version of DAB provides for an ensemble of audio and ancillary service in

the 1.537 MHz of bandwidth of a DAB channel in this scheme. In the same time, there is the fact that listening to digital radio receivers (DAB) has overtaken combined listening over digital television and the Internet - this is due to the greater mobility of the users/listener accessing services, information and communicating with others. Data services and applications just in use tell the story of Eureka-147's ability to provide ancillary services in terms of multimedia transmission. These include HTML pages, JPEG pictures or slideshows and MPEG movies using the Multimedia Object Transfer (MOT) protocol. Eureka-147 is definitely not radio as we once knew it, and it brings the new platform of multimedia wireless communication medium.

There are many IMS-based convergence solutions in spite of some open issues remaining to be resolved including user identification, authentication and authorization, interoperability between types of networks, numbering, and handoff mechanisms.

6. Post-Information Society Readiness

Towards the end of the nineteenth century and during the first half of the twentieth century, a loosely knit group of European intellectuals was deeply committed to exploring ways in which knowledge might be better organized and disseminated in order to promote the progress of science, social welfare, and new international institutions. The "information" interests of the key figures involved reflected what we might label a modernist

The post-modern society is the basis for post-information society. What is different in the analysis of industrial societies or post-industrial societies? First, the information society paradigm gives emphasis on a continuous economic growth and a model of technologically developed society. Secondly, the post-modernity emphasized the change of society from modern and industrial into a completely new society. It has rejected the modern society. The post-modern analysis looks at the structure of society from a completely different point of view. It rejects the linear development of society from one form to another, from an industrial society to a service economy and information economy. In short, it is looking at the information as a key resource in society and economy. Its concept is based on presumption that today's society and economy is still building on the information technology.

Jean-Francois Lyotard is the best-known scholar of post-modernity; and his ideas of the society after the modern are widely shared. Baudrillard, Heidegger, Simmel, Habermas and Jameson have been the mostly referred amongst the social theorists of the post-modernity. For them, the society has passed the modernity, and we live in the era after that, the post-modernity, which is discontinuous from the earlier form of society, the modern society. For Lyotard and others, postmodernism means the following: there's an end to the grand story of development, there are

no boundaries between categories or genres, the state and social institutions have lost their meaning and role in society, and the categories and genres are producing new structures without earlier history.

As the analysis of information or post-industrial society has emphasized the role of information technology and industries in the development of society, the post-modern analysis has emphasized the changes in the structure of society, in the production and decoding the meaning in the communication processes. The first, the information society analysis, is driven by the technology and information or communication industries. The second, the post-modern stresses the decoding and understanding the processes of communication in the development of society, how they produce new structures of society and new communities of communication. The communication or information technology is thus analyzed in the context of social institutions and the structure of society, how technology produces these new communities and structures.

Modernity according to sociologists and economists has industrial society as a main characteristic. Therefore, it is important to analyze the nature of modern society as an industrial society. Giddens describes modernity as a society with the following institutional dimensions: industrial mode of production, capitalism, surveillance and military power [7]. Capitalism and nation-state have been the major forces of modern society. One of the driving forces of modern industrial society has been the economic growth based on high-level of technological innovation and technology used in the industry. The information functions in the modern society and nation-state have been the surveillance (control of information) function, regulation and the information embedded in the production process (technology and labor).

Today, the economy is globalizing and integrating. The nation-state is no more an independent economic unit; the economic systems are becoming integrated and global. This means, for example, the transnational companies are exceeding the nation-states, and the global division of labor, capital and markets is taking place. In addition, the global distribution of information is there, and that strengthens the development of globalization of information, like news, exchange and currency-rates and raw materials. The modern society has embedded several hypotheses. They are as follow: the separation of time and space, the globalization of information, the concept of time and phase of time, the modern society lacks time, or time is measured in slices that are valued in abstract measures. The modern society is also a complex system that requires a large amount of information and knowledge to both for organizations and

individuals to be able to manage in every-day life, there is a demand for practical information, as well as practical information. This creates again new markets for information services and products. As an example, to be able to use an automated bank teller, or to make a reservation in a concert, one has to gain a certain amount of knowledge, how to use the computer, and network.

No society without individuals, and therefore post-information society is impossible to be developed without new kind of humans that not only live within and use e-technologies but also communicate and work as new human kind. One point of view comes from Hauben who coined the term "Netizen" and introduced it into popular use [8].

Licklider and Taylor envisioned the world of the Netizen several decades ago. They understood the computer as a communication device [11] while others still treated it as an arithmetic engine. It is important to understand Licklider's vision since he focused on the communicative and community aspects of the future of computer networking. His ideas reflect the true importance of the Network. Licklider and Taylor established several principles from their observations of how the computer would play a helpful role in human communication.

These principles were:

- Communication is defined as an interactive creative process.
- Response times need to be short to make the conversation free and easy.
- Larger networks would form out of smaller regional networks.
- Communities would form out of affinity and common interests.

The Network has made a valuable impact on human society. The enhancement of people's lives provides the incentive needed for providing access to all in society. Society will improve if network access is made available to people as a whole and these newcomers are introduced to the principles of Netizenship. Only if access is universal will the Network itself truly advance. The ubiquitous connection is necessary for the Network to encompass all possible resources.

These words on the Network (dominantly understood as Internet) as communication medium must be broaden with content everywhere paradigm as well as total mobility in accessing information and in communication with others to shape post-information society environment.

The new attributes are denoted to the post-information society (Figure 2.):

- mobility – people carry mobile phones and other information appliances
- broad reachability – people can be reached at any time and from anywhere

- ubiquity – easier and ad-hoc information access in a real-time ubiquitous network environment
- convenience – information appliances that store data have IP-based network connection via fixed and wireless access points
- localization and personalization of services and devices

integration, applications, commercial operation and services, is part of the overall strategy for entire mobinets society.

The truly developed mobile environment based on e-mobility platform will improve the entire post-information society and also improve daily life of people by overcoming technical challenges such as secured electronic payments, personal and business data access anywhere at anytime, and seamless

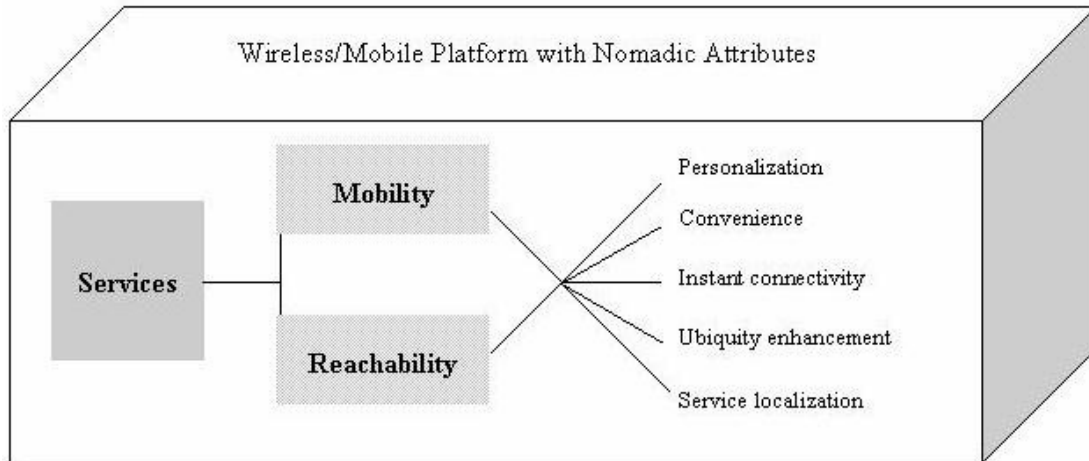


Fig 2. Mobile Platform Attributes for Post-Information Society

7. Conclusion Remarks

The communications has made a valuable impact on human society. The enhancement of people's lives provides the incentive needed for providing access to all in society. Society will improve if network access is made available to people as a whole. In the same time, the concurrent evolution of computing, microelectronics, wireless data technologies and the Internet have given rise to data mobility. Furthermore, telecommunications has reshaped communication with three major changes. The first was digital that made multimedia communications possible, the second was packet switching (read this as Internet) that opened uninterrupted (always on) access to communications services, and the third was wireless that strengthened mobility.

Mobile and wireless communications have created unprecedented possibilities for people to communicate and have been instrument in generating economic growth. The actual shift toward human oriented communication as well as toward fundamental social values' confirmation is about mobility and total access from any place, at anytime. With the strong convergence of fixed-line and wireless communications networks, further deployment is available to reshape social activities to new forms of individual behavior consuming information through universal, mobile platforms. Forming a complete WiMAX ecosystem, including chipset, network elements, test labs, system

continuity of services between networks and information appliances.

Nevertheless, much of these appliances that encompass us into post-information society will not be useful if it would not be well designed to anticipate not only the access to network but also the communication between the user and appliances. The keyword is usability that incorporates an entire range of design issues, ranging from access to user cognition. The current need is to design usable e-technologies that ease people into the post-information society to ensure equal opportunity within our societies.

The real development of post-information society is considering efforts to realize mobile ubiquitous network environment that ensure prompt connection and information access anytime, anywhere by anyone with anything. Post-information society utilizing this ubiquitous network environment is the new universal platform where people are able to share knowledge and information, create new social and cultural values, and realize a more convenient life by exchanging a wide range of information and utilize various types of services. The combination of mobile with Internet and IP-based technologies, and the integration of fixed and mobile technologies, raises a host of possibilities for innovative applications and new modes of interaction. Wireless applications of pervasive and ubiquitous technologies conjure up images of intelligent mobile networks environment

reshaping our post information society into real mobile-networked society. Thus, the realm of post-information society becomes the truly mobinets society of the future.

Finally, the post-information society based on wireless communications environment is strongly coped with the co-emulation needs. In the context of multicultural and multisocial communications, be it individually or grouped triggered, there are two directions. One direction is to try to make an individual or group (or even nation) similar to other individual or group. Another course is to accept/understand an individual or group behavior, culture from other individual or group reshaping its own sense to better meet different sets of value, believes and knowledge. To provide socio-economic model for post-information society it is important to emulate others and to help others to emulate us. The process of mobinets society development creates the new social framework where the individual, a group or nation can no longer confine the boundaries of its social networks to its own cultural, social or national borders. They will coexist inside co-emulated social environments based on open societies that wireless communications and mobinets encompass.

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