

Technological Convergence

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Abstract- Nowadays we are witnessing a convergence of technologies and new forms of communication that allow for the personalization of mass communications and standardization of individual communications. Even though convergence lacks a generic or universal definition, it can be divided into technological, market, economic, and regulatory categories; and is taking place between infrastructures, and at the content, service, and application levels. As technological convergence relates to the information and communication technologies (ICTs) sector, it is not only a technological issue but also a developmental one, with impact in everyday lives and bridge of digital divide. It is changing the nature of communication, consumption, work and leisure; and, more important, it brings benefits and opportunities as well as challenges and threats to our society. The objective of this paper is to mention those benefits and opportunities along with some concepts about convergence and, finally, to give some recommendations to overcome challenges.

Keywords: convergence, technologies, communication, infrastructures

1.0 Introduction

The first computer system was built by Abacus. Blaise Pascal has been credited in the history of computer for building the first digital computer systems in 1642, which basically added numbers entered with dials, and was made to help his father, a tax collector. That is how the digital 0's and 1's has been used to represent quantities in computer systems. We have often been asked questions such as, "what is the 0's and 1's, the bits and the bytes?" "Is it important to understand how computer systems uses bits and bytes in order to work with them?" and we also frequently hear people comment "we - simply do not know why we cannot understand the 0's and 1's, and the worst is the TCP/IP".

2.0 Advent of Technological convergence

Technological convergence is the tendency for different technological systems to evolve toward performing similar tasks. Convergence can refer to previously separate technologies such as voice (and telephony features), data (and productivity applications), and video that now share resources and interact with each other synergistically. The rise of digital communication in the late 20th century has made it possible for media organizations (or individuals) to deliver text, audio, and video material over the same wired, wireless, or fibre-optic connections. At the same time, it

inspired some media organizations to explore multimedia delivery of information. This digital convergence of news media, in particular, was called "Mediamorphosis" by researcher Roger Fidler, in his 1997 book by that name. Today, we are surrounded by a multi-level convergent media world where all modes of communication and information are continually reforming to adapt to the enduring demands of technologies, "changing the way we create, consume, learn and interact with each other".

- Convergence; allows for, thanks to advances in digitalization, different types of content (data, audio, voice, video) to be stored in the same format and delivered through a variety of technologies (computers, mobile phones, television) or to be executed in different platforms. There are two broad definitions of convergence; technological and media or content.
- Technological convergence; occurs when multiple products come together to form one product with the advantages of all of them.
- Media convergence; refers to the removal of entry barriers across the IT, telecom, media and consumer electronics industries, creating one large 'converged' industry.

3.0 Digital Convergence

Ifeanyi O. Asonye defined Digital Convergence as the priming of underlying digital technology components and features such as voice, texts, video, pictures, broadcasts, presentation, streaming media, global connectivity and personalized services; the combination of all of these features and abilities from multiple electronic systems into a simplified, converged and computer-mediated communication system to enable individuals interact, play, communicate, collaborate and share information in many new and different ways.

Digital convergence is an evolving reality, not a future pipe dream. This is amazing advances in computational capability forecasted by Moore's Law and made into reality by semiconductor manufacturers that are the primary engine. Computer Systems has been digital since the first computer about 2000 years ago. If you are really interested to learn how the computer systems work and communicate, the answer is yes, you must understand the bits and bytes, however, an end-user only needs to know how to use a digital system productively, so, don't be daunted or overwhelmed

much less become scared of the Digital Convergence Technology. Nonetheless, there is no doubt that a thorough understanding of the Fundamentals of Digital Systems (the 0s and 1s) is the key that unlocks understanding, for designing, architecting, implementing, integrating, fixing and troubleshooting all global digital systems.

It is an understatement to say that convergence between computers and consumer electronics is escalating, creating challenges and opportunities for both businesses and consumers. Now, it cannot be over-emphasized that the consolidation of separate email, voice, and video, fax and data resources presently offers an opportunity for system integrators and significant savings for business of all sizes. Accordingly, the challenge of integrating email, voice, video, fax, and data is becoming a rising priority for many network managers.

In this decade, we are just beginning to tap into the numerous benefits and features of Digital Convergence using digital technology, made possible due to the ability of the many different things such as pictures, voice, video and data to be digitized into the 0's and 1's and subsequently into very small files.

Digital Convergence Technology

Technology is changing so fast that no one may be capable of giving you a one hundred percent detail of what is happening at any given time.

It is worth noting that presently, there are tons of futuristic designs in software and hardware. Many of them happened several years ago, and are still fairly expensive for the consumer market. Many of the current systems, and some of the designs are still very expensive to upgrade. There are lots

of prototypes in the research laboratories. In the academic area, algebra, physics, engineering math and algorithms has many "constants" and "variables". From "**silicon chips**" to the "**point charges**", the possibilities and products of the **end results** in combination with physical properties of the materials are **exceedingly great**.

Many of the potentials have yet to be offered and implemented for consumers. When you go to the Microsoft® Research, for example, you will see lots of things that are going on there. Microsoft® spends billions of dollars researching technologies that neither have anything to do with windows, office, nor would you ever think the consumers will need them for anything. You will observe that if you upgraded or purchased a new business PC with an Operating System such as Windows 2000, and if you are not a "Power User", there is probably not enough reason to upgrade very quickly, in 2003-2004. What we are seeing is transition on how computer systems will be used in many different ways in the very near future, and that is the promise of the Digital Convergence Technology.

Digital Convergence would have become wide-spread before we can seize complete control of the Internet and enjoy its full capabilities. We shall discuss Digital Convergence briefly so that you can explore, enjoy and profit from the new capabilities offered by the emerging Digital Convergence Technology.

Understanding Digital Convergence is neither about the ability to identify components of the emerging digital environment nor the ability to quickly and visually distinguish between say, a Palm Pilot PDA, Digital Mobile Phone, a Pocket PC, or the Tablet PC and a Laptop. It is important to understand the features and benefits for you as an individual or a professional in today's fast paced and competitive business environment.

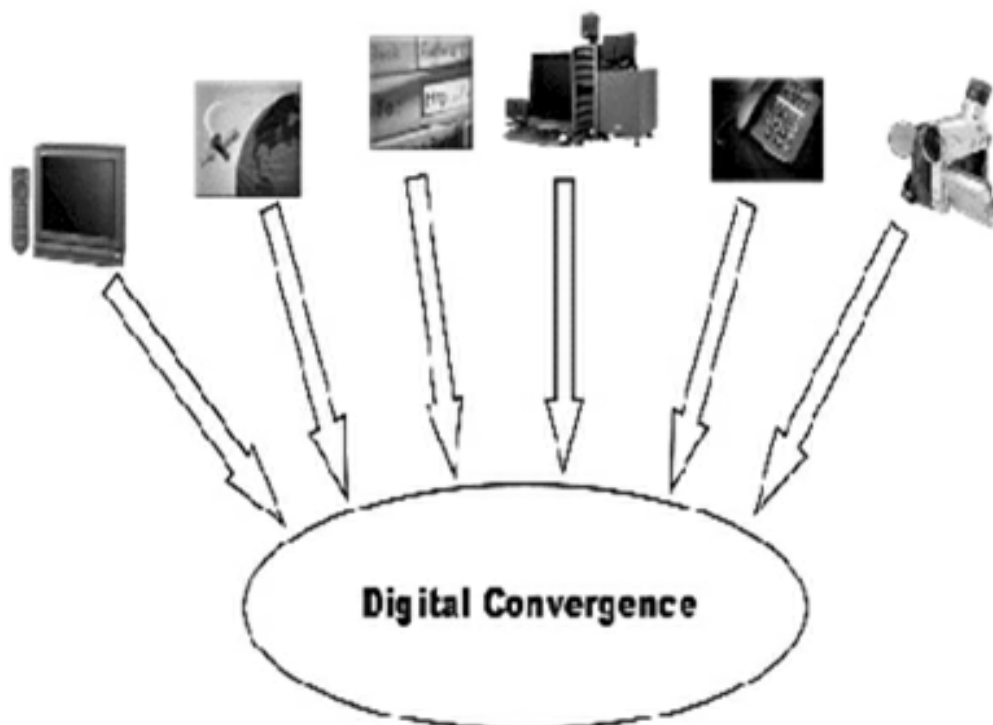


Figure of Computing, Digital Communications Technology, and Digital Media

Voice Over IP Solutions (VoIP) application meets the challenges of combining the legacy voice networks and packet networks by allowing both voice and signalling information to be transported over the packet network. The concept of **VoIP** is used in **Wireless LAN Networks**; and sometimes referred to as **wVoIP, VoFi, VoFi, VoWi-Fi and Wi-Fi VoIP**.

A fax-over—Internet protocol (FoIP) application enables the interworking of standard fax machines with packet networks. It accomplishes this by extracting the fax image from an analog signal and carrying it as digital data over the packet network. The email fax system allows you to send and receive faxes using a regular fax number(s) over the internet using any email account.

An IPTV- provides an integrated environment to deliver broadcast-quality video over the IP-based communications using high-speed internet broadband networks such as DSL, High-Speed Internet Cable, and T1, T2 and T3 lines.

4.0 The PHASES of DIGITAL CONVERGENCE Technology

During the Digital Convergence Phase 1, convergence existed in many consumers' minds, at that time contents were bulky, with delivery delays, flickering texts and cumbersome navigation. Yet with all the applications of convergence from microwaves, that bank to Internet appliances that do your laundry, lock your doors and turn on your sprinklers - you would think that we had finally reached convergence nirvana with all of our needs fully realized.

Making the case for digital convergence is similar to communicating the need for high-speed Internet access in the late 1990s, when consumers' limited understanding of the benefits of high-speed technology hampered its wide-scale adoption. In the 1990s, consumers bought only the bandwidth they needed to support their Internet usage at the time.

The popularity of television encouraged an experiment with convergence in the mid-1970s in Columbus, Ohio. There, Warner Amex introduced an interactive television service named QUBE. It was a costly failure. People weren't ready to interact with the folks behind the broadcast. The success of the VCR, a passive machine, reinforced that finding. By the late 1980s, the rapid adoption of communication devices such as pager, fax machine and cell phone made us far more willing to interact with devices in general. In Digital Convergence Phase 2, as we embraced e-mail, streaming media, internet broadcasts, online shopping, instant messaging, internet phone calls (VOIP – Voice over IP) technologies and the latest of all the Media Centres and we discovered what the Internet had to offer, these devices took on one or more functions of the others. Faxes could be sent and received via the computer; radio could be heard via the Internet; and wireless phones could be used to receive text data and browse the internet. People realized that interacting with content could be convenient as well as entertaining. The Internet was now training us to take control.

Beyond the rather generic and multiply defined e-commerce and e-business, typical topics are enterprise-wide opportunities to use technology in enterprise resource

planning, supply-chain management, and customer relationship management. Some great books by professors, executives, and consultants have also explored the impact of technology on large organizations. These usually focus on technology-facilitated business and organizational concepts such as human capital, the networked organization, and business arrays, said Andy Covell director of Information Technology at the SU School of Management and the author of *Digital Convergence Phase 2*.

In reality, we believe that in this decade, individuals and businesses will mostly need the services; the Consultative Digital Approach, the infrastructures, connectivity solutions, the right Global Standard Forest and "Domain" Configurations, Design and Implementations, and the right applications that may be required to actually interact with these devices in many different ways, to even begin to take advantage of the Digital Convergence Technology and its associated devices, said Ifeanyi O. Asonye, an Independent Business Technology Consultant, Project Manager and Trainer at Globrocks Corporation; Globrocks Information Systems. Ifeanyi is also the current Unified Systems and Unified Communications Evangelist at Globrocks. Globrocks is a US based Business Technology Solutions and Services Provider.

With gaming companies' heads in the right place, the market is ripe for innovation. For gamers, the advantage of connecting gaming consoles to the Internet is the ability to extend the gaming community indefinitely: Gamers can compete against other users across the world. Through instant messaging, they can share game secrets, learn to access levels they couldn't get to on their own and trash-talk with their opponents. For entertainment buffs, convergence is transforming common devices such as DVDs and TVs into home entertainment centres, with interactive technology enabling manufacturers to set apart their products on competition-laden store shelves. The evolution of features such as digital photo viewing capabilities allow users to view their family photos on their big-screen TVs using their DVD players, and even create personal slide shows. Audio enhancements let consumers connect their MP3s to DVD players or rip songs from CDs.

We're seeing digital convergence redefined in the consumer electronics market today - just as we've seen with the cell phone adding on relevant features such as text messaging, and the automobile now coming equipped with a global positioning system and even TVs for passengers. At the same time, adding Internet connectivity can make these added features even richer. With Internet-enhanced DVD players, consumers have the ability to access extra Web-embedded content on DVDs. In addition, consumers with interactive TVs and DVDs will be able to watch coming attractions, be among the first people to see new trailers and be invited to sneak previews in their areas. They will spend time in virtual theatres, watching films with movie fans all over the world, and join online events or chats. It will even be possible to chat with actors, directors and special effects artists during the movie. With the use of a remote control, consumers can download screenplays, buy opening-day tickets to new movies and purchase advanced copies of DVD movies.

As these pieces - simplicity, creative applications and innovative technology - come together, digital convergence

will migrate from a Jetson-era notion to a consumer-driven necessity.

5.0 Benefits

Convergence plays an important role in society from the economic, social, and development perspective. It can influence the way in which governments develop appropriate policy while looking for social welfare; enterprises compete in the market; and individuals communicate with each other and benefit from efficient and lower-cost, innovative and new value-added products and services. In this sense, technological convergence brings new opportunities to meet development goals and bridge the digital divided; a single service provider can offer different products and services.

Technological convergence is not only a technical issue, but also a developmental one. It has different meanings according to aims, interests, and roles of different stakeholders such as government, policy-makers, regulators, civil society, private sector, and customer. The opportunity arises to obtain equilibrium of interests and to increment understanding and awareness among them through adequate communication channels, multi-stakeholder dialogue and participatory cooperation. Technological convergence along with standardization enables transparent and modular communication between different products over the network and the possibility of delivering a broader set of them. Therefore, manufacturers and software programmers can work in different but coordinated ways.

Other benefits are lower entrance barriers, promotion of competition, lower cost equipments, quicker market response, and new business opportunities. In addition to the evolution of infrastructure, privatization, liberalization, and competition in telecommunications evolved in response to trends in globalization, there is an interaction among globalization, public policy and governance, it means that public policy shapes globalization, and globalization shapes governance; innovation and changes in technology affects competition and globalization and will influence generation of new public policy issues which will generate new consideration in governance.

6.0 Challenges brought about by technological convergence

The biggest challenges brought about by technological convergence are identified in the policy and regulatory arena involving concerned stakeholders. Concerning the policy arena, technological convergence faces the challenge of reaching and protecting public interests, and avoiding being used politically and artificially to protect vertically integrated markets by the broadcasters and their regulators. Concerning the regulatory arena, regulators have to respond to technological innovations and deal with changes in their frameworks and legislation. This requires a transition to a cross-product, cross-platform, and cross-sectional licensing. Participating stake holders, are also directly facing some challenges; on the one hand, network operators need to be increasingly competitive, as for example, they have to transform their traditional infrastructure and circuit switched

network into more efficient packet switched one. And on the other hand, in order to deliver value-added products and services, operators need to provide services, applications, and content which fit the needs, location and preferences of users at reasonable and competing prices in suitable markets. This supply should be done through flexible and open-architecture technologies and equipments. This equipment should contain core features flexible enough to support upgrades and scalability. On the software side, providers have to look for better ways to store and access information in a safe and rapid way.

Governments aim to finding equilibrium and avoid asymmetry in favour of the less regulated services. Similarly, socio-ethical difficulties arise regarding oversight, transparency, and surveillance acts or abuses, as well as ways to handle unawareness of stakeholders. In relation to markets, since they are getting smaller within countries, it is necessary to look for others and to try to gain the advantages of economies of scale. Countries have to look for regional markets. In addition, technological convergence threatens universal service funding systems; and regarding to cyber security, policies have an essential role to play to overcome mobile security threats, theft and phishing, and denial of service attacks.

In addition, aimed to ensure interoperability, modularity, and flexibility, providers are confronting the difficulties of standardization and harmonization through cooperation and participation of industry players. Among other important challenges; technology neutrality requires working on initiatives aimed to lowering barriers for adoption of technological convergence and infrastructure facilitation. Second, focus and priorities of each country regarding adoption of technological convergence require technical capacities within the countries especially in developing countries, through international cooperation and incorporating the best practices of developed countries.

Finally, it is important to take into consideration not only the interactive dynamic among the technological, political, legal, and marketing arena, but also the different velocities of changes each of them have. Technological innovation is more dynamic than the competition dynamic of the market and it is more dynamic than the adequacy and stability of public policy and the legal framework.

8.0 Conclusion

ICTs perspective on convergence requires public interests and objectives to be analyzed within an economic and social context. Moreover, convergence is a dynamic and continuous phenomenon, so it is important to understand it as a process and way for development as submitted by Helmut Leopold. Some drivers of this phenomenon are technology and innovation, flexibility of regulation, economy, and dynamism of the market –in terms of facilitation of competency along with awareness and knowledge of consumers as collaborated by Friedman Rob.

United Nations (2005), WGIG –submitted that, Technological convergence is stimulating greater commercial, legal and

social challenges, especially because it crosses national borders uninhibited. Therefore, opportunities brought by it will be better embraced if challenges are overcome through a competing, interactive and cooperating work from different stakeholders; within and between countries with not only a national but also a regional and global perspective.

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