



A Review of Convergence in Information and Communication Technology

Tirus Muya Maina¹

¹Senior ICT Technologist, ICT Directorate, Murang'a University College, Kenya

Keywords:

Convergence; Telecommunication; Information Communication Technologies.

Correspondence:

Tirus Muya Maina. Senior ICT Technologist, ICT Directorate, Murang'a University College, Kenya.

E-mail: tirus.maina@gmail.com/tmuya@muc.ac.ke

Funding Information:

No funding information provided.

Received:

June 2014; Accepted: July 2014

International Journal of Scientific Footprints 2014; 2(3): 80–98

Abstract

Convergence is the interlinking of computing and other information technologies, telecommunications networks and media content that originally operated largely independently. Convergence has arisen as a result of the evolution and popularization of the internet as well as the activities, products and services that have emerged in the digital media space. 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. Technological convergence has raised a number of issues of adjustment to the new environment by telecom operators, service providers, policymakers, regulators, and users. Issues like interoperability, interconnection, Policy and regulatory framework, consumer protection and universal access appear as the most relevant challenges. There are three approaches taken by countries to address convergence which are legislative approach, a regulatory approach and a self-regulation approach. The objective of this paper is to highlight various forms of convergence, those benefits and opportunities, Issues on convergence, Approaches in implementing ICT Regulations on Convergence along with some concepts about convergence.

Introduction

Communication networks were designed to carry different types of information independently. Radio was designed for audio, and televisions were designed for video. The older media, such as television and radio, are broadcasting networks with passive audiences. Convergence of telecommunication technology permits the manipulation of all forms of information, voice, data, and video. Telecommunication

has changed from a world of scarcity to one of seemingly limitless capacity (Blackman, 1998). There is no universal definition of convergence, although generally it is understood to mean the ability of different networks to carry similar kinds of services e.g., voice over Internet Protocol (IP) or over circuit switched networks, video over cable television or Asynchronous Digital Subscriber Line (ADSL) or, alternatively, the ability to

provide a range of services over a single network (ITU, 2011).

Technically, convergence defines a multimedia environment and or network where signals, regardless of type that is voice, quality audio, video, data etc. and encoding methodology may be seamlessly exchanged between independent endpoints with similar characteristics (Broadbent & Bauwens, 2008). Convergence is further defined as the interlinking of computing and other information technologies, media content, and communication networks that have arisen as a result of the evolution and popularization of the internet as well as the activities, products and services that have emerged in the digital media space (Happyday40, 2011). Technology convergence as illustrated by Stobbe & Just (2006) as a process by which telecommunications, information technology and the media, sectors that originally operated largely independently of one another are growing together. It is a process of qualitative change that connects two or more existing, and previously distinct technologies.

While historically, technology handled one medium or accomplished one or two tasks, through technological convergence, devices are now able to present and interact with a wide array of media. For example, the cellular phone, once used for calling now not only

places calls ,it is capable of sending and receiving data such as text messaging, playing music, surfing the internet as well as GPS and video recording capabilities(Happyday40, 2011).

Fatima (2010) observed that Technology convergence and many other converged services has initiated a new renaissance in all the fields, as now a single device can handle data, voice, entertainment and many other complementary services, thereby reducing both size and cost. One of the very known example of media convergence is the internet where mediums like television, radio, newspaper are congregated to one, and people from all over the world has access to it. Fatima further noted that due to convergence of computers and mobile, Mobile Commerce known as M-commerce is a hot innovation in the field of technology. Through m-commerce one is provided with services like mobile money transfer e.g. MPESA in Kenya, mobile ticketing, mobile banking, Mobile brokerage, mobile browsing and many more.

Convergence is accelerating as noted by ITU(2011), as existing networks are modified to offer new services e.g., upgrade of telephone networks to offer ADSL, alteration of electric power networks to offer broadband services, and the modification of cable networks to offer interactive services.

Convergence is also possible with wireless broadband technologies. As a result, different network infrastructures can today provide a plethora of services. Cable television providers can offer consumers voice, Internet access, and broadcast services over the same network as one bundled package of services, and for one monthly price. Likewise, a mobile service provider may be able to offer a subscriber data and video services, as well as voice services, and digital television (DTV) providers are offering interactive services.

A number of factors are pushing ICT service providers toward converged business models. These market drivers are now increasingly common worldwide, including in developing countries. Convergence is a process driven by technology and demand and resulting from service providers' adopting new technologies and business practices. Fundamental technology drivers are the digitalization of communication and the falling costs of computing (Singh & Raja, 2010).

Further Singh & Raja (2010), cited that digital data processing and increases in computing power have allowed data compression, increasing a network's carrying capacity even if its bandwidth remains fixed. Cable and wireless network capacities have also been growing steadily. More recently, the widespread and growing use of Internet

protocol (IP)-based and packet-switched data transmission has made it possible for different devices and applications to use the same networks. This has sharply reduced costs and significantly eased the design and deployment of access devices. Improved device capability is a significant contributor to convergence.

Another market factor supporting the introduction of convergence as highlighted by Singh & Raja, (2010), is the deployment of broadband networks. Broadband connectivity facilitates convergence because it allows the provision of multimedia content, such as CD-quality audio and streaming video, at reasonable prices. As of 2007, broadband was commercially available in 166 countries, and nearly a quarter of the 300 million subscribers were in middle-income countries.

2. Forms of ICT convergence

2.1. Technological/Network convergence

Technology is the most commonly referred to aspect of convergence. Technological developments, particularly the digitalization and computerization of all communication and media areas established a common technological foundation for the different communication and media areas which previously were based on diverse analogue technologies (Nordic competition authorities, 2004). At a technological or network level - it

is associated with the integration of previously separate telecommunications, broadcasting and information technology networks or technologies (Finger, 2010).

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 (Olawuyi & Mgbole, 2012). Further Olawuyi & Mgbole noted that 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 fiber-optic connections.

Technological convergence has inspired some media organizations to explore multimedia delivery of information. This digital convergence of news media, in particular, was called "Mediamorphosis" by researcher Fidler (1997). 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"(Fidler, 1997).

The interlinking of computing and other information technologies, media content, and communication networks that has arisen as the result of the evolution and popularization of the Internet as well as the activities, products and services that have emerged in the digital media space. Many experts view this as simply being the tip of the iceberg, as all facets of institutional activity and social life such as business, government, art, journalism, health, and education are increasingly being carried out in these digital media spaces across a growing network of information and communication technology devices.

Computer networks, wherein many different operating systems are able to communicate via different protocols. This could be a prelude to artificial intelligence networks on the Internet eventually leading to a powerful super intelligence (Nick, 2002) via a technological singularity. Convergence services, such as VoIP, IPTV, Mobile TV, etc., will replace the old technologies and is a threat to the current service providers. IP-based convergence is inevitable and will result in new service and new demand in the market. (Shin, Won , & Dong, 2006).

Convergent solutions include both fixed-line and mobile technologies. Recent examples of new convergent services include due to technological convergence include Using the

Internet for voice telephony, Video on demand, Fixed-mobile convergence, Mobile-to-mobile convergence, Location-based services, Integrated products and bundles. Convergent technologies can integrate the fixed-line with mobile to deliver convergent solutions. Convergent technologies include: IP Multimedia Subsystem, Session Initiation Protocol, IPTV, and Voice over IP, Voice call continuity and Digital video broadcasting.

Technological convergence based on digitalization and computerization has added a new and powerful quality to the industrial convergence developments in the markets and, furthermore, has put pressure on the policy and regulatory provisions regarding market convergence and cross-media ownership. A good example of technological convergence is the internet. It provides a common platform on which IT services, telecom services, broadcasting and other media services can be provided. Moreover digitalization has made it easier to provide the same content on different platforms (Nordic competition authorities, 2004).

2.2. Economic/ Market convergence

From the development of the ICT sector, it seems that market redefinitions taking place during convergence are closely related to technological developments. Technologies

and markets for these technologies mutually shape each other (Bezzina & Terrab, 2005). There is no doubt that technological convergence has added a new and powerful quality to the industrial convergence developments in the markets and, furthermore, has put pressure on the enactment of regulatory provisions regarding market convergence and cross-media ownership.

Economic/Market convergence, results from mergers, acquisitions, or collaborations among firms. New business entities are created to offer multiple services, old and new, and address different markets (Singh & Raja, 2010). At a market level, convergence is associated with the increasing mergers, acquisitions and strategic alliances amongst corporations in broadcasting, telecommunications and IT. Industry lines seem to blur as various communications company seek to explore investments in non-traditional sectors. At this level, convergence is thought to raise economic issues of competition when increasingly oligopolies seem to emerge out the various joint ventures between the three communication sectors (Finger, 2010).

The socio-economic and business implications of the Information Society are currently being studied in different fora at a Community level.

The impact of the new services resulting from convergence will be felt in the economy as a whole as well as in the relevant sectors themselves. The most significant example is the emerging field of electronic commerce. It includes both indirect (electronic ordering of tangible goods), and direct (on-line ordering and delivery of services) forms. Electronic commerce makes it possible to trade at low cost across regions and national frontiers (European Commission, 1997).

2.3. Regulatory and Policy Convergence

Regulatory convergence refers to the confluence of previously separate industry-based laws and regulations into a single legal and regulatory framework. Traditionally the telecommunications, broadcasting, content, and computer industries were regulated by a different set of laws or none at all. The computer industry has, for the most part, remained virtually unregulated except for general laws that apply to all industrial or commercial activities (Garcia-Murillo & MacInnes, 2003). Regulatory frameworks have an important role in the era of multiple plays. First, they have to remove such impediments to the full play of market forces and technological innovation. Second, they can facilitate the realization of benefits from innovation and competition, and reduce the risk of creating dominant market power.

Consequently, they must adapt to multiple play (Singh & Raja, 2010).

For regulatory frameworks to create an enabling environment, they have to remove artificial restrictions and promote competition on a level playing field. Ensuring an enabling regulatory framework will require that the tools and approaches used for authorizations, spectrum management, interconnection and access, and universal service facilitate the free play of market forces and the deployment of new technologies. If regulatory frameworks allow the market to function without impediments to innovation and competition, they will support the introduction of advanced technologies, encourage new investments, and enable growth Singh & Raja (2010).

Closely associated with the concept of regulatory convergence is the issue of agency convergence. In the same way that regulation has been separated due to different laws and regulations, countries have also created different regulatory authorities for these industries. Telecommunications and broadcasting are sometimes brought under the control of a single agency while another body regulates content (Garcia-Murillo & MacInnes, 2003).

Nations have created a regulatory agency for both broadcasting and content separate from

the agency that regulates telecommunications. Thus, convergence of regulatory agencies has been defined by Garcia-Murillo & MacInnes (2001) as the increasing centralization of regulatory authority towards a system based on functional units instead of industry divisions. This means that once service providers offer not just voice related services or cable TV related services but provide all information and communications technology (ICT) services, it no longer makes sense to regulate based on outdated industry divisions. A better approach is to regulate based on market and consumer issues such as tariffs and quality of service.

Henten, et al. (2002) argues that, although it is possible to regulate a converging market place by means of separate regulatory organizations, there may be a number of advantages in joining them together. Further Research by Henten, et al. (2003) on convergence shows that the degree and character of convergence developments are distinct because of; technology developments, first and foremost the digitalization process; and the political liberalization, including more liberal policies in relation to market convergence.

There is, consequently, an increasing necessity of a closer relationship in the regulation of the different communication and media areas. Due to this relationship, Henten,

et al. (2002) points out that the synergies between the different regulatory areas must be developed more proactively, encompassing the regulatory contributions of the different areas. Telecom contributes with infrastructure regulations and content issues; broadcasting with access and content issues; IT contributes with, e.g. privacy and security issues; and together the different areas contribute with new regulatory issues such as intellectual property and e-commerce regulation

3. Opportunities on convergence

Convergence plays an important role in society from the economic, social, and development perspective (Kate, 2006). 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 (Arenaza, 2008). Technological convergence brings new opportunities to meet development goals and bridge the digital divide; a single service provider can offer different products and services.

3.1. Opportunity for users

Convergence provides ICT users access to a distinctly expanded variety of services. For

example, whereas household telephone or cable subscribers previously received only one service, they can now receive three voice, video, and data over either network (Pyramid Research, 2007). Naomi (2007) cited that Convergence benefits users because it increases the reach of services. She further noted that any communications infrastructure now carries telephone service, moving countries closer to universal service. This also improves the utilization of the existing infrastructure, making it more cost efficient.

The flexibility of digital information is creating the possibility for more and enriched conventional services such as digital television and radio and better quality mobile communications, as well as a whole range of new services and applications. These new services are as varied as electronic newspapers, on-line supermarkets and catalogues, home-banking, and the use of multimedia web sites for both internal communications, and as a key tool for business (Gaitonde, et.al. 2000).

As digital video broadcasting and mobile television proliferate and evolve, they will make triple play over wireless networks possible. Similarly, the ability of cable television infrastructure to carry converged services has driven investment in fiber-optic networks by telecommunications operators.

Of the ten countries with the highest broadband penetration, nine also have strong cable infrastructure (Noami, 2007).

Convergence has another important implication for users: potential reductions in tariffs as noted by Singh & Raja (2010). The main reason for this reduction is the presence of increased competition in the market as a number of networks provide similar services, which in turn reduces the cost per service. In France, the Internet service provider (ISP) Iliad led significant price reductions in the triple-play market by reducing its bundled tariff; the rest of the market soon followed (Wall Street Journal 2006). Lower tariffs and a wider range of services also make some services more attractive to users who are price-conscious or unsure of the personal usefulness of new services Singh & Raja (2010).

Singh & Raja (2010) noted that Convergence drives increased coverage for advanced ICT services over wireless media. Mobile phone subscribers in developing countries, for example, are significantly more numerous and far more diffused than the number of personal computer users. As a result, cellular operators that implement service converged networks, financial services, public services, and entertainment applications can reach a far larger proportion of the population than

existing wire line networks. Access to high-quality, reliable, and affordable ICT services can have significant impacts that strengthen governance, through e-governance, or provide distance health or distance education opportunities.

The provision of digital video broadcasting over cellular networks has proven potential to increase the number of television viewers in countries such as Kenya and the Philippines. As wireless networks proliferate, use of broadband 3G and digital video broadcasting makes wireless triple play possible. Networks in Afghanistan are using broadband wireless for data connectivity, and new technologies such as WiMax and iBurst and revisions to the Wi-Fi standards are raising expectations. In 2005, for example, Kenya Data Networks began deploying a WiMax system designed to offer converged voice and data services to its customers (All Africa, 2005).

At device level, consumers find in convergence an opportunity to enjoy the convenience of having many devices all in one, saving on both size and ownership costs. A single mobile phone device can receive television programs and play videos, thus enabling simplicity and convenience in device ownership as one device can be used to access multiple services (Papadakis, 2007).

3.2. Opportunity for service providers

Service providers in both the telecommunications and broadcasting sectors as noted by Singh & Raja (2010) have seen convergence as a powerful means to leverage existing infrastructure to provide a wider range of services at lower costs, thus generating higher revenues and reaching new subscribers. Additionally in a technological convergent environment industry boundaries become blurred, allowing service providers to offer services in multiple markets. For example, besides access to television, cable operators can also offer voice telephony and internet services (Papadakis, 2007).

The significant merger, acquisition and alliance (M&A) activity witnessed abroad is motivated by a range of commercial and strategic factors. New market structures reflect a substantial shift in the value chain, with value migrating from simple delivery to the production and packaging of content or the offer of on-line of services and transactions. (Gaitonde, et.al., 2000). Service providers also see convergence as a way to cut costs. They seek to lower operating expenses through consolidation of different sectors or by using standardized IP-based network equipment (Singh & Raja, 2010). Liberalization and competition, coupled with digitization and significant increases in

network capacity of both broadcasting and telecommunications networks, is rendering the transmission and delivery of services a commodity item, converting it into a low-margin high-volume business (Gaitonde, et.al., 2000).

Firms currently operating in the lower parts of the value chain are therefore seeking to increase volume on their core activity, through horizontal alliances or organic growth into new geographical markets as further noted by Gaitonde, et.al., (2000). At the same time, they are moving up the value chain to higher margin activities through vertical concentration.

Convergence allows service providers to enter new markets, making it possible for them to compete in a larger market for more subscribers, and grow their businesses beyond their traditional sector or technology domains. The results are even stronger in countries with traditional communications infrastructure with limited reach or take-up. One recent report found that telecommunications firms offering IPTV have succeeded in countries that have relatively low pay television penetration but high broadband penetration (Telecommunications Management Group, 2008). As convergence enables incumbent players in the telecommunications broadcasting sectors to expand their roles, it

also marks the entry of powerful new players from publishing and IT industries (Gaitonde, et.al. 2000).

Papadakis (2007) observed that Established companies will find in convergence an opportunity to operate more efficiently, increase returns on technology investments and realize other business benefits through development of new services and rapid market expansion. Convergence opens up new sales markets for companies, a case observed in mobile operators. Convergence allows service providers to adopt new business models, offer new services, and enter new markets (Singh & Raja, 2010). As the market saturates, providers look to non-voice services, such as video streaming, portals, messaging, information services, financial services and gaming, to drive future revenue growth.

Convergence also alters the impact of the ICT sector on social and economic development as could be expected given the role of ICT as a critical input to economic and social activity. Increased competition due to convergence leads to reduced tariffs, increases service coverage, and drives economic growth, enhancing the benefits of economic liberalization (Singh & Raja, 2010).

4. Issues on convergence

Technological convergence has raised number

of issues of adjustment to the new environment by telecom operators, service providers, policymakers, regulators, and users. The combination of services over the same platform is challenging common perceptions about the best means to license and regulate providers. Traditionally, regulatory frameworks were designed for an era when clear functional differences existed between services and infrastructure, but these regulations are increasingly inadequate for dealing with today's world. At first glance, interoperability, interconnection, consumer protection and universal access appear as the most relevant challenges (Papadakis, 2007).

Olawuyi & Mgbale (2012) observed that 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 stakeholders 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.

Singh & Raja (2010) observed that Resisting convergence reduces potential benefits, is difficult to enforce, and inevitably leads to

pressures for reform. Restrictions cause users to lose potential benefits from innovation and cost reduction. Governments may believe that convergence may undermine social, political, cultural, or economic objectives. Similarly, the political, cultural, and social importance of broadcasting makes governments wary of new providers. In response to these concerns, governments may decide to resist convergence and take steps to prevent new services and providers from entering the market. By 2006, 36 of 54 African countries forbade VoIP (Balancing Act n.d.). In developing countries, VoIP is often perceived as potentially undermining the revenue of incumbent telecommunications firms, especially when lack of competition has allowed these firms to draw large monopoly rents (Singh & Raja, 2010).

In some countries, the idea of convergence is broadly accepted, but specific modalities are restricted. In the United Arab Emirates, incumbent Etisalat offers a full range of converged telecommunications and video services, but Internet telephony services like Skype were banned in 2006 (Skype, 2006). Concerns involving content regulation have led Bahrain, which has an otherwise liberal telecommunications sector, to restrict private participation in audio-visual services, preventing fully converged services. As of

early 2008, India, which has an open and competitive media sector, did not allow private FM radio stations to broadcast news (Singh & Raja, 2010). Resisting convergence reduces potential benefits, is difficult to enforce, and inevitably leads to pressures for reform. Restrictions cause users to lose potential benefits from innovation and cost reduction

Papadakis (2007) noted that as barriers to market access are significantly reduced, allowing an increased number of new players to enter the market and provide a wide variety of different service packages, established operators and services providers are required to reassess their business models and strategies not only to face these new providers, but also to upgrade their networks to integrate it into their own offering and further convincing consumers of the value added by the new services for which they must pay. Mergers and acquisitions of firms in the telecommunications or media sectors might also reduce the diversity of content both new and local content available to users (U.S. Congressional Research Service, 2003).

While convergence has the potential to increase competition and reduce tariffs, it can also reduce or undermine competition (Katz & Woroch, 1998). If a subscriber gets all services from one provider, the cost of

changing to alternative providers is likely to increase. In addition, if a backbone or access network is owned by one converged service provider, other service providers may not have access to that network or face high costs for interconnecting, a problem being discussed in growing debates on network neutrality and open network access (Frieden, 2006).

Among other important challenges; technology neutrality requires working on initiatives aimed to lowering barriers for adoption of technological convergence and infrastructure facilitation. 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 (Bezzina & Sanchez, 2005).

As society becomes increasingly interconnected and dependent of ICT networks, as noted by Papadakis (2007) cybercriminals continue to invent increasingly cunning ways to exploit human and computer vulnerabilities to their malicious benefits. This, challenges operators, service providers and users to take measures to minimize risks of network intrusions, attacks and viruses. In a similar way, as technologies and systems

become complex, the higher is the risk of their instability. Product designers, manufacturers and operators are challenged to guarantee the reliability of these new technologies.

5. Approaches in implementing ICT Regulations on Convergence

There are three approaches taken by countries to address convergence which are legislative approach, a regulatory approach and a self-regulation approach.

5.1. Legislative approach

According to ITU (2011), the legislative approach consists of developing legislation that responds to convergence, either in the immediate term or in anticipation of convergence trends. Legislative solutions define new laws or create new regulatory frameworks to respond to convergence and guide future policy direction. This can be done by developing and implementing a reform of the entire legal framework for telecommunications or by amendments to existing laws.

An advantage of the legislative approach is that it allows the introduction of a new framework to deal with convergence, without constraints imposed by other regulations or by the existing telecommunications law that may contain categories in which converged

services do not fit. A new law or an amendment of an existing law aimed at addressing convergence through a technology-neutral approach with a simplified service category can eliminate contradictions and inconsistencies in regulatory classifications. This ultimately makes the regulator more efficient and effective (ITU, 2011)..

When designing new legislative frameworks to address convergence, flexibility and foresight are critical elements. Given that the market of new services and technologies is extremely dynamic, legislators must be mindful not to develop legislation that may rapidly become outdated. Legislation should allow the regulator sufficient flexibility for interpretation so that solutions can be implemented as needed despite the evolving nature of convergence, and can do so without constricting future applications and technologies that could benefit the economy and consumer welfare (ITU, 2011).

Although a legislative approach commonly involves a modification of the entire legal framework, it may also be carried out through a process of amendments. Through an amendment process, policy-makers can obtain the feedback of industry, consumers and other affected parties for each amendment and address external input before carrying out the legal reform. The amendment process can be

quite effective to address urgent convergence challenges without the time-consuming process required for an entire legal framework reform, and is useful to prepare industry and consumers for further regulatory changes (Huang, et al, 2012)..

5.2. Regulatory approach

In order to facilitate the development of new technologies, which brings telecommunications, broadcasting, and the Internet closer together, the regulatory frameworks governing these industries are being coordinated, and correspondingly modified, so that they are all focused on the same objectives (ITU, 2011). Today, the ICT sector requires governments to undertake a broader perspective of law and regulation and assess the impact and interaction of telecommunications legislation with ICT related legislation, such as media/broadcasting legislation, content laws, intellectual property laws, and privacy laws (Singh & Raja, 2010).

Under the regulatory approach, countries do not develop new legislation to address convergence. Instead, they modify existing regulations or institute new regulations to address new technologies. For example, in the United States, the Federal Communications Commission introduced regulatory modifications to allow new technologies, such

as power line communications. The regulatory approach can be a practical way of addressing convergence provided that existing regulations can be modified or new ones introduced relatively quickly. However, the regulatory approach must be carefully managed to minimize inconsistencies between new and existing rules (ITU, 2011).

Governments can play a key role in facilitating ICT convergence by creating a framework that promotes competition and innovation. New policies and the removal of regulatory restrictions can help stakeholders of all sizes expand their opportunities while improving access to information for residents in remote regions (Huang, et al, 2012). Beyond policy reform, governments can stimulate investments through financial incentives. They can even directly invest in infrastructure and services as a way to empower their citizens and remain competitive with other countries. This three-stage process reform policies, provide incentives, invest in infrastructure and services provides a roadmap to economic development by encouraging technological innovation and meeting market demand (Huang, et al, 2012).

5.3. Self-Regulation Process

The self-regulation process consists of

developing and designing convergence policy through an ad hoc or existing consultative body. This body is normally composed of several government agencies, industry representatives, and other interested parties. Governments can play a key role in facilitating ICT convergence by creating a framework that promotes competition and innovation. New policies and the removal of regulatory restrictions can help stakeholders of all sizes expand their opportunities while improving access to information for residents in remote regions (ITU, 2012).

Beyond policy reform, governments can stimulate investments through financial incentives. They can even directly invest in infrastructure and services as a way to empower their citizens and remain competitive with other countries. This three-stage process—reform policies, provide incentives, invest in infrastructure and services—provides a roadmap to economic development by encouraging technological innovation and meeting market demand (Huang, et al, 2012).

The self-regulation process has certain potential problems. For example, the intervention of industry representatives may pose a risk in those jurisdictions where competition has not developed or where significant asymmetries exist among

operators, since the consultative body may be dominated by these operators and its conclusions could reflect narrow interests. In these cases, self-regulation guidelines developed by these consultative bodies may result in rules that benefit existing operators to the detriment of new competitors that operate new technologies providing converged services. Policy-makers must carefully manage these risks in order not to regulate convergence according to the special interests of a few companies and against consumers and the public welfare (ITU, 2011).

Conclusion

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. Technological convergence has raised a number of issues of adjustment to the new environment by telecom operators, service providers, policymakers, regulators, and users. Issues like interoperability, interconnection, Policy and regulatory framework, consumer protection and universal access appear as the most relevant

challenges. There are three approaches taken by countries to address convergence which are legislative approach, a regulatory approach and a self-regulation approach.

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 (Helmut, 2008). 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 (Friedmen, 2010).

References

- [1] All Africa. (2005). Firm Imports Sh72m Expansion Kit.
- [2] Arenaza, S. (2008). Technological Convergence.
- [3] Balancing Act. (n.d.). Kenya—Legal VoIP Begins to Shake Up the Market and Bring Prices Down. http://www.balancingact-africa.com/news/back/balancing-act_297.html.
- [4] Bezzina, J., & Sanchez, B. (2005). Technological convergence and

regulation, Challenges facing the developing countries. Retrieved November 2013, from InfoDev Information for Development Program:

http://www.infodev.org/files/2985_file_Communication_and_Strategies.pdf

- [5] Bezzina, J., & Terrab, M. (2005). Impacts of New Technologies on Regulatory Regimes, InfoDev and CITPO. The World Bank, Global ICT Department.
- [6] Blackman, C. (1998). Convergence between telecommunications and other media: How should regulation adapt? *Telecommunications Policy*, Volume 22 (Issue 3), Pages 163–170.
- [7] Broadbent, S., & Bauwens, V. (2008). Understanding convergence. *Feature*, 15(1), 23-27.
- [8] Cisco Systems. (2007). Annual Report.
- [9] European Commission . (1997). Towards an information society approach. Green paper on the convergence of the telecommunications, media and information technology sectors, and the implications for regulation. Brussels: European Commission .
- [10] Fatima. (2010, October).

- Technology Convergence. Retrieved November 15, 2013, from StudyMode.com: <http://www.studymode.com/essays/Technology-Convergence-433474.html>
- [11] Fidler, R. (1997). Mediamorphosis.
- [12] Finger, G. (2010). Digital convergence and its economic implications. Development Bank of Southern Africa.
- [13] Frieden, R. M. (2006). Network Neutrality or Bias? Handicapping the Odds for a Tiered and Branded Internet. Working Paper 1755. *bep Legal Series*.
- [14] Friedmen, R. (2010). The Changing Universal Telecommunication Mission when Technologies Converge. Penn State University .
- [15] Gaitonde, G., Gopikrishna , R., Priya , B., Kiran , K. S., & Prabhu, R. (2000). *Technology & Policy Issues In Convergence: An Analysis* . Indian Institute Of Management, Ahmedabad .
- [16] Garcia-Murillo , M., & MacInnes, I. (2003). The impact of technological convergence on the regulation of ICT industries. *International Journal on Media Management*, 5(1), 57-67.
- [17] Garcia-Murillo, M., & MacInnes, I. (2001). FCC organizational structure. *Telecommunications Policy*, 25(6), 431-452.
- [18] Happyday40. (2011). Technological Convergence. Retrieved 11 15, 2013, from StudyMode.com: <http://www.studymode.com/essays/Technology-Convergence-671842.html>
- [19] Helmut, L. (2008). *Manifestations of Convergence*. Telekom Austria AG.
- [20] Henten, A., & et al. (2002). Some Implications for Regulation of ICT and Media Convergence. WDR: www.regulateonline.org.
- [21] Henten, A., & et al. (2003). *Designing Next Generation Telecom: ICT Convergence or Multisector Utility?* Lyngby, WDR.
- [22] Huang, I., Guo, R., XIE, H., & WU, Z. (2012). *The Convergence of Information and Communication Technologies*. The Global Information Technology Report 2012 (pp. 35-45). World Economic Forum.
- [23] ITU. (2011). *Impact of*

- Convergence. Retrieved November 04, 2013, from ITU ICT Regulatory Toolkit: www.ictregulationtoolkit.org
- [24] Kate , W. (2006). The importance of convergence in the ICT Policy Environment. APC Issue Papers.
- [25] Katz, M. L., & Woroch, G. A. (1998). Introduction: Convergence, Competition, and Regulation. *Industrial and Corporate Change*, 6 (4), 701–18.
- [26] Nordic competition authorities . (2004). Retrieved from <http://www.ks.dk/english/publications/publications2004/telecompetition/>
- [27] Nick , B. (2002). Ethical Issues in Advanced Artificial Intelligence .
- [28] Noami, E. (2007). State of Telecom 2007. Presentation at the Columbia Institute for Tele-Information. Columbia University, New York.
- [29] Olawuyi , J. O., & Mgbole , F. (2012). Technological Convergence. *Science Journal of Physics*, 2012(Article ID sjp-221, 5 Pages, 2012. doi:10.7237/sjp/221).
- [30] Papadakis, S. (2007). Technological convergence: Opportunities and Challenges.
- [31] Pyramid Research. (2007). *From Triple-Play to Quad-Play*. Cambridge, MA: Pyramid Research,.
- [32] Shin , D., Won , Y., & Dong, H. (2006). Convergence Technologies and the Layered Policy Model: Implication for Regulating Future Communications. *International Communication Association* (pp. 1-19). EBSCO.
- [33] Singh, R., & Raja, S. (2010). Convergence in information and communication technology : strategic and regulatory. *The World Bank, The International Bank for Reconstruction and Development*. Washington: The World Bank.
- [34] Skype. (2006). Press Release.
- [35] Stobbe, A., & Just, T. (2006). *IT, Telecoms & New Media: The dawn of technological convergence in Economics* (Vols. Vol. 56,). Deutsche Bank Research.
- [36] Telecommunications Management Group. (2008). *IPTV: The Killer Broadband Application*. Arlington, VA: Telecommunications Management Group.
- [37] *The Wall Street Journal*. (2006). How France Became a Leader in Offering Faster. *The Wall Street*

Journal.

- [38] U.S. Congressional Research Service. (2003). FCC Media Ownership Rules: Issues for Congress. U.S. Congressional Research Service, Washington, DC