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1 TECHNOLOGICAL CONVERGENCE

In your view, what are
a) the main benefits arising from technological convergence as they relate to the information and communication technologies (ICTs) sector? (e.g. new devices, new applications, new services etc.), and (b) the biggest challenges brought about by technological convergence? (e.g. regulatory challenges, cybersecurity threats, socio-ethical implications etc.)?

1.1 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[a], 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[b].

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.

1.2 What is convergence?

- 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[6]. There are two broad definitions of convergence; technological and media or content[c].
- Technological convergence; occurs when multiple products come together to form one product with the advantages of all of them[6].
- Media convergence; refers to the removal of entry barriers across the IT, telecom, media and consumer electronics industries, creating one large 'converged' industry[6].

1.3 Benefits

Convergence plays an important role in society from the economic, social, and development perspective[12]. 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[5]. In this sense, technological convergence brings new opportunities to meet development goals and bridge the digital divide[d]; a single service provider can offer different products and services[e].

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[12], multi-stakeholder dialogue and participatory cooperation.

Technological convergence along with standardization[f] 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[1].

Other benefits are lower entrance barriers, promotion of competition, lower cost equipments, quicker market response [14], 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[1], [7].

1.4 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 [8].

Concerning the regulatory arena, regulators have to respond to technological innovations and deal with changes in their frameworks and legislation[9], [11]. 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[14]. 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[g].

Governments aim to finding equilibrium and avoid asymmetry in favor of the less regulated services. Similarly, socio-ethical difficulties arise regarding oversight, transparency, and surveillance acts or abuses[18], 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[h] funding systems; and regarding to cybersecurity, 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[i].

Among other important challenges; technology neutrality[j] requires working on initiatives aimed to lowering barriers for adoption of technological convergence and infrastructure facilitation[11]. 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[k].

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[15].

1.5 Conclusion

ICTs perspective on convergence requires public interests and objectives to be analyzed within an economic and social context[l]. Moreover, convergence is a dynamic and continuous phenomenon, so it is important to understand it as a process and way for development[14]. Some drivers of this phenomenon are technology and innovation[m], flexibility of regulation, economy, and dynamism of the market -in terms of facilitation of competency along with awareness and knowledge of consumers[2].

Technological convergence is stimulating greater commercial, legal and social challenges, especially because it crosses national borders uninhibited[1]. Therefore, opportunities brought by it will be better embraced if challenges are overcome though 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.

1.6 References

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Notes

[a] "The term is used interchangeably between and within the contexts of integrating technologies, services and applications, markets, policies and regulations, institutions and their functions; both within and between nations." See [13].
[b] "Digital Divide is part of a much broader Development Divide" See [4] and [11]..
[c] The term convergence is commonly used in reference to the synergistic combination of voice (and telephony features), data (and productivity applications) and video onto a single network. See [12].
[d] Both technological and media or content convergence end up reaching the consumer.
[e] Regarding convergence in the media for example, for the customer it means more features in less space, and for the providers it means remaining competitive for keeping market dominance or presence. See [2]
[f] Best experiences in standardization began in the software development.
[g] Some of the disadvantages of technological convergence regarding to new devices are found in their initial forms, as for example converged devices are less functional and reliable, and more likely to problems that could discourage end users, however tendencies show that a wide range of technologies are converging into single multipurpose devices. Other impediments could be storage space, power supply, battery, capacity, complexity. See [17].
[h] It is recommendable to consider universal access and service in terms of four components: infrastructure, services, cost, maintenance and upgrade. See [2].
[i] Some issues such as proprietary incompatibilities or not adoption of standards are difficult to overcome.
[j] Not partiality or discrimination. See [8] and [16].
[k] The implications of technology and market convergence on regulation has been different depending on the focus and priorities of each country or block of countries, for example the US has focused enhancing competition in the delivery of similar services by different networks, and in the finding of solutions created by horizontal integration**.** On the other hand Europe has focused on the societal advantages in forms of new services, applications, industries and devices. See [8] and [1].
[l] The more convergence trend to grow, the more competition trend to increase, bringing with them removal of any controls against public interests. See [8].
[m] Infrastructure, hardware and software.