REMARKS ON THE LATEST EVOLUTION OF NEW INFORMATION AND COMMUNICATIONS TECHNOLOGIES GENERATING THE TECHNOLOGICAL REVOLUTION

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Abstract: *The ascension of the digital economy has played an important role in the evolution of the informational society and of the knowledge society, revolutionizing, at the sametime, certain aspects of our attitude to economic development, given the fact that digitization promotes in a radical manner new business models via the online platforms. The departure point of this study is the desire to determine the factors favoring the rise of the digital economy in order to identify the founding features and principles of a new economic and social development era. Consequently, this study brings into focus the latest evolutions of the Information and Communications Technology (ICT) as main factors involved in what can be called a technological revolution in full bloom, concretized in the development of new technologies, such as: the cloud, big data, mobile apps, geolocation, Internet of Things (IoT), learning machines and mobile robots.*

Keywords: *the cloud, big data, mobile apps, geolocation, Internet of Things (IoT), learning machines and mobile robots.*
JEL Classification: *M15, Q55, O32.*

1. Introduction

The innovations in the domain of the information and communications technologies have led to what can be called a technological revolution in full bloom. On the one hand, these new technologies have helped the nations to accelerate the economic increase and the business opportunities, but, on the other hand, have brought challenges and numerous effects concerning the intellectual property rights, private life protection, and the availability of and access to information.

Essential in the new economy is the passage from the industrial economy to an economy characterized by information, intangible assets and services. In other words, the new economy has been described using new terms, such as: "knowledge economy", "borderless economics", "network economics", "digital economy", "information economy" (Woodall, 2000; Sharma, et al., 2004). A digital economy is a convergence of the calculation and information communications. The combination of the network calculation technologies and of new business models has led to the creation of a completely new market to shape a digital economy.

2. Factors favoring the ascension of the digital economy

The digital economy is not just an economy of the computers connected in complex networks. It is an economy that uses correctly the resources of the computers connected in network, for which the Internet and all the other resources are the only chance of social progress for the next years. Thus, the main factors contributing to the ascension of the digital economy are numerous, yet those interacting with various effects and intensities define the present technological revolution and, for this reason, calls for an adequate analysis (Figure no. 1).

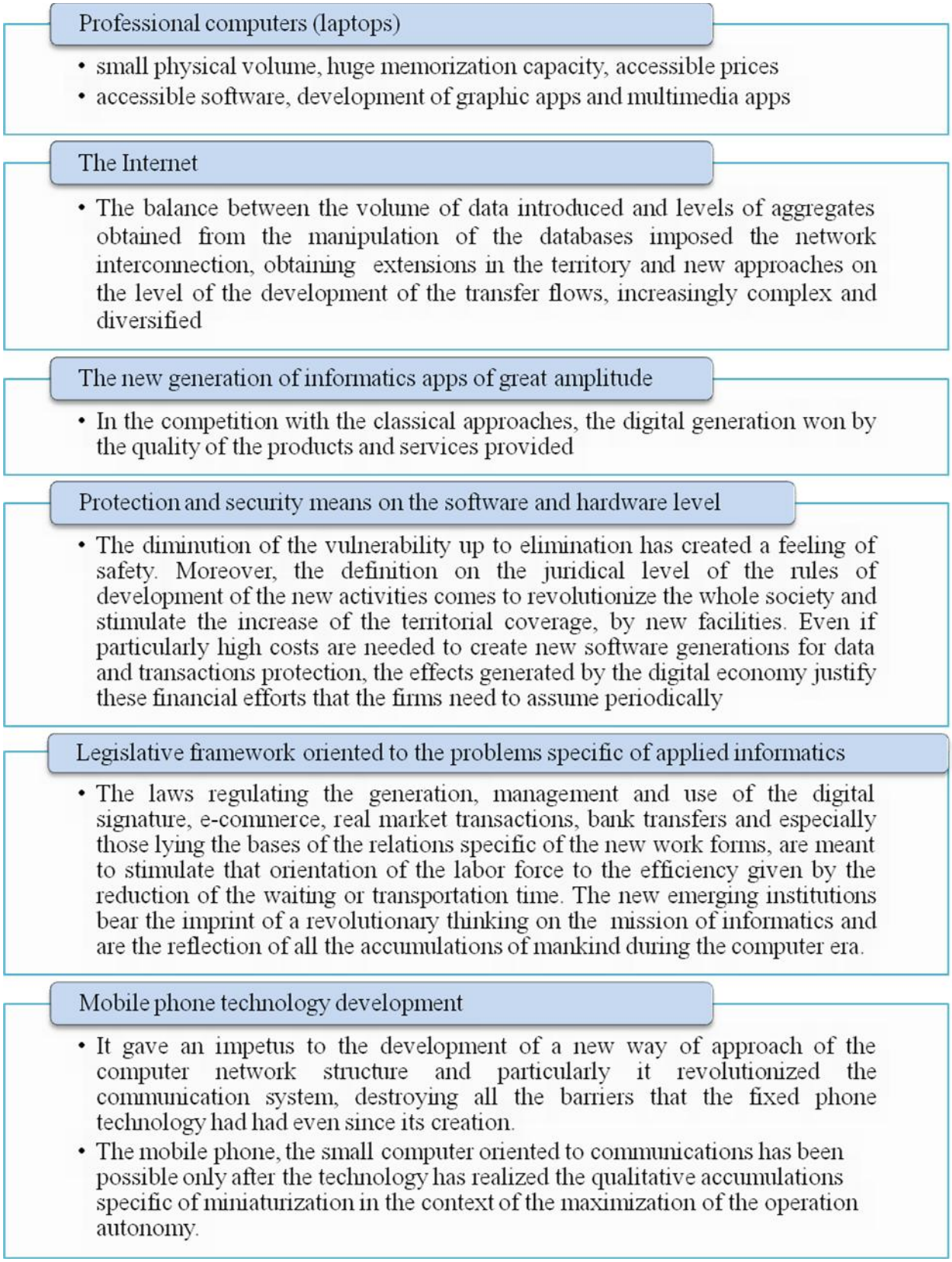

Figure no. 1. Factors favoring the ascension of the digital economy

Source: elaborated by the author

3. Specific features and fundamental principles of the digital economy

According to the definition, the digital economy has four specific features, i.e.: lack of relevance of the geographic position, key role played by the online platforms, importance of the Internet network and use of big data, which distinguishes it from the traditional economy, especially due to the transformations associated to the technological revolution (Charrier and Janin, 2015).

The features specific of the digital economy are built step by step, based on average-term decisions, with adjustments assuring continuity and especially development, this being the basic condition of the dynamics of the modern informational society (Figure no. 2).

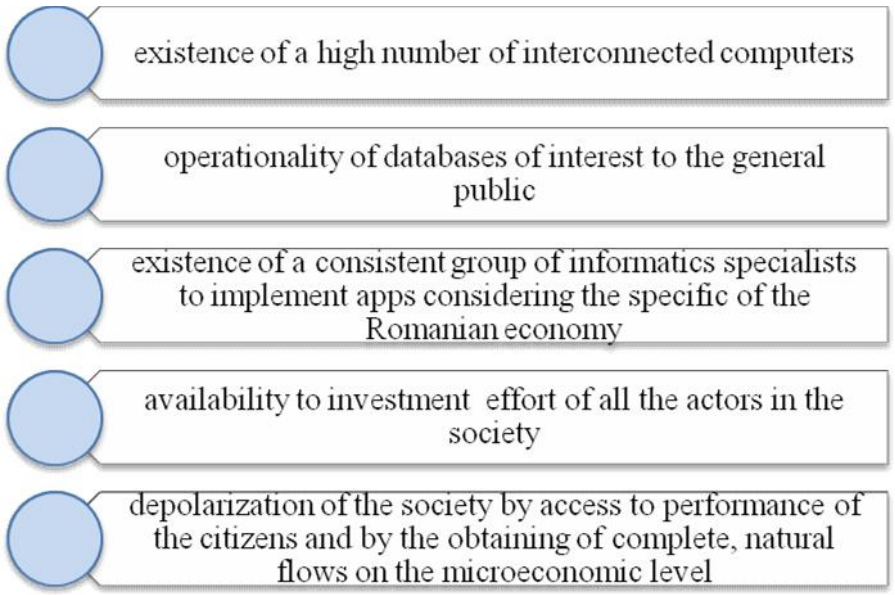

Figure no. 2. Features specific of the digital economy

Source: elaborated by the author

At present there is no consensus regarding the fundamental principles of the digital economy, however, as an analysis of the literature carried out for ETUI (Degryse, 2016), but also of the specialized literature, has shown, they are approached critically and summed up as follows:

1. *Digital information* has become a strategic resource, and the network has become the organization principle of the economy and of the society as a whole. A new generation of digital technologies generates unprecedented data quantities and provides tools needed to exploit this asset and its lever value.

2. *The digital economy* - together with an ever greater array of tangible and intangible economic activities - respects the principles of increasing outputs (positive external network effects).

3. *The new business models* take advantage of the economy based on on-line platform, especially on the markets for digital goods and services.

4. *A new model of the industrial production* (sometimes called "industry 4.0") involves short production series of mass personalized goods, the global fragmentation of the value chains, the relations between manufacturing capabilities and the blurring of the boundaries between producers, salesmen and consumers, on the one hand, and between industry and the services sector, on the other hand.

5. The *profitability calculations for technological investments* have been revolutionized by a diving in the hardware and software cost associated to a leap in their performances and productive efficiency. However, a cause-effect relation between innovation and the productiveness of the technological profits has not yet been determined directly, and the relation between technology and productiveness is still strongly influenced by the society, by the taking over of the innovations and the organizational changes within the companies.

These five evolutions differ from the perspective of the character of novelty attributed to them. Some, such as the evolution of the information and knowledge-based economy have recently suffered a reinterpretation, while others have been debated around the first decennium of the new century. Other evolutions, like the economy based on online platforms, are more recent and have not yet been deeply explored. As a first starting point, the five evolutions presented above will be examined closer to establish if they represent a continuation of the previous trends or the emergence and development of radically new technologies.

4. NICT generating the technological revolution

After having identified the factors favoring the ascension of the digital economy and highlighted the main specific features, but also the fundamental principles of the digital economy, our perspective turns to the evolution of NICT, which have generated the present technological revolution, highlighting only what is new. While some authors have indicated the existence of a threshold effect for the digital technologies regarding performance, others have tried to identify "new technologies" (Holtgrewe, 2014) that could trigger a new wave of change on the level of the economy. We will start by presenting the main factors involved in what can be called technological revolution in full bloom, before examining their potential of transformation on the level of the economy.

4.1. "Cloud" technology

The storage environment/ Cloud technology means storing large amounts of data in virtual locations, while **"**cloud computing" refers to the use in parallel and from a distance of hardware infrastructures. The development of cloud technologies has become a key factor in the proliferation of intangible and geographically-independent activities. Technically, mobile application, software and data sources can be easily accessed wherever they are, either by natural persons (who use services, like Dropbox, OneDrive, icloud and GoogleDocs), or by companies and their employees. From the perspective of work, **"**cloud" technology is not just a stimulus for the increase of all the work forms at a distance and virtual, but also a valuable tool to implement externalization and offshoring strategies, especially in the IT services and call center industry. The users of the cloud services are often obliged to change their work environment and relations, in order to manage more complex and unpredictable situations, which impose the increase of the availability requirements (Holtgrewe, 2014).

4.2. Big data

The evolution in the cloud technologies domain have led to the emergence of large-scale physical infrastructures under the form of data centers and high-speed connections. The recent progress in the high-quality data and software exploitation permits the analysis of vast amounts of digitized data. Thus, the principles lying at the basis of big data have been defined as **"**the four V": volume, velocity, variety and value (Escande and Cassini, 2015), and the prediction power of the big data software is improving at the same pace, due to its habits of combining a data volume going beyond today's human understanding. The

extension of the big data industry has also nourished open data policies, meant to offer access for the public to data, especially in the domains mapping, meteorology, legislation, public health, mobility, socio-economic statistics, official archives, historical documents, etc., and to diverse directives and regulations that have already been adopted in the framework of the European Union regarding the provision of access to open data and the conditions of use of this access (Robertshaw, 2015). The growth of open data is not just a welcome evolution for democratic transparency, but also a huge business opportunity for many actors in the economy.

In point of work, big data collection and analysis has implications concerning the surveillance and monitoring at work and the watching of the employees' activities. Big data modeling supposes the use of quantitative of qualitative performance data as a basis for comparative analyses and individual performance profiles; these are not new data in the managerial arsenal, but the tools available now to implement them are increasingly powerful. The use of big data by consumers transform the work practices in the domain of commerce, marketing and financial services, the objective being to personalize the products and services provided (Lestavel, 2015).

4.3. Mobile apps

The mobile phone, heavy and simple at first, meant an exceptional element, which has changed the way of communication among individuals and which, later on, has turned into a terminal incorporated in the digital economy. The mobile apps' reliability is what has turned the mobile phone into an intelligent, complex and elaborate device (smartphone).

In the digital economy, most platforms have mobile apps, which can be downloaded on smartphones and tablets and permit the access to online services and social networks, without a PC-based browser. Apps provide access anywhere (and at any moment) where a connection is available. Mobile apps are more than firmware; they are, also, tool for data collection and provision to the data centers of online platforms. They are an excellent example of the phenomenon known under the name of "pervasive computing". Although most people are familiar with mobile apps due to their usefulness in the daily life, they also have an indirect impact on the activity generated by the need to be constantly online.

4.4. Geolocation

At present, it is not just smartphones and tablets that have geolocation functions; most laptops use a GPS type of combination, which identifies the relative geographic position in the 3G and 4G mobile phone networks, and nearby hotspots or Wi-Fi. So, devices can provide location data, on condition that the geolocation function should not be de-activated by the user.

In point of work, geolocation has already had a major impact for the planning, monitoring and watching of the employees making deliveries, maintenance operations, repairs, etc. Along with the other new digital technologies, such as big data, mobile apps, IoT, online platform and Internet networks, geolocation represents a rich innovation source.

4.5. Internet of Things (IoT)

The term "IoT" is an abbreviation used for communication protocols and operation systems permitting the digital data to be exchanged between (physical or virtual) objects equipped with sensors, instruments of telemetry, RFID chips or QR codes and apps

incorporated in computer, telephone or hardware. The connection of these objects stimulates their potential of value creation (Nemri 2015; Rifkin 2014).

4.6. Learning machines and mobile robots

By definition, a robot is a programmable automatic machine with feedback abilities, capable of interacting with objects connected and adapt to the changes in it environment.

The improvements of the new robot generations are characterized by increased accuracy in their learning and perception abilities (Frey and Osborne, 2013). "Learning" machines rely on the progresses made during the recent years in point of power and memory (big data, electronic vision, forming and recognizing speech), of calculation, in order to adapt their behavior based on past events. However, it is difficult to evaluate the real potential of these systems in diverse work situations in the real life, based on the performance of some prototypes, because history shows that the construction of completely new plants was needed to be compatible with these robots (in the car industry, for example), because of the impossibility to incorporate them efficiently in the existing installations.

5. Conclusions

The digital economy is a state of the economy, in which the information obtained from several points is stored in databases, and its complex use is independent of location. In other words, the digital economy raises information to a new level, orienting itself towards assuring the transparency of the processes and towards substantiating the decisions. To support this new type of economy, an adequate funding is needed, along with a change of attitude towards a management guided by the saving of time, the only one with effects on the social productiveness when the reserves related to process organization and ergonomics have told their last word.

In order to extend the economic potential, the new economy or the digital economy relies rather on the exploitation of ideas than on material things. Thus, the symbiosis between the change in manufacturing and business processes and Information and Communications Technologies (ICT) is the motor force towards the new, digital economy. Seeing that the technological progress and the use of the information technology will continue rapidly, a great part of the information and many other services will be available online. A large access to the intra- and internet networks, and the use of NTIC are the basis of the digital economy. In other words, the new economy is a combination of services and ICT, permitting the digitalization of the information and modifying the structure of the enterprises and of the industries.

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