Determining the absorption capacity of innovations In South East European countries: the case of the Republic of Moldova

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Abstract:

Over the last five years, various innovations have come forth, giving way to the use of information technology-based services. This has contributed to the grand development of various start-ups in various fields, including financial innovation. The current pandemic has harsher emphasised the need to develop various online financial products and services globally. However, the transition of the humanity's development to an advanced technological level also requires a specific training level. This, by large, depends on the uneven level of the countries' development, the readiness degree of the society and their absorption capacity.
This article aims to assess the factors that might halt or trigger the development of these innovations in the Southeast European countries, to determine the readiness degree to apply financial innovations, and to estimate the risks of using them.

Research methods used: comparative analysis, induction, deduction, forecast based on data analysis

Keywords: innovation, capacity of innovation, technological level

Introduction

The harsh global competition and the rapid development of technologies have currently yielded new challenges for organizations, as well as for the private business sector. Innovation is one of the 12 pillars, which triggers the competitiveness of an economy. Within this frame of reference, countries are facing new challenges, and the scientific and business environment are adopting strategies for the improvement of their performance.

In such a scenario, technology transfer is of major importance. The process of acquiring technology from external sources has drawn attention and stimulated an increasing number of researchers over the last few years. Several studies (e.g., Reddy and Zhao, 1990; Sung et al., 2003; Gopalakrishnan and Santoro, 2013; Santoro and Bierly, 2006) have analysed the key factors of technology transfer between the research and industrial environment (i.e. the absorption capacity, human resources, trust, connection to social reality, previous experience of partnerships, international experience) and the importance of intermediary organizations.

However, these studies usually focus on technology transfer within a sector, region or country, thus neglecting its international dimension. Moreover, the key intermediary factors which support the technology transfer worldwide have been ignored.

For these reasons, it is very important that as regards technology transfer we do not limit ourselves to spatial or area dimensions. Since its inception, technology transfer as a development process has had an international and cross-sectoral character. Of course, this process can also take place locally or regionally and can be achieved very easily and its effects are visible, but when it comes to international or global technology transfer this process is slower, but the results will be commensurate. (Http://rttm.md/en/node/227)

Having taken the above said into account, we have tried to determine what factors hinder countries from innovation, we shave ought to estimate the development potential of the developing countries, given the digitalization of the global economy.

I. General trends in the digitalization of the global economy

Analysing various researches, studies conducted by specialized institutions, it has been proven that digitalization changes the value chains into various ways and leads to the opening of new channels for adding value and wider structural changes.

The positive results registered by some players are far from being automatic. Any value achieved is unlikely to be evenly distributed only due to the digitization potential to back up development. Even though individuals, companies and countries do not or only partially take part in the digital economy, they can still be affected indirectly.

The employees who possess limited digital skills will be disadvantaged compared to those who are better prepared for the digital economy, and the existing local firms will face stiff competition from the domestic and foreign digitized companies, and various jobs will be lost due to automation.

The net impact will depend on the development level and digital availability of the countries and their stakeholders. It will also depend on the policies adopted and implemented at national, regional and international level. The impacts on value creation and acquisition should be taken into account in more economic dimensions (e.g. productivity, value added, employment, income and trade), for various players (employees, micro, small and medium-

sized) enterprises (SMEs), platforms and governments) and for various components of the digital economy (core, narrow and broad in the field).

Depending on the definition, the estimates for the digital economy range from 4.5 to 15.5% of the world GDP. In terms of added value in the information and communication technology (ICT) sector, the United States and China altogether account for almost 40% of the world's total. As a share of GDP, however, the sector is the largest in the Taiwan Province of China, Ireland and Malaysia.

Global employment in the ICT sector increased from 34 million in 2010 to 39 million in 2015, accounting for the largest share in IT services (38%). The share of the ICT sector in total employment increased over the same period, from 1.8% to 2%.

In the ICT sector, IT services are the largest component, with a share of 40% of the total value added. The international computer services industry is currently dominated by the United States; its share in the industry is almost as high as the combined total of the next nine economies. India is holding the largest share among the developing countries.

Over the last decade, the global exports of ICT services and digital delivery services have grown considerably, faster than the global exports of services, mirroring the growing digitalization of the world economy. In 2018, digital exports for deliverable services amounted to $ 2.9 trillion, or 50% of total global service exports. In the low-developed countries, such services accounted for about 16 per cent of the total service exports, and they tripled from 2005 to 2018.

Digital platforms are becoming increasingly important in the world economy. The joint value of the platform companies which had a market capitalization of over 100 million dollars were estimated at over 7 trillion dollars in 2017 - 67 by one per cent higher than in 2015.

Some global digital platforms have reached very strong market positions in certain areas. For example, Google holds about 90 per cent of the Internet searching market. Facebook accounts for two-thirds of the global social networking market and is the best social networking platform in more than 90% of the world's economies. Amazon boasts a share of almost 40% of the world's online retail business and its services are similar to the global cloud infrastructure on the service market.

In China, WeChat (owned by Tencent) has over a billion active users, and together with Alipay (Alibaba), the payment solution has captured virtually the entire Chinese market for mobile payment devices. Meanwhile, Alibaba is estimated to have approximately 100,000 employees and around 60% market share of China's e-commerce market. Several factors can help to explain the rapid growth in the dominance of these digital giants. The first is related to the network effects (i.e. the more users are present on a platform, the more valuable it becomes for everyone). Digital finance represents the financial services provided via mobile phones, personal computers, the Internet or cards with a digital payment system. (Ozili, P., K., Impact of digital finance on financial inclusion and stability, 2017). The second lies in the ability of platforms to extract, control and analyse data. As in network effects, more users results in more data and more data means a stronger ability to outperform potential rivals and capitalize on the benefits of the first engine.

The local firms from the developing countries can benefit from using the services provided by global platforms. In some cases, local knowledge (for example, searching habits, traffic terms and cultural variations) gives an advantage to locally rooted digital platforms,

enabling them to provide tailored services to local users. However, due to the dynamics of the competition outlined above, the platforms of developing countries that are trying to expand typically are in an upward battle. The dominance of global digital platforms, their control over data, as well as their ability to create and capture the resulting value provide severe challenges for firms from developing countries to entry the market. (UNCTAD, DIGITAL ECONOMY REPORT 2019)

In addition, the development of Fintech can significantly impact the financial system, innovation in the technology sector, having the possibility to give a new shape to its existing structure (Bruegel.org- Capital Markets Union and the Fintech opportunity, 2017)

We would like to mention that innovation is not only characteristic of the companies that provide IT services, but also of other fields, for example, Sodexo is an international food services and facilities management company that generated revenue of 24.17 billion US dollars in 2019. The number of staff employed by Sodexo increased significantly in 2019 to 470,237 - an increase of almost over 9,500 compared to the previous year. After this follows a period of relatively stable staff over the last four years.

Management has been facilitated by assuring efficient and effective working environments by combining technology, people and processes. The global infrastructure management market amounted to 1.15 trillion US dollars in 2017. The North American region had the largest share in integrated space infrastructure management, while in the Asia Pacific region the internal administrative space management sector yielded the most revenue that year. Depending on the industry, corporate industry brought in the most revenue to the global building management market. (Published by E. Mazareanu, Nov 22, 2019)

II. Evaluation of the economic innovation potential of the Republic of Moldova

The global trends have had titanic effects on the world economy as well as on the economies of the developing countries. The main issue of these countries does not lies only in the implementation of innovations, but also in the assessment of those factors that stagnate the application of innovative business models, as well as their absorption and dissemination capacity. Next, we intended to carry out an analysis regarding the readiness of the economy of the Republic of Moldova to integrate into the global digital chains and to develop a knowledge-based economy.

According to the report on the Global Innovation Index in 2017, the Republic of Moldova ranked 54th out of 127 countries, while Ukraine ranked 50th and Romania 42nd. This could be the direct implication of the fact that just 0,4% out of GDP is invested in R&D on a national level, while in the EU since 2009 the target share of R&D investments has been set at 3% of GDP. Additionally, financing of the research and development activity in the neighbouring countries is way higher than it is in the Republic of Moldova. Accordingly, in our country, the number of researchers reported to 1 million of the population (662.1) is lower compared to that in the neighbouring countries as, for instance, in the Ukraine - of 1,006.2 people. We have tried to estimate which indicators or situations in technology transfer by some means undermine economic development.

The most critical aspects refer to the lack of companies' spending on research and development, the collaboration of the academic environment with industries, the availability of scientists and engineers, as well as the Governmental acquisitions of advanced technologies.

There are some companies in the industry which have enough capacity to generate innovations, but the generated products/solutions are pinpointed towards the external market, the European Union or the CIS. There are few innovative products intended for the local market, and the solutions are far from being adapted to the requirements of the local businesses. This is largely due to the inability of the private sector to adopt IT technologies. The unawareness of the potential benefits and vaguely formulated technical tasks lead to a low perceived value of the IT technologies.

It has been found that in the current industrial field there are some companies which have sufficient capacities to spawn innovations, but the generated products/solutions are focused towards the external market, the European Union or the CIS. There are few innovative products created for the local market and the solutions are far from being adapted to the requirements of the local business. This is largely due to the inability of the private sector to adopt IT technologies. The ignorance of the potential benefits and vaguely formulated technical tasks lead to a low perceived value of IT technologies.

To ensure that the IT technologies would trigger an increase in the productivity of the private sector, it is necessary to establish a framework for cooperation between research institutions, the academic environment, IT companies and the private sector. Moreover, according to OECD research findings, the role of IT is vital in the development of innovations. "the employment of the national innovation systems emphasizes the fact that the flows of technology and information between people, businesses and institutions are essential for the innovation process".

The private sector is relatively sceptical of IT solutions that could increase productivity. This is largely due to the need for considerable investment without having the certainty that the promised effect will bring to fruition. The internal market is small and the solutions developed for an insignificant number of beneficiaries will have high costs. For policy makers, the understanding of the national innovation system can help to identify leverage points which would improve the innovative performance and global competitiveness. This can help with the identification of inconsistencies within the system, both between institutions and in government policies, which can hamper technological development and innovation.

The policies aimed at improving networking between players and institutions in the system and at improving the innovative capacity of the companies, in particular, their ability to identify and absorb technologies, are most valuable in this frame of reference.

The best practices from the international experience of some countries, that have made substantial progress in the IT field, (China, India, South Korea, Malaysia, Singapore) highlight 3 types of state interventions for the backup of innovative policies in the IT field and namely:
a) Research and development support - by providing free space to the companies involved in advanced R&D, as well as the necessary software tools, a series of incentives related to research and development, grant programs to support companies which invest in R&D.
b) Protection of intellectual property rights – the amendment of the copyright law so as to be in keeping with the Trade-Related Aspects of the WTO Agreement on Intellectual Property Rights (TRIPS). In different countries, such as China or Malaysia, the copyright law has been revised so as to include "computer software".
c) Facilities and incubation services provision - through the networks of incubation centers and/or through IT parks, which have incubation facilities supported by governmental institutions and academia.

The information and communication technology (ICT) sector is a growing sector that annually contributes to the GDP generation, by about 11-12%. The ICT sector provides a range of advantages and opportunities for the whole community. It is a fast-growing sector that significantly contributes to economic growth and poverty reduction, creating more than 2,000 highly skilled jobs each year and providing fair earnings, freedom, opportunities and economic independence. Information and communication technology supports innovation and competitiveness in the public and private sectors and enables scientific progress in all areas. It has positive implications for all the branches of the national economy, including education, health, administration, etc. The 2030 Sustainable Development Agenda apprehends information technologies and information as the main tools for achieving goals and reaching sustainable development targets, as well as important facilities.

The National Strategy for the development of the information society "Digital Moldova 2020", in accordance with the Action Plan, envisages "Strengthening the capacity of ICT application - a high degree of using the benefits they offer for all society members".

It includes the strategic directions referring to education, such as the Digital Compulsory General Education Program and the Digital Continuing Education and *Digital Inclusion Program for All*, which represents the pinpointing of the education system towards the training and development of the digital skills and leads to a large-scale information technology integration in the education system.

The innovative potential includes, besides the ability to generate innovations, the resources input, meant to generate innovations: money, equipment, human resources. The acquisition of measurable values for the factors involved in the innovation process implies finding appropriate indicators to depict the fundamental aspects of the innovative potential.

To this end, it is necessary to assess the potential of human resources which are considered the main feature to be developed; we have tried to estimate the young population potential that might currently be involved in achieving these objectives.

Table 1. Higher education graduates list by cycles

Types of studies	2017	2018	2019
Bachelor's	13421	11952	10763
Master's	5744	5399	4754
Doctorate	410	380	234

Source: developed by the author based on bns data. 2020

The findings show a negative trend in the desire of young people to continue their studies and the declining demand for undergraduate studies (Cycle I) is a worrying fact.

We also wanted to estimate how many of these people are studying ICT, information technology and engineering.

Table 2. Number of ICT graduates related to the total number of graduates, %

	2018/2019		2019-2020	
	Bachelor's	Master's	Bachelor's	Master's
ICT	25	9	28	11
Engeneering	35	11	33	12

Source: developed by the author based on National bureau of Statistics data. 2020

The dynamics of improving the specialists' trainings in these fields is witnessing a positive trend, which has led to increased potential, and thus being noticed in the gross value

added of the ICT sector to the national economy, which accounted for about 21.7 bn. lei in 2018, increasing by 4.3% compared to the previous year (current prices).

However, if we analyse the structure of the ICT sector by components, according to data, in 2018, over half of the gross value added of the sector was generated in the branch of "Wholesale of computing and telecommunications equipment" (56% of GVA; 6.4% contribution to GDP yield). Important contributions are made by the branches of "Electronic Communications" (21% of GVA; 2.4% contribution to GDP) and "Information Technology" (19% of GVA; 2.2% contribution to GDP yield). This still places us far away from the innovative development of the economy.

Over 2016-2018 increasingly, there was a relatively obvious trend of growing the contribution of the "Information Technology" branch to the GDP formation (from 2% in 2016 to 2.2% in 2018; +0.2 percentage points) and to the decrease in "Electronic Communications" (from 2.7% in 2016 to 2.4% in 2018; -0.3 percentage points).

Table 3. The number of graduates over the last three years, per 1000 inhabitants

Types of education	2017	2018	2019
High schools / secondary schools / secondary vocational education institutions	66	68	64
Post-secondary vocational education institutions	23	26	25
Higher education institutions	73	68	62

Source: developed by the author based on National Bureau of Statistics data. 2020

The information above shows a drop in the population number, another cause being the lack of the possibility to pass the baccalaureate exams, and the decreasing interest in studies, in some cases, as well as the departure of many young people abroad for the purpose of studying.

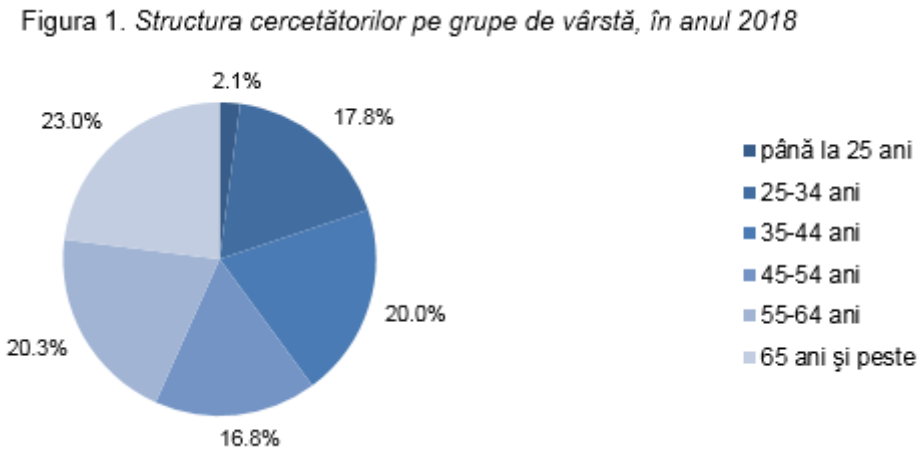
We have made an attempt to estimate the current potential of developing innovations and perspective areas in the economy. In 2017, more than 2,000 companies were active in the information and communication technology sector, which accounts for about 4% of the total number of the companies from the country. Most companies in the sector provide information technology services (about 47% of the total ICT companies), followed by electronic communications companies (about 17% of ICT companies).

Companies that provide computer and communications equipment repair services and those engaged in the wholesale trade of computing and telecommunications equipment hold a share of about 10% in the total number of companies along with the companies which carry out activities. (The government of the Republic of Moldova, (2018)

To assure that IT technologies lead to an increase in the productivity of the private sector, it is necessary to establish a cooperation framework between research institutions, academia, IT companies and the private sector.

Against this background, we have tried to estimate the potential of the local research studies. Namely, the breakdown of researchers by age groups reveals that the largest share is held by researchers aged over 65 (23%), and the 45-54 age groups (17%) constitute the smallest proportion.

Figure 1. The breakdown/structure of researchers by age groups in 2018



Source: Digital Strategy of the Republic of Moldova 2018-2023

The greatest number of researchers has been working in the field of natural sciences (35.5%), and the fewest - in the field of liberal arts (9.8%). Compared to 2017, the share of scientific researchers in the field of medical science decreased (by 1.4 per cent) and the share of scientific researchers in the field of social sciences increased (by 0.8 percentage points).

In 2018, the expenses incurred for the research-development activity amounted to 484.5 million lei, out of which 469.5 million lei (96.9%) were current expenses and 15.0 million lei - capital expenses (3.1%). Expenditures incurred in state-owned entities accounted for 89.4% of total expenditures. Compared to 2017, they spent by 31.8 million lei (respectively, 7.9%) more in the public sector for the research-development process.

Table 4. Expenditures on research and development, in 2017 - 2018 (million LEI)

	2017		2018	
	Total	Inclusive of state entities	Total	Inclusive of state entities
Total expenditures	**453,9**	**401,3**	**484,5**	**433,1**
Current expenditures	436,9	385,1	469,5	419,4
Capital expenditures	17,0	16,2	15,0	13,7

Source: Developed by the author based on National Bureau of Statistics data. 2020

Provided the prevalent factors are to be analysed, then in the total current expenses these are personnel expenses (329.6 million lei or 70.2%), increasingly growing by 21.6 million lei compared to 2017.

Out of the total current research-development expenditures, 54.6% were designated for applied research, 28.4% - for fundamental research and 17.0% - for technological development. Compared to 2017, the share of current expenditures for basic research increased by 2.4 percentage points, while the share of current expenditures for technological development and applied research dropped down.

Table 5. Current expenditures on research and development by fields of science, in 2018 ml. lei

		Fields of science					
	Total	Natural sciences	Engineering and technological sciences	Medical sciences	Agricultural sciences	Social sciences	Humanitarian sciences
Current expenditures- total	469,5	172,2	96,0	49,8	78,2	39,8	33,5
Fundamental research	133,3	74,5	8,0	6,6	2,4	15,7	26,1
Applied research	256,3	91,8	20,9	36,3	75,8	24,1	7,4
Technological development	79,9	5,9	67,1	6,9	–	–	–

Source: Developed by the author based on National Bureau of Statistics Data. 2020

Depending on the scientific fields, the structure of the current expenditures is as follows: natural sciences - 36.7%, engineering and technological - 20.4%, agricultural - 16.7%, medical - 10.6%, social - 8.5% and humanities - 7.1%.

Compared to 2017, the distribution of current expenditures by scientific fields has changed, in particular, it dropped the share of current expenditures in engineering and technological sciences by 3.6 percentage points, and increased the share of current expenditures in agricultural and natural sciences.

Conclusions

To explore the potential for innovation, the IT sector inclusively needs to eliminate the internal vulnerabilities associated to the insufficiency of competitive human capital, limited innovation policies, but also to an inefficient framework for the country promotion. This last aspect is to be improved by encouraging the local IT companies to participate in global incubation programs and organizing matchmaking events with potential investors.

The assessment of the Moldovan IT outsourcing market and the analysis of the global IT outsourcing market, brings about the conclusion that the Republic of Moldova should probably maintain and expand its areas of strong traditional capabilities (apps development, maintenance and testing services for the West European and US markets).

Although in recent years there has been a slight increase in the companies' spending on information technology, its level is still far from being optimal and it has been focused only on a few economic sectors.

In order to increase the absorption capacity, the emphasis should be placed on qualified studies based on skills, abilities and creativity, which are essential qualities in the modern global economy. Additionally, the emphasis should be on the share of research spending, the orientation of the young people towards research, but not in the least, on an increased prestige in society towards the people in this field and finally on attracting investments in high added value areas, with increased profitability, for the expansion of the innovative services range.

Another aspect which can enhance the absorption capacity is the quality of teaching, which is currently modest. In claiming this, I refer to the fact that at the moment there are no specializations and university programs such as Data Science, Big Data, or any kind of program which combines economic and social sciences with technology. The impact of the COVD-19 pandemic and the trend it brought towards digitalization, highlighted further the need of such specialists. Thus, it is imperative the establishment of a national strategy towards this issue, with a prompt and clear action plan.

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