ECONOMIC SYMBIOSIS BETWEEN TECHNOLOGICAL CHANGES AND PRODUCTIVITY IN COMPANIES

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Abstract: The purpose of this paper is to show that there is very close connection between technological changes in companies and productivity. Those economic symbioses that exist in these two entities are wholesome evolution of competitive modern company, where the prizefight for the larger quantity of the market is enormous. The paper will explain technological changes and their impact on productivity in the companies. Technological change denotes to the progress of the already current technologies and inventing innovative ones to increase the existing merchandises in the market while also creating new ones. Technology adopts innovation, generates jobs, and boost long-term economic success. By refining communication and making prospects for data-sharing and cooperation, information technology symbolizes an arrangement issue as important as bridges, highways, dams, and buildings. Productivity is the output created per unit of input. The progression of technology has a considerable effect on productivity. The companies can accomplish enhanced outputs thanks to more efficient systems used in production. The 6 important factors which are affecting the industrial productivity are: Government Policy, Quality of Human Resources, Availability of Finance, Technological Development, Natural Factors, and Managerial Talent. Methodology that is used in this paper is vast literature reviews by many authors that are interested in this area of research. Also, and comparative analyses will be used about these two entities. Technological changes lead to increase in productivity of labor and capital of the companies.
Keywords: technological changes, productivity, symbiosis

1. INTRODUCTION

Management, as a modern science, is closely related to technology and the productivity of human resources, which are the driving force in every modern company. There is a causal connection between the management of the company and the reflections of new technologies, which are manifested through the increase in productivity, the establishment of innovation capacities, the increase in competitive advantages as well as the consequences on human resources. This causal connection is of particular importance for this research, because the emphasis of the research is placed on the outcomes of the implementation of new technologies, i.e. the results of that impact...does productivity increase or decrease?; Do companies develop greater innovative capacity?; Does technological change increase the competitiveness of the company?; What is the impact on human resources, their adaptation, education, etc.

2. AREA OF RESEARCH

It is known that changes are the only constant of the modern world. They contribute to companies repositioning, refocusing, reorganizing, renewing, progressing and developing. Hence, it is a crucial need for companies to be flexible in order to quickly and appropriately face the changing environment, which today is characterized by constant challenges. There are different types of business changes, but most of the time they all contain the element of unknown, which is exactly why technological changes (planned or unplanned, gradual or radical) require to be adequately managed. The dynamics with which technological progress is constantly implemented in every segment of the company's operations, be it information-communication technology or the technical-technological process, is so emphasized that it requires continuous engagement during the work of each person. It implies the confirmation that new achievements in technology are permanently implemented in economic processes. Hence, the claim that technology cannot be abstracted or separated from the economy and social context in any modern society is fully justified (Grubler, 2003).

We are contemporaries of the new era in which technological innovations are in correlation with human social existence and as such are inseparable from it. In fact, we live in a world driven by technology, where change is a continuous process that needs to be absorbed and used in business processes.

Technology is a dynamic category, which constantly moves and changes, and therefore technological creativity implies economic progress, and as such represents a very significant potential force of a society (Mokyr, 1990).

3. LITERATURE REVIEW

Technological changes are a driver of the economic potential of companies, which is complex, but at the same time interesting for research, and precisely for those reasons, technology in interaction with human capital, as well as the impact on the productivity of companies, are the subject of this study of interest and research to a large number of economists. Thus, according to (Romer, 1990a), the level of education has a crucial role as a factor and animator for increasing productivity because it determines the capacity of the economy to be innovative, as a characteristic of highly developed countries.

Accumulated knowledge is precisely what generates science and is the initial impulse for innovation, that is, for the development of technologies. It follows that any more educated nation actually implies a more developed economy.

For the first time, the word productivity was used in an article by the economist Quensay, in 1766. In 1833, Littre defined productivity as the desire to produce. In 1950, Organization for European Economic Cooperation (OEEC, 1950) gives a much more precise definition of productivity, namely: "Productivity is a quotient obtained by dividing output by one of the factors of production."

In this context one can talk about the productivity of capital, investment or raw materials, mainly according to whether the output refers to capital, investment or raw materials.

At the most basic level, however, productivity represents the economy of the company. In theory, there are a number of definitions of productivity that date back a long time, but it is most often defined as the ratio of total output to all input factors. From the largest number of theorists, three different forms of productivity are accepted as universal, namely:

1. Total productivity, which defines the ratio of "total output to all input factors";
2. Total factor of productivity or "the ratio of the total output to the sum of the corresponding inputs of labour and capital";
3. Partial productivity, that is, the ratio of "total output to one class of inputs."

On the other hand, Drucker (Drucker, 2001) clearly emphasizes the importance of productivity as an economic indicator, which is contained in his statement: "Without clearly set goals for productivity, business has no direction of movement". Improving productivity is fundamental for companies to survive in a competitive market. The goal of any productivity improvement, in fact, is to make lasting improvements to a company's performance. Productivity is the best method with which to confront inflation, reduce unemployment, increase profits, reduce costs, create capital and improve the quality of operations.

According to (Dedrick et al., 2003), productivity is identified as a basis for economic prosperity, a prerequisite for national development and an important indicator of organizational competitiveness.

Therefore, productivity can be explained with the help of the following formula, i.e. relational ratio:

(Achieved results) / (Spent resources)

As already emphasized, productivity can be partial , in cases where it is a question of the possibility to compensate the output value with one of the input resources. The advantages of this type of productivity are that data can be obtained very easily, the productivity index can be calculated quickly and easily, it is easy to understand, that is, the problem of its reduction can be easily diagnosed and an appropriate technique can be used to improvement.

However, if it is used for one of the input resources, then it can lead to a wrong image of the company and a series of criticisms about the performance of the entire management (Janáček and Zamrazilová, 2001).

In addition to partial, there is also Total - factor productivity (TFP), i.e. the quotient of the net output with the sum of labor and capital, as input resources. TFP is a relevant measure for technological changes where the real growth of production value is measured, which cannot be explained by labour input, capital and distribution channels (Zhi et al., 2001).

Total factor productivity measures the synergy and efficiency of capital and human resources at the same time. It should be emphasized here that this factor measures the degree of technological progress in correlation with economic growth. Namely, high TFP gives indications about the efficiency, utilization and management of resources, materials and input parameters, which are necessary for the production of certain products and services (NPC report, 2003).

High productivity in companies also means high profit, because the ratio is:

Profit = revenues - costs of goods and services

The continuous implementation of new technologies in companies has one definite and main goal, which is: to increase the productivity of the company.

Or, more precisely (as Arnulf Grubler, 2003 will note), the increase in productivity is due to technological changes, that is, to produce more with less input, regardless of which factor of production it is. When realizing the goal of increasing productivity and reducing costs, companies, most often, as the first segment on which they make changes choose human resources management (George Bolander, Scott Schnell, 2010).

Technology is not some uncontrollable force over man, but man is the one who, with his active attitude towards nature and society, develops technology and adjusts it to his needs. Thus, according to a number of authors (Dragan Lajovic, Vladimir Vulic, 2010), man is forced (because he is the one who initiates scientific research work) to create new technologies, which he will apply and change, that is, he will use the results of each resulting application. So, man is a subject, i.e. a mover of technological development and a user of the results of that development.

The continuous implementation of new technologies in modern and aggressive competitive companies is already embedded in the strategy and philosophy of each company separately. Namely, today we live in a world where technologies give a picture of the future, and the kind we have never imagined. Technology changes man and the way he adapts and accepts new processes in his work.

In theory, it can be noted that (Michell Langbert, 2011) technology, in fact, increases the involvement of human resources in business processes and in a certain way exerts an influence on the overall management in the company. So, companies make a kind of redefinition of their own strategy in operations with an adequate reallocation of resources. According to a large number of theorists, one of the sources of productivity is the application of knowledge. In essence, it means scientific knowledge, namely the production of material goods and services, as well as the knowledge of the techniques for applying new ways of production, in fact, manifest the content of the new technology.

Productivity is one of the indicators used to show economic prosperity in the long term, especially in the second half of the 1990s. Increasing productivity is the key to increasing the standard of living of a country, and hence the importance of these two elements to merge and become the subject of research.

Changes in technology are the only source of permanent productivity increases, but a number of factors can affect real and "measured" productivity. For example, workers may work harder during times of high demand and companies may use capital more intensively by introducing more shifts in production ; both factors can measure productivity in these cases as relative to technological progress.

Also, in periods of high demand, productivity can increase as companies take advantage of increased volume; authorities claim that this effect is not permanent and should be reduced when measuring technical changes in the long term.

Authors Susanto B., John F., Matthew S. present new estimates of how technological change increased productivity in the second half of the 1990s. That is, they believe that as investment in technologies increases, it may lead to a mismeasurement of productivity growth, because the implementation of new technologies would mean that companies' ability to produce more is impaired as employees are diverted from their responsibilities towards adapting to new technologies.

These "adjustment costs", lower production growth, and thus lower productivity. Regardless of these factors, however, the authors come to the conclusion that productivity growth in the second half is due to the increase in investments in technological changes, and not to other factors such as management, etc.

The concept of productivity is based on the theory of production in economics. Production theories are grouped into two groups: the marginal approach and the classical approach.

In the neoclassical approach, an important contribution to the theory of production was made by Walras (1874) with the theory of marginal values and the theory of Pareto (1927), that is, the uneven distribution among the input factors of production of products or services. Further Shepard (1953) and McFadden (1966) implemented duality theory in economics. Another important model in the theory of production is the analytical model of activities developed by Koopmans (1951) and Debreu (1951). They develop a model in which the problem of choice between alternatives is related to the problem of optimal utility from the offered alternatives.

Apart from the two basic factors that directly affect productivity (capital and labour), there are other secondary factors that can be considered in relation to productivity, and many times we ignore them (Griliches and Mairesse, 1983; Bartelsman and Doms, 2000). I will mention a few on this occasion:

- The regulatory policy of the state. Companies in their business decisions are guided by this regulatory policy, which is implemented by the state.
- The role of the company's management and the method of ownership. The choice of technologies and production factors is the choice of the management, that is, the manager is responsible for the success or failure of the company, therefore the management and the way of managing the company is of crucial importance.
-Technologies and human capital. Physical and human capital are two sources of productivity that differentiate companies from each other. Nelson (1981) emphasizes the importance of how technologies are generated and

distributed within companies. Doms, Dunne, and Troske (1997) point out that employees who have more skills than employees with average skills are associated with adaptations of modern technologies.

- The export of companies. How companies are oriented towards the global market is a factor that affects the productivity of companies, because they are able to learn and implement new technologies from the countries where they export and thus increase their competitiveness.
- Organizational structure of the company. Syverson (2010) believes that the organizational structure of the company is an important element when we measure productivity, because the strategic decisions made by the management are in direct correlation with the productivity of the company.

Technological change is a term used to describe a process in which several processes are sublimated: invention, innovation and diffusion. This term is actually synonymous with the term technological development, technological achievement and technological progress. Technological changes refer to a continuous process of improving technology and its diffusion by the company or system.

Technological change is illustrated through the linear model of innovation, which was later replaced by a model of technological change that involves all processes of innovation: research, development, diffusion and use.

Clayton M. Christensen (1997) points to the fact that if the technology that is implemented in a company is a completely new technology, which unexpectedly replaces the already existing technology, it is more unacceptable than a technology that undergoes only certain corrections.

Technology is explained by (Griliches, 1987) as "Currently the best way to convert resources into desired outputs"

4. CONCLUSION

So, the conclusion is the there is symbiosis between technological changes and productivity in companies in a very progress and innovative way. Logical product of the main objective, and are related to:

- economic potential increase with the technological changes that are implemented in the companies;
- determination of the innovation capacity of the company is in correlation with technological changes;
- there are interactions of human capital with technological changes

Increasing the competitiveness of the company on the domestic and foreign markets, is thru implementation of new technology in companies. The productivity increases as a result of the technological changes implemented in the companies. Technology is a progress in a way it cannot be avoid by companies. Implementing the changes is a way the companies exist and can be competitive on a market.

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