

DEFINING FACTORS SIGNIFICANT FOR ORGANIZATION OF TECHNOLOGICAL PROCESSES

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Summary: *Standard of living of the mankind and degree in which we satisfy consumers' needs both depend on how developed technological processes are. High standard of living is the best indicator of development of production processes and of level of satisfaction of consumers' needs, and the level of development of technological processes directly depends on many factors among which the following could be described as general factors: working-age population, natural resources and social wealth; and the following factors can be described as special factors: labor productivity, labor intensity and technical progress, and this is exactly the subject of this paper.*

Key words: *production, development, population, natural resources, social wealth, labor productivity, labor intensity, technical progress.*

INTRODUCTION

In an industrial business system, with manufacturing technology, production programme is defined by the type and quantity of certain products. This fact reveals the very special role any product plays as initiator and bearer of the many operations and activities in a company. Product fulfills the function of a generator of business streams that are all directed towards achieving production, in order to fulfill certain consumption needs and to achieve the economic effects which guarantee that the cyclic business process within the system shall remain permanent.

Despite the fact that product is determined by a whole string of various elements, product is at the same time a subject to change that can be:

- result of deliberate actions,
- effect of random factors (low quality resources bring about difficulties in production and lower the quality of the final product, i.e. increase the cost of production).

Development of industrial production through increase of variety of products and adequate quantities, has been coming along in accordance with population needs. Between production and consumption, i.e. using products in accordance with given conditions, adequate channels had been established in order to bring to life the basic purpose of production: satisfying consumer needs.

The level of satisfaction can best be perceived through the standard of living of population. Higher standard of living is the most obvious indicator up to which levels needs are met. High standard of living and higher degree of satisfaction of needs must always mean large

production as well. In this regard, economists point out several relevant factors, classified as the group of general factors: working-age population, natural resources and social wealth, and some special factors: labour productivity, labour intensity and technical progress.

GENERAL FACTORS OF PRODUCTION

Population

Unemployment that appeared in industrially more developed countries in the 19th century, and increasingly uneven development, as well as geographical allocation of production, all these caused economic migrations of population from European countries into overseas countries, specially North and South America and Australia.

Population of any country is the basic production potential of that country. Larger population means that more people are involved in the making of the GDP, and that, at the same time, means larger production on a national level. On the other hand, larger population requires larger quantity of products to satisfy their needs. The fact that a large number of producers can create a large production does not, implicitly, mean wealth and abundance. Those are mainly the countries where agricultural population and extensive mode of agricultural production prevail.

Apart from the population of a certain country, we must also take into account population density, i.e. the number of people per square kilometer. Countries with higher population density should include a large number of people into the process of production. This requires a highly developed industry, or – if it is a mainly agricultural country – it requires their transformation into intensive agricultural production. This because, under conditions we mentioned, this type of agricultural production alone can provide that demands of population are satisfied, considering limitations of agricultural land and demands for food of the majority of the population. [2].

When studying the importance of population for social production, we must not forget the fact that only working age population is engaged in production, while the entire population of a certain country is engaged in consumption of goods.

Active population is the creator of social production and national income, while inactive population participates in consumption of these values, without contributing to them. That is why the scope of social production is conditioned on participation of active population within the entire population. If this element has a favourable place, then population becomes a very important factor for larger production. Countries such as Hong Kong, Singapore, and many Western European countries are capable of producing much more goods than countries that have much larger population. The structure of active population is conditioned on, before anything else, extent of development of national productive forces, specially in industry and agriculture. [2].

The structure of active population is also influenced by natural conditions, i.e. natural resources that make the material base for economic development. Relation between agricultural and non-agricultural population depends on the number of people employed in secondary and tertiary industries. Agricultural population is larger than non-cultural population in economically less-developed countries, while in developed countries non-agricultural work force is predominant.

Apart from analysis of active population, it is necessary to organize analysis of the structure of population and of some other criteria, such as: sex, age, education, etc. The purpose

of these analysis is to provide insight into contribution that certain population groups play in social reproduction, but also to perceive their position within reproduction. Parallel with general social and economical development, population involved in the process of production rises as well, but so does the age limit too because modern technological processes demand higher qualifications.

Expertise is a specific type of capital and deficit of this capital can be covered by adequate immigration policies. In the beginning of developmental phase the structure of demand for labor is such that it does not require large numbers of labor with highest skills, but in later phases of development highly educated work force is a must.

Natural resources

Natural resources of any given country are: forests, agricultural land, sources of energy, mineral resources, climate conditions, plants and animals, soil stability. Natural resources include entire nature that man is able to exploit to maintain and increase social production.

Available resources are not necessarily at the same time indicators of adequate production. Countries, regions and nations that do not have adequate natural resources at their disposal more often than not are not able to achieve large production, so in most of those countries production is not adequate. We should point out the examples where lack of natural resources does not necessarily lead to inadequate production. Countries such as Japan, Taiwan, Hong Kong, Singapore, Switzerland, Belgium and others do not have significant natural resources. But, these countries have achieved enormous productive capabilities. Lack of natural resources is compensated by import from those who have larger quantities of natural resources than they need. This import is compensated through the export of final products of highest finishing. It should be pointed out that there are also many countries with relatively large natural resources, but they have inadequate production, and, consequently, high degree of poverty. Among those countries there are Tansania, Nigeria, Uganda, Indonesia, Burma, India, Russia, and Iraq. In the framework of natural resources of abundance, in those countries there usually was no stimulus for faster development. Social progress was the fastest where nature was neither too generous, nor too frugal. Such conditions motivated man to act, giving him opportunities to transform his ideas in practice, changing both nature and himself at the same time. [3].

Two basic types of natural resources are material and non-material resources. Material natural resources include all material goods found on the face of the earth, deep inside the earth and in water. Non-material natural resources include climate conditions that can influence, either favorably or less favorably, the exploitation of material natural resources.

Social wealth

Social wealth is made of all the material goods that make up the basis of production and consumption of any society, and these material goods were created over centuries by the work of many generations, and these goods are at the society's disposal. That is why we say that those are accumulated products of human labor, contrary to wealth that is given by nature, without human influence. For example energy of water in rivers falls under natural wealth until people capture that energy by building dams and regulating waters, and then that energy is used to give power to power plants or any other energy consuming plant. So,

regulated energy of water is not natural resource but social wealth. Still, we find other opinions in theory, where one can find the opinion that social wealth should also include the available natural wealth, up to the extent that it should include all the financial claims and obligations towards foreign subjects. Social wealth clearly shows economic might of a certain society. Larger social wealth of a certain country creates preconditions for its faster growth and prosperity. [3].

With the first hiper-production crisis we learned that, despite large social wealth, economic might and standard of living in developed countries can drop significantly, and that those categories should be taken in relation to the scope of achieved production, and not only to national wealth of a given country. From that moment onwards, statistical and other research projects are directed towards calculating and monitoring the categories of domestic product and national income, while the concept of social wealth is being abandoned little by little. Nevertheless, for the purpose of having adequate economic policies, it is not enough to learn only the size and the structure of production of a certain country, but we must also get insight into its entire national wealth, as well as its structure by economic sectors, by propriety sector, its relation against national income, etc. In practice we face numerous statistical problems regarding the method of calculating national wealth, valorization, problems with prizes, basic structure of this type of wealth, growth rate, etc. According to its contents, social wealth can be material and spiritual wealth. Material wealth includes all the manufactured goods that can be used for production or consumption, and spiritual wealth includes all spiritual goods and cultural achievements of a certain society, such as works of art. [4].

SPECIAL FACTORS OF PRODUCTION

Labor productivity

Labor productivity is creative power of the work force. It is the ability of an individual, under certain conditions, to create, in a time unit, larger or smaller amount of material goods. With labor intensive production result is achieved due to increased effort of the employees, i.e. increased consumption of energy within time unit. Productivity is a relation between results of production represented by a certain quantity of material goods, and engaged labour represented by engaged working hours, or by the number of people engaged, as shown: [1]

$$P = Q/L$$

Where:

P – labor productivity, Q – achieved production, L – engaged labour force.

Productivity is measured by the quantity of products produced during certain time, that is, during time needed to produce one unit of product. Higher productivity means that with smaller amount of labor force we are able to produce more, i.e. we engage less work for a single unit of product. We can study productivity on both macro and micro levels, depending on whether we study the relation between results of production and engaged labor force in one organization, or whether the focus of our attention is shifted towards national level.

Several factors influence increase in productivity, and they are: work experience, degree of expertise and ability to implement achieved knowledge, capability to organize production, how developed means of production are, natural resources and other factors.

Work experience is the first and basic condition for larger production and it can be achieved in the studying process. [6] Expertise and the ability to implement it are also very

important for labor productivity. More developed science and technics will mean that man rules over nature in a higher degree, that is, they show better use of natural resources for social production. Technological inventions are not always usable in every day life.

Organization as a factor of productivity is directly related to knowledge and experience of the producer. Organizational skills can be achieved through experience, i.e. by learning. This is about man's ability – given same inputs – to create greater outputs thanks to increased degree of organization, i.e. it is about the ability to produce more material goods. A case indicative of this would be a case of two companies with identical qualification structure, where performance is not the same due to different work organization. It is a fact that better organization contributes to higher production and because of this fact we pay much more attention to this problem today. Truth be told, organizational abilities are a natural gift. We must always remember that these abilities can be improved up to 70% by studying. Therefore, organization as such is studied on a massive scale today. With all other given factors equal, organization is the decisive factor in labor productivity. It appears as a separate factor, not only within an individual productive unit, but also within a society as a whole.

How developed means of production are is also a factor in productivity. This is about the fact that with more developed and improved means of production can create more material goods, even if we have fewer natural resources at our disposal. More modern machinery and better quality raw materials always mean more productivity than depreciated machinery and low quality raw materials, given same other conditions.

Natural resources, from fertility of soil, through depth of mines and percentage of usable ingredients within ore, all the way to climate conditions, all these represent factors that – given that all other conditions are equal – influence productive force of labor. Better natural resources mean that with less labor we can achieve same or higher quantity of products. These conditions can best be seen in activities related to quality of soil and to climate conditions, such as agriculture and mining.

Manufacturers in Western Europe, in America and Asia have been far more productive than those from the socialist countries. It is a proven fact that far less was produced in socialist countries and this was mainly due to low productivity. All this means that socialism – socialism that will be remembered by its economy rather than its ideology – has disappeared.

Labor intensity

As a factor of the technological process of production, intensity shown up to what extent manpower energy is consumed during work process, i.e. it represents the extent of labor consumption in a time unit. In order to produce as much goods as possible, people exert themselves to the maximum, i.e. they consume more and more of their manpower. Intensity means that we should do more work in same time-frame due to increased use manpower. By increasing labor intensity man invests the same amount of work over shorter period of time. This increased amount of work invested in a shorter period of time worker achieves by putting in more effort and density of work, in order to usefully spend every single moment of working hours. This way we face situation where larger amount of work is squashed into given time-frame.

When labor intensity is lowered to a certain minimum, the performance drops to zero. This level of labor intensity when work performance drops to zero represents the lower limit of labor intensity. By increasing labor intensity relative to lower limit, performance at first rises progressively relative to increase in labor intensity, and then it becomes digressive. After reaching a certain limit every further increase of performance ceases, despite the fact that input of worker's bioenergy is still going up. Level of labor intensity where increasing labor

intensity does not bring any further increase of performance is the upper limit of labor intensity. Somewhere between upper and lower limit of labor intensity there is also the standard labor intensity. It is the labor intensity level where you have minimal use of worker bio-energy per product as a unit. Any deviation from standard labor intensity results in excessive use of labor conditioned on organizational factors.

Increasing production within given time-frame by increasing labor intensity has its limitations. This increase must not mean that laborers become exhausted and worn out, because this way his health can be endangered which stands in sharp contrast against ethical social norms.

Neoclassical theory claims that worker' labor intensity depends on: a) worker's motivation, skills, endurance and inclination towards putting in more effort within given working hours; b) technical equipment of process of production; and c) distribution of results of enlarged production between capital owner and worker.

Labor intensity can be influenced by technics, i.e. technology used for work. Development and implementation of scientific and technical progress in production entirely changes production. Invention of conveyer belt had a very special role in this regard. Conveyor belt enforced new speed for workers in the working process. In that way organizational characteristics automatically determine the intensity extent as an integral process. In those conditions, the types of workers' movements, their speed and number is strictly determined.

Technical progress

Technical progress is one of the main generators of social production. Technical progress can be perceived from creation of new and improvement of existing technics and technologies, i.e. from creation of new and improvement of existing means of production that provide work savings, from innovations and implementation and improvement of characteristics of existing products and from improvement of organization and production management. So, it is all about implementing new means of production, new methods of production and about transferring existing methods from more advanced production units into those not so advanced. Influence of technical progress means structural changes in entire material production, and this in turn increases social productivity and brings higher efficiency into deployment of available resources. Apart from increase in production, technical progress means larger volume of products, shortens time of production, saves raw materials, lowers cost per unit and increases quality. Technical progress cannot be separated from economic results, and it is based, primarily, on scientific achievements.

The social implications of technical progress cannot be overstated. Technical progress reduces the gap between manual labor and mental labor, it increases the amount of free time, improves work conditions, causes increases of health and cultural standards, satisfies ever increasing man's needs, but he also creates some new ones, too.

Schumpeter gives quite a good explanation of how technical progress influences market economy. Innovation gives an impulse to the entire capitalist economy and the period of prosperity lasts until the innovation wears off. Therefore, technical progress causes cyclic movements in a capitalist economy.

Technical progress consists of: [1].

1. inventions or innovations
2. implementation of innovations
3. expansion of implementation of innovations – diffusion.

In modern times, the path from an invention until its practical use on the market gets shorter and shorter. An example of this time period from an invention until its practical exploitation is given in Figure 1.

There are several indicators when measuring technical progress – its speed and levels achieved. We generally combine several methods in practice, because one single method cannot cover every single type of measurement.

The most important indicators of technical progress are:

- speed of increase and level of labor productivity;
- speed and level of diffusion of new and modern technologies;
- extent of development and growth of scientific/research and developmental activities;
- quantity and movement of innovations and speed of implementation of new products.

Investments in scientific research are getting larger by day. Putting money into knowledge is considered investment, so knowledge and its exploitation is the main source of welfare and progress today. Peter Drucker claims that new postindustrial age is dawning, in which society capital shall be replaced by knowledge. Figure 1 shows the time period from an invention until implementation for several products.

Figure 1. – Time difference between certain innovations and their application in practice

Innovation	Year of			Country of innovation
	invention	applicatio n	differenc e	
Submarine	1624.	1900.	276	USA
Typewriter	1714.	1870.	156	Denmark
Photo	1727.	1839.	112	France
Video recorder	1956.	1970.	14	Holland
Laser	1954.	1967.	13	USA
Mikro processor	1959.	1971.	12	USA
Comm. Satelite	1957.	1962.	5	USA
Nylon	1934.	1938.	4	USA
Insulin	1921.	1923.	2	Canada
Polivinilhlorid	1931.	1932.	1	Germany

Technical progress stands in a close correlation with labor productivity and intensity, and it is classified as a special factor of production. Technical progress contributes to lowering labor costs, means of production and subjects of production. This transfer is one of the basic characteristics of economic development and nowadays it is not used for less-developed countries alone.

CONCLUSION

Large population means at the same time a larger production capacity, but also larger consumption. While only working population participates in production, the whole population

of a certain country participates in consumption. It is necessary to organize various analysis of the population: sex, age, education, and other types of analysis of the population in order to evaluate contribution of certain segments of society to social reproduction.

Natural resources include the whole nature that can be used by man in order to achieve social production. The importance of natural resources for production is huge in the first stages of economic development. This type of wealth does not always mean large social production. Natural resources consist of material and non-material natural resources, and further material resources are divided into mineral and biological resources.

Social wealth is made of entire material wealth that make the basis of production and consumption in any given society created by generations of people over large periods of time (centuries). The scope and structure of social wealth is influenced by the scope and structure of natural resources, as well as prevailing social relations. Despite large social wealth, economic strength and standard of living can drop significantly in developed countries. According to contents, social wealth can be material or spiritual social wealth, and according to purpose, we have production, consumption and reserve funds.

Productivity is ability of an individual to, under certain conditions, in a time unit, creates larger or smaller quantity of material products. Productivity can be perceived on a macro and micro level, and it is conditioned on work experience, level of training and ability to apply acquired knowledge, on ability to organize production, on how developed means of production are and on natural wealth.

We define labor intensity as the extent up to which we use labor per time unit. Labor intensity of a certain worker is conditioned on worker's skills and endurance, on technical equipment and on way of distribution of results of production.

Technical progress is mirrored in creation of new and improvement of existing technics and technology, i.e. on creating new and improving existing means and methods of production that provide savings in labor, on new inventions and implementation of improved qualities in existing products and on improvement of organization and production management. This progress brings productivity growth, shortens time of production, contributes to savings in raw materials and improves quality. Technical progress consists of innovations, implementation of innovations and expanded implementation of innovations. Time gap between an invention and its implementation is getting shorter and shorter.

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