# KAPITEL 6 / *CHAPTER 6* [6]

# FORMATION OF INTELLECTUAL CAPITAL AS A BASIC TREND IN ENSURING THE PROGRESSIVE DEVELOPMENT OF ECONOMIC SYSTEMS

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## Introduction

Currently, humanity is experiencing an epochal trend – a phase transition (PHT) to the future socio-economic formation. The peculiarity of this trend is that it develops in the process of three industrial revolutions at once – the Third, Fourth and Fifth, which are a kind of general megatrend.

*The third industrial revolution (Industry 3.0)* is a phenomenon of radical qualitative transformation of socio-economic systems, characterized by the following processes: the transition to renewable sources of energy and raw materials, the mass introduction of additive technologies and network production systems, the digital basis of the recording and transmitting information, the formation of horizontal production-consumer structures and their corresponding forms of solidarity of economic relations.

*The fourth industrial revolution (Industry 4.0)* is the introduction of cyber-physical systems into the processes of production and consumption of products, which gives rise to fully automated networks capable of operating without direct human involvement (Industry, 2016; Shahan, 2016).

*The fifth industrial revolution (Industry 5.0)* is a phenomenon of human adaptation to a cybergized environment, during which the personal basis of a person develops, in particular, based on the synergistic integration of human cognitive abilities and artificial intelligence, as well as human biological nature and technical means.

A feature of socio-economic systems is the active role of a person, who influences with his work the change in the conditions of the external environment and the formation of the necessary prerequisites for PHT in the systems themselves. In the process of epochal phase transitions that change the contours of human civilization in the essential triad of man (bio-labour-socio), the centre of gravity gradually shifts from "bio" through "work" to "socio". The last element (socio) occupies a leading place in the new information and network formation.

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The development of a person's nature should become dominant in the system of goals and values of the future society. For the first time in the history of mankind, in the conditions of full automation of production (in particular, through the "Internet of Things"), a person can be freed from routine work to provide for his life needs to develop his creativity. The question, however, remains open: to what extent the billions of people on the planet will be able to overcome the internal barrier of numerous complexes formed by the ways of the former life of the human race, which limited the role of man to the duties of a slave performer. Even if this dependence often had the character of dependence on the conditions of competition or was dictated by the necessary survival circumstances.

Thus, the development of a person's intellectual capital becomes a basic factor in implementing the specified socio-economic phase transition.

## 6.1. The leading role of intellectual capital in modern production

In modern production, the ability of human capital to use information flows that pass-through enterprises and produce new information is crucial in developing economic systems.

Using the terminology of material production, it can be noted that information products can be in the form of *blanks* (for example, collected and analysed facts), *semi-finished products* (ideas), *finished products* (information services, for example, consultations) or *"information nodes"* (art samples) and *complex systems* (technological solutions).

In the 21st century, the software product has turned into one of the most profitable products, bringing billions of profits to manufacturers. Consumers pay this money, understanding that only by mastering the most progressive types and means of production they will be able to increase efficiency dramatically. This, for its part, is economically extremely profitable.

For economic systems, the quantity and quality of received, produced and transmitted information is a key factor in their functioning and development. Any economic system or its separate elements: from cross-border corporations and macroeconomic systems to individual enterprises, their executors, private households and consumers – must constantly receive, process and reproduce significant amounts of information. Its quantity and quality determine the success or failure of systems.

The logic of the development of economic systems shows that in their functioning processes, the role of the information component (compared to the material and energy component) is constantly growing. In particular, the share of labour, material and energy costs for producing and consuming information in the structure of costs for implementing economic processes is constantly growing. In the information component itself, not quantitative but qualitative characteristics are gaining more and more importance: reliability, adequacy, completeness, relevance, orderliness, timeliness, value, adaptability, etc.

## 6.2. Economic functions of information

Information increasingly begins to perform the functions of those key components of the economic system, which were previously performed by material assets. Among them can be named: *raw materials*; *means of labour*; *the subject of work*; *finished products*; *means of consumption*; *capital (source of profit)*; *product (object of purchase and sale)*; *property object*; *means of protection*.

Moreover, the value of information forms of the economic system continues to increase steadily. Certain circumstances contribute to this.

It is possible to single out several groups of factors that determine the increase in the importance of information in the modern economy.

One of the most important is accelerating the pace of development and changes in the economic situation. In particular, in the second half of the XIX century, the average period of technological change was 50 years, in the first half of the 20th century – 15–30 years old, in the second half of the 20th century – 5–10 years, at the beginning of the XXI century – 1–2 years, and in a number of industries – several months (Galitsa, 2009).

But any qualitative economic transformations force us to answer three key economic questions in a new way: "What to do?", "How to do it?", "For whom to produce?". You can answer them only by collecting and processing new masses of economic, social and technical information – a kind of informational "raw material".

An equally important point is the significant expansion of technical capabilities, which the increase in the information level of technologies opens up for production. This makes it possible to bring into production ordinary (and most importantly, cheap) materials of a new quality in which they were not used before (for example, silicon as

a raw material is used for the production of computers or optical fibers). This makes it possible to focus not on the resource (material factor) but on its properties and functions (informational characteristics).

Another circumstance is the objective need to increase the requirements for information characteristics (accuracy, reliability, durability, etc.). This happens due to the maximum speeds and operating modes of technical systems.

**Information as a subject of work.** *Information* becomes the leading subject of labour, i.e. what a person puts his labour to during the production of products. She has always been him. After all, the form and properties of objects of work, which a person changes during production, are primarily informational characteristics. This did not occur to people until the measurements were measured in millimetres and centimetres, the leading shape was the rectangle and the cylinder, and the manufactured products had only one single function of use.

The fact that the specified informational characteristics (in particular, form, properties, functions) become leading subjects of work, humanity began to realize when the weight began to play a role: in dimensions – particles of a micron, in forms – configurations of complex geometry, in properties – the ability to work in extraneous physical conditions, in consumer characteristics – multifunctionality ... It was then that goods began to become not material resources and products (bricks, cement, steel, cars), but physical properties and functions: accuracy, strength, speed, speed, reliability, quality, design, ergonomics provided by these products (Fig. 1). And it was then that a not so long ago unusual, but now understandable, combination entered everyday life: "price-quality ratio."

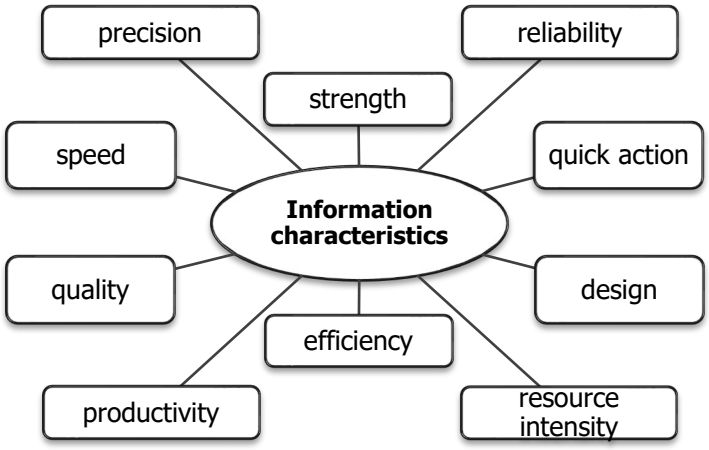


**Fig. 1 - Information characteristics of products**

**Information as an instrument.** Information is increasingly turning into a

instrument. Today, information systems are an integral part of almost all fixed assets. That information is a key component of computing machines and measuring devices is self-evident and requires no further comment. But information plays an extremely important (and sometimes leading) role in functioning other fixed asset elements: machines, equipment, instruments, devices, transport, and transmission devices. Even in the maintenance of buildings and structures, the role of information is becoming more and more tangible.

Information systems increasingly provide the necessary mode of functioning (humidity, temperature, air composition and other physical characteristics). In modern means of work, the leading importance of information is due to two reasons: firstly, the fact that it plays a primary role in the performance of production functions; secondly, by the predominant share of its value in the total price of the product, which sometimes reaches 80–90%. In particular, about 70% of the price of a modern automatic washing machine falls on the small electronic unit that controls the operating modes.

Information's role in production is growing even more during the formation of "smart" production systems, the "Internet of Things", and unmanned vehicles.

In 2019, the number of industrial robots in the world increased to 2.5 million. On average, their number increases by 15% per year. And in the next five years, this number will grow by 16% yearly. In general, the world market of industrial robots is estimated in 2020 at about 45 billion US dollars (Boiko, 2019).

According to their functions, robots are divided into different groups: milling, cutting, processing, painting, dispensing (pouring), assembly, disassembly, soldering, welding, and others.

In terms of the number of robots per 10,000 workers, two Asian countries lead by a large margin: South Korea and Singapore. In the first, this indicator exceeds 700, and it approaches this figure in the second. The United States, Taiwan, and a number of European countries (Sweden, Denmark, Belgium, the Netherlands, Austria, Spain, and Slovenia) follow with a rate of more than 300 robots per 10,000 workers. Finland, France, Switzerland, the Czech Republic, and China have indicators in the range of 100–150. It is noted that the majority of countries are significantly ahead (in a number of cases – by several times) of previously made forecasts (Boiko, 2019; Salnik, 2020).

**Information as a commodity.** Goods are connecting links between producers and consumers. From a synergistic point of view, it is with the help of information that enterprises exchange matter, energy, and information with the external environment (suppliers and consumers), carrying out production metabolism.

For the socio-economic system, goods are also carriers of information signals, with the help of which transformative processes in society are set in motion - some branches, spheres of activity, professions, and social groups arise, and others begin to die. After that, people's lifestyle changes. Their life conditions, movement, communication, activities and entertainment, fields of knowledge, skills, etc., are changing. Usually, by observing the change in priority types of goods, one can also assess the nature of future transformational processes of social life.

If at the beginning of the 20th century the US economy was dominated by enterprises that produced or transported material products, then at the beginning of the 21st century, more than half of successful enterprises produce an information product. It is worth noting that the basis of the wealth of all the ten richest people on the planet is precisely the information business (Table 1).

**Table 1 - The top ten richest people on the planet and the basis of their business (Top-10, 2020)**

| Name | The basis of business |
|---|---|
| 1 Jeff Bezos | Internet company, aerospace company, publishing house |
| 2 Bernard Arnault | Internet company, aerospace company, publishing house |
| 3 Bill Gates | Software product; server equipment; co-founder of Microsoft |
| 4 Warren Buffett | Software product; server equipment; co-founder of Microsoft |
| 5 Mark Zuckerberg | Internet technologies, creation of a social network, founder of Facebook |
| 6 Amancio Ortega | Trade and financial business, hotel and tourist business, modelling business, sports |
| 7 Larry Ellison | Software product; server equipment |
| 8 Carlos Slim | Infrastructure projects, information and communication technologies, energy |
| 9 Larry Page | Internet technology, co-developer and co-founder of the Google search engine |
| 10 Sergey Brin | Computer engineering, information technology, economics, co-developer and co-founder of the Google search engine |

**Figures and facts**

Other data can be cited that show the role of information business in developing the world economy. In 2019, the volume of exports of services provided using digital technologies reached almost 3 trillion dollars USA. This accounted for 50% of world exports of services. Since 2005, the export of the mentioned information business

services has more than tripled (Report, 2019).

Digital platforms on which business is built play an increasingly important role in the work of enterprises. In 2018, the market capitalization of companies based on digital platforms exceeded $7 trillion USA. At the same time, the colossal progress in their development is worth noting. In the last two years alone, the mentioned indicator has increased by 67% (Report, 2019).

According to the level of capitalization for 2020, the first seven leading corporations include companies based on information technologies: Microsoft, Apple, Amazon, Alphabet, Berkshire Hathaway, Facebook, and Alibaba. In particular, the value of shares of each of the first two companies exceeded 1 trillion US dollars, and the value of Amazon shares approached this figure (Bondarenko, 2019; Microsoft's, 2019).

Regarding the information reality, goods can be conditionally divided into the following groups:

– goods that materialize information (science-intensive products and services);

– goods designed to affect information (computers, memory devices);

– goods that use information in production as a "working body" (genetic engineering, educational technologies);

– goods that use information as an object of consumption (tourism, perfumery);

– goods that are themselves information (computer programs, virtual services).

The specifics of information goods become clearer during a more detailed study of some information products.

## 6.3. Types of information goods

In 2000, humanity crossed not only the boundary between two millennia. It became a landmark event in the economy as well. The volume of intellectual product sales in world trade equalled the value of the material commodity mass. Now the share of information goods is even higher because the role of information, even in producing goods that have a material form is increasing yearly. According to some estimates, at the turn of the millennium, the cost of information accounted for three-quarters of the added value of manufactured products (Melnyk & Briukhanov, 2010). In the new economy, more and more people are selling and buying not substances and energy but

information, concentrated in knowledge and human labour in products and services.

A complete list of such products would probably take hundreds of pages. It would include science-intensive industrial products (aerospace equipment, devices, chemical reagents, building materials, clothing samples, interior items, pharmaceuticals, perfumery products, means of processing information and communication, works of culture and art, educational technologies and more). Figure 2 shows only a few of the large range of information goods.

The above types of products are unique leaders in the markets of information goods in the last decade and differ in their originality from the products and services that people are used to in the industrial era. The given list can be significantly supplemented with information products that have existed throughout almost the entire social history of mankind, but only today are rapidly acquiring the properties of goods. They are actively sold and bought, having their market niches and an established pricing system. Their production and implementation are accompanied by a tough (sometimes very brutal) competitive struggle with inevitable victories and defeats.

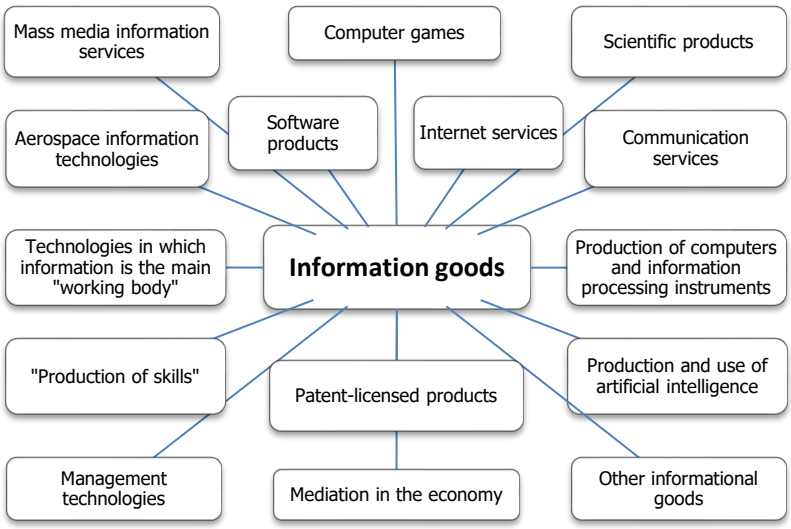


**Fig. 2 - Some types of information goods**

These types of products include services: *education*; *medicine*; *art*; *cultures*; *show business*; *tourism*; *sports*; *recreation*; *architecture*; *advocacy*; *politicians and much more*.

Among the types of service activities in producing and distributing material goods, these types of services become the main groups of the most consumed goods. This is a significant phenomenon. In the person-consumer, the palm of primacy passes from the material entity "bio" to the informational (personal) person "socio".

## Conclusions

Based on mentioned we can conclude the following. As a basic element of intellectual capital, information assets (communication channels, technologies, connections, data, scientific ideas, objects of intellectual property, etc.) act as a dominant factor in the phase transition to future socio-economic formation. And the intellectual capital itself turns into a decisive instrument for implementing the objectives of the transition processes.

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