Researching the Supply Chain Management for Human Resources by Virtue of the Techno-economic Paradigm Concept

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***Abstract*- The supply chain for human resource management is one of the most popular, actual, and versatile areas of economic science. The main scientific and practical problem of the research is the insufficient knowledge of the reasons for the supply chain for human resource management development against the background of an extensive accumulation of theoretical material, the inconsistency of empirical estimates of various processes and phenomena associated with the formation and use of human capital. The purpose of the research is to study the main stages of the supply chain for human resource management evolution from the point of view of the techno-economic paradigm concept. The methodological basis of the research is the theses of the classical economic theory and the supply chain for human resource management in all its diversity, the techno-economic paradigm concept, as well as the innovative development concept. The article considers the historical periodization of the capitalist economy development, explores the evolution of views on the human's role in the world public production. It is concluded that the human's role in the world public production is determined, first of all, by the prevailing techno-economic paradigm. A scientific base for researching the human capital and its main components is created and developed in accordance with the techno-economic paradigm and its appropriate structure type. The article covers the time period from the end of the XVIII century until the 90s of XX century.**

Keywords: supply chain for human resource management, classical economics, techno-economic paradigm, production resource, human factor, capitalist economy, economic history.

1. Introduction

The supply chain is a dynamic entity that has product and financial information flows within it. The performance appraisal process also requires several steps such as formulating or reviewing macro goals and strategies, performance standards, comparing actual performance with the standards of each indicator, announcing results, and applying corrective actions to continuously improve performance through the feedback mechanism. The supply chain for human resource management is one of the most popular, actual and versatile areas of economic science. The constant relevance, the large number and different directions of research in the framework of this theory are explained by the role that a human plays as a carrier of an economic resource in the society's development. The use of physical, mental, moral and other human qualities a in economic (business, industrial) processes has been an object of scientific attention and research since ancient times; the specific content and scope of ideas just depended in many respects on the specific era, i.e. historical and technological conditions in which socio-economic transformations took place.

The role of the human factor in the economic history and production development is closely linked and, in fact, integrated into the economic structures theory, which is popular today, is confirmed by numerous empirical studies, and by the concept of the world capitalist development periodicity. Based on the introduction of scientific discoveries and breakthrough inventions in public production, a change in the techno-economic paradigm objectively and naturally leads to a change in technological paradigms in various industries, as well as related socio-economic and managerial paradigms.

The purpose of the research is to consider the main stages of the supply chain for human resource management evolution from the point of view of the techno-economic paradigm concept. The main scientific and practical problems of the research are the insufficient knowledge of the foundations and reasons for the supply chain for human resource management development against the background of an extensive accumulation of theoretical material, and also the inconsistency of empirical estimates of various processes and phenomena associated with the formation and use of human capital. Accordingly, there are many disputes in science and practice over the validity of certain provisions of the supply chain for human resource management and the recommendations it gives to modern management.

2. Research materials and methods

With today's increasing globalization and associated growing demand for talented supply chain managers, human resource management (HRM) in supply chain management (SCM) has emerged as a top priority for firms. Science owes for the emergence and development of this theory (related theories) to many scientists, including K. Marx (the economic formations theory), [1-6]. Of course, human capital is the immediate subject of research for far from all of the scientists studying the cyclical development of capitalism. However, the techno-economic paradigm theory to a greater extent explains the patterns of changing dominant resources in the world economy, the transformation of the human's role in the public production development; it also justifies the periodization of the formation and accumulation of human capital.

The methodological basis of the research is the classical and modern provisions of the supply chain for

human resource management in all its diversity, the concept (theory) of techno-economic paradigms, as well as the concept of innovative development. In methodological terms, the study is based on general methods of economic and institutional analysis, including systematization, generalization, abstracting, comparisons, and expert assessments. The study is based on the conceptual apparatus developed by world science, which makes it possible to objectively and reasonably study such scientific categories as labour, human capital, investment in education, and the cost of human capital and others.

3. Research results

The systematic literature review indicates a growing focus on HRM/SCM issues in recent years, a trend that is predicted to continue. Periodization of the capitalist economy development as a basis for researching the human's role in the world public production. We present chronology of the techno-economic paradigms for the capitalist period of the world economic development with their main characteristics (table 1) based on the results of modern researches.

Table 1. Techno-economic paradigms chronology for the capitalist period of the world economic development

Techno-economic paradigm	Key inventions	Dominant resource	Main characteristics	The role of human factor in public production
First (1770-1830)	Spinning machine	Natural: land, water, wind, wood	Economic nationalism. Handicraft, manufacturing. Manual and mechanized labour	The prevalence of physical labour
Second (1830-1880)	Steam engine	Coal	Free trader imperialism. Appearance of factories, machine production	The simple and universal nature of professional skills. Human being is an appendage of a machine
Third (1880-1930)	Electric motor	Electric Energy	The heavy industry development. The emergence of conveyors, the scientific organization of labour	In general, the simple and universal nature of professional skills. Knowledge has limited importance for production. Establishment of vocational training institutions
Fourth (1930-1970)	Internal combustion engine, jet engine, nuclear reactor, radio communications, computer	Oil	The conveyor production development, diversified structure of industry. Scientific and technological revolution in the middle of the twentieth century.	The increasing role of knowledge, skills and qualifications as a resource. The supply chain for human resource management forthcoming. Differentiation of workers and remuneration according to educational qualification level
Fifth (1970-2010)	Microelectronics, information technology, Internet	Telecommunications	Expansion of the production volume and assortment of goods, the growing importance of intangible assets. The information revolution at the beginning of the XXI century.	The knowledge, abilities and human professional experience are recognized as the main factor in production. Investing in human capital is considered fundamental.
Sixth (2010-2040)	Nanotechnology, biotechnology, microenergy, artificial intelligence	Intellectual work	R&D is a leading industry. NBICS convergence (combining nano-, bio-, info-, cogno-, social- technologies into a generic area of knowledge)	Knowledge is the main factor in the economic development. The Knowledge economy development. The predominance of creative work.

Sources: [7]

As a retrospective analysis shows, the human's role in public production is determined by the prevailing techno-economic paradigm. In accordance with this, attempts were made to create a scientific base for the study of capital contained in a human being with a view to its effective use in the economy.

3.1. The evolution of views to the human's role in production and Supply chain for human resource management

The first significant attempt to explain the human factor role in the development of production was the labour theory of value. According to this theory, the basis of the market value of goods is the value created by human labour. The first industrial revolution contributed to the active development of labour theory, bringing

significant qualitative changes in the organization and producer goods, the emergence of machines as fundamentally new means of labour and, as a result, the replacement of manual by the machine labour one.

Despite the primacy of machines as the most important factor in production, the concepts of "labour", "productivity", "cost" were inextricably linked with individual. Adam Smith wrote that an increase in the productivity of useful labour depends, first of all, on increasing the agility and skill of the worker, and then on improving the machines and tools with which he worked [8]. According to Karl Marx, labour is a process in which a human being mediates, regulates and controls substance exchange between him and nature [9]. The economic category "labour force" formulated by Marx as a combination of spiritual and physical abilities that a living individual has, is a fundamental prototype of the modern "human capital" category.

During the second and third techno-economic paradigm, a number of scientists related to marginalism and bourgeois liberalism expressed a special attitude towards human beings and their abilities. Some Western scholars regarded humans as a part of fixed capital, that reflected the widespread view to a worker at that time as an appendage of machinery and to the slavish nature of labour itself. L. Walras, J. R. McCullough, G. D. Macleod, N. Senior, I. von Tyunen, I. Fischer, S. S. Hübner and others made direct analogies between a human and physical capital, defined a worker as a useful material object, and substantiated capitalized estimates of the human beings' value. In 1830, John R. McCullough wrote that it is appropriate to consider each individual who has reached adulthood as a machine that required twenty years of care and capital expenditure. In 1924, Irving Fisher noted that human is as material as a horse or a bull [4]. It is noteworthy that the point of view on the small difference between the economic value of slave and the value of free worker has existed long enough.

Some scientists as A. Marshall, F. Liszt, J. S. Mill, J. S. Walsh and others did not consider human being as capital, but as the qualities inherent in human being, which he uses in the production process. In particular, in 1890, long before the advent of the supply chain for human resourse management, Alfred Marshall talked about the effect of income on the health and quality of population existence, the relations between professions and earnings, the training impact on a worker's qualification, and therefore, on his/her labour productivity and the amount of rewards received [10].

It should be noted that the beginning of the twentieth century corresponding to the second half of the third techno-economic paradigm was a period of industrial concentration, enterprises' enlargement and industries' monopolization. All this led to revising the role of human and labour in production. This was largely accomplished within the framework of the Fifth Management Revolution, the theoretical platform of which was the rational bureaucracy concept, which determined the basic principles of interaction with personnel: the labour division, the competence of workers, formalism, and adequate remuneration for labour. Often, the role played by the representatives of the first school of scientific management in the formation of the supply chain for human resource management is often underestimated: the search for effective management methods they carried out implied a sharply increased role of education and qualification. "An enterprise can only live to the extent that it develops the talents of its employees and their performance. An enterprise lives by the force and brains of the people it produces. We have reached the point where there aren't enough people to make things," Henry Ford wrote in 1926 in his book "Today and Tomorrow" [11].

Worldview positions of the largest businessmen of the early twentieth century: Henry Ford in the USA, Henri Fayol in France and Konosuke Matsushita in Japan are valuable in that they pay a lot of attention to the issues of human qualities realization. They considered their managerial activities in the context of improving society. The postulate that the ultimate goal of industry is to create a world in which people have the best chance to use their brains, expressed by Ford 100 years ago, is fully consistent with the spirit of the modern supply chain for human resource management and the future era of the sixth techno-economic paradigm.

The fourth techno-economic paradigm based on the scientific and technological achievements of developed countries (USA, Western Europe, USSR) in the middle of the 20th century has marked the transformation of science into a powerful productive force, which entailed corresponding changes in the material and technical base of public production, as well as in industrial and social relations. The objective process during this period was a significant increase in the role of human knowledge and intellectual abilities in public production, and in the scientific plan; it involved the search for conditions for sustainable economic growth, factors for increasing production efficiency and personal well-being of the population. In 1958, an authoritative Western journal, The Journal of Political Economy, published a paper by the American scientist Jacob Mincer, in which he showed on the basis of empirical analysis the dependence of the male employees' income on their professional training duration [12]. The denotation "human capital" was first spoken in the title of the paper "Investment in Human Capital and Personal Income Distribution", although no definition was given to this term. In 1962, the same journal published its entire issue called "Investing in People," and it was this moment that marked the birth of the supply chain for human resource management as an independent research program.

The uprising of the supply chain for human resource management in its classical form is due to American economists Jacob Mincer, Theodor W. Schulz and Gary S. Becker. For the first time in history, the emphasis in research of the human role in production has shifted from a costly concept to an investment approach, in which the costs of health, education, vocational training, job search, migration, etc. are considered more as an investment, i.e. based on the expectations of future rather than actual benefits.

Becker argues that the cost of education and training, medical care, social programs, etc. are equivalent to investments in the creation and acquisition of new equipment and technologies, since in the future they would provide the same (even greater) economic return

both for private business and for the whole society. The supply chain for human resource management has a wide field of practical application: from explaining interpersonal and inter-territorial differences in earnings to modelling income generation schemes depending on age and professional skills [13].

4. Conclusion

It can be concluded that human resource systems that support collaborative supply chain relationships lead to competitive benefits. Understanding human capital mainly as human knowledge and skills acquired in the process of training and contributing to the growth of labour productivity, Mincer, Schulz and Becker, like many their followers, considered human capital mainly from the point of view of individual investments in education. As Schultz wrote, education is one of the capital forms, the most important factor ensuring economic growth and at the same time a separate source of growth. Education capital is human capital due to the fact that it is inseparable from a person. In 1962, analysing specific types of human capital, Becker paid the greatest attention to on-the-job training, because it clearly illustrates and defines the effects obtained from investing [14]. A little later, at the turn of the fourth and fifth techno-economic paradigms, the supply chain for human resource management was reflected in numerous studies related to investments in education as the main direction of investment in human capital. In particular, multilevel assessments of the economic return on education were carried out; approaches to the valuation of human capital based on education costs were developed and the relations between the investment in education and a wide range of indicators (the level and dynamics of wages, employee mobility, labour productivity, etc.) were analysed [15]. Following Mincer, who proposed an economic model describing the dependence of wages on the number of years of study and professional experience, Becker, Schulz and other scientists considered the training duration both as the main factor in the income magnitude and as a measure determining the level of human capital development.

In general, for the period 1960-1980, the conceptual and categorical apparatus of the theory was substantially replenished; the methodology was enriched; a kind of worldview shift in understanding the problem of sustainable development took place. Moreover, in the second half of the twentieth century, the supply chain for human resource management has developed to a greater extent as a rationalistic neoclassical concept based on the principle of “methodological individualism”, i.e. on the notion that any social phenomena can be reduced to their foundations in the field of individual behaviour. The supply chain for human resource management justified the economic mechanism of investing in a person showing that the difference in income can have a meritocratic meaning as a result of more effective individual strategies.

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