

## FLEXIBILITY AS THE SOURCE OF SUPPLY CHAIN COMPETITIVE ADVANTAGE

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**Abstract.** The article describes the competition reorientation for markets among individual business entities on competition between supply chains. The supply chains as open dynamic economic systems are considered. The evolution stages of key sources of competitive advantages formation and their meaning are revealed in the article. The article also includes the description of the main sources of supply chains competitiveness in contemporary market conditions. The influence of the time factor on the adaptability of production systems and supply chains flexibility is proved.

**Key words:** flexibility, supply chains.

**The problem formulation.** High market dynamics and growing demands as well as the customers needs, progressive globalization and increasingly strong pressure by market rivals forces the modern enterprises to unite forces in the competition, namely through the mutual coordination and common business processes within the supply chain. At present the traditional rivalry between the individual companies is replaced by rivalry between the whole supply chains – usually complex structures which operate globally. The implementation of the supply chain management concept and processes coordination of the management of the chain individual members provides great opportunities for specialization, reducing costs, improving the activity effectiveness as well as the speed and flexibility of response on the needs of the last customers than it would have been possible in a single enterprise activity [5].

The problem of the rational formulation and effective providing of their functioning is increasing concerning its topicality with the gradual shift of the sources of competitive advantages with the level of individual enterprises to the level of supply chain. In practice, indeed, not all the supply chains operate successfully and gain competitive advantage at the market. As a result of

complication of economic, technological, competitive environment, it is becoming more and more difficult for enterprises in the supply chain to create value for consumers higher than the competitors may do, and thus remain in the profit. The main sources of competitive supply chains according to different scholars include not only the expenditure efficiency, but also their effectiveness, flexibility, adaptability, speed of customer service etc.

The paper analyses namely flexibility as a source of sustainable competitive advantages of supply chains which is actualized by modern market demand concerning improving of elasticity of “hard” supply chains.

**Analysis of the existing research.** An important contribution to the development of the theory and practice of competitive strategies creation, analysis of enterprises competitiveness sources was made by foreign scientists such as I. Ansoff, H. Assel, M. Porter, K. Prahalad, A. Thompson, G. Hamel, and other famous scientists. Problems of enterprises competitiveness providing are covered in the works of our scientific schools, including:

- representatives of the Kharkiv Scientific School focus their research primarily on theoretical and methodological foundations of the competitiveness of enterprises (Yu. Ivanov, M. Kyzym, O. Tishchenko, etc.);
- Lviv scientific school is focused largely on the study of innovation and logistics in enhancing the competitiveness of enterprises (O. Kuzmin, J. Petrovych, Ye. Krykavskiy, Zh. Poplavska etc.);
- other Ukrainian scientists emphasize on the specific formation of competitive advantages and competitive strategies, and determination of their impact on the competitiveness of enterprises in certain industry markets (I. Kuznetsova, I. Altukhova, N. Kubrak etc.).

It is impossible to omit works of Donetsk (L. Balabanova, I. Tuleev) and Kyiv schools representatives (N. Butenko, A. Dligach, V. Herasymchuk etc.).

The essence of the concept of organization flexibility in the theoretical and practical aspects was studied, first of all by modern foreign scholars who studied in particular:

- conceptual basis of flexibility, its nature and types (D. Hervin, A. Seti, S. Seti);
- the impact of flexibility on organization productivity (S. Bahremi, L. Coste, M. Malhotra)
- The role of flexibility in an instable environment (D. Aakeer, D. Upton, D. Galbraith).

Ukrainian scientists, including W. Anishchenko, S. Komarynets, I. Otenko, J. Petrovych, Zh. Poplavska, T. Sadovska, and others made a series of works on production flexibility and productivity of production lines and logistics management specialists (Ye. Krykavskiy, M. Vasylevskiy, M. Hryhorak, M. Oklander, M. Poston) develop methodological approaches to the management of movement of material flow in the supply chain and management of value chain (O. Hirna, O. Shandrivska, N. Kosar, N. Chornopyska, R. Syvak).

However, some problems of the formation of enterprises modern competitive strategies in an increasingly unstable economic environment is still studied insufficiently, in particular there is lack of research of the competitive strategies formation in terms of the supply chain competitiveness. The necessity to solve these issues determines the relevance and definition of objectives of this research, including:

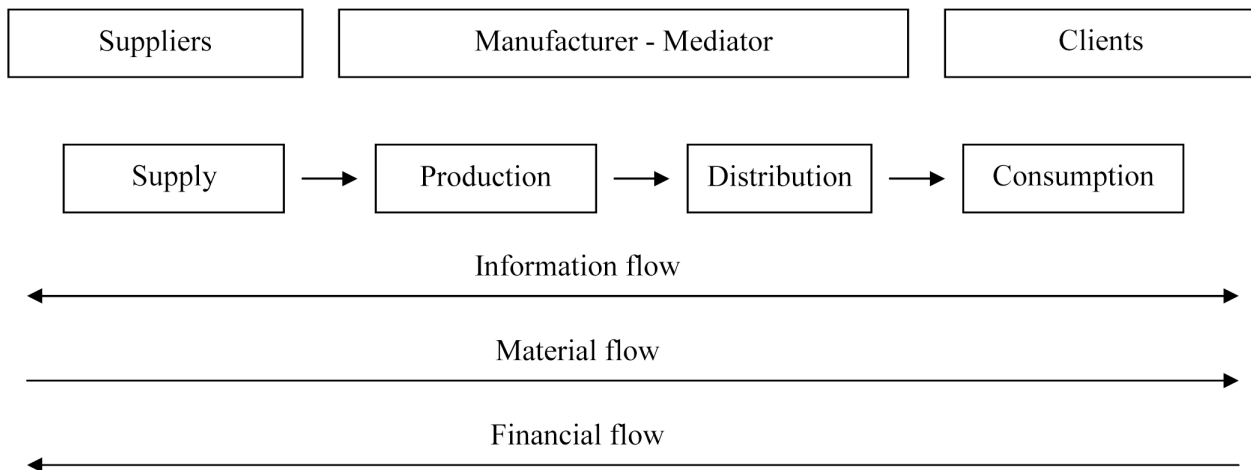
- to justify the emphasis shift of competition in the market from individual enterprises to competition between the whole supply chains;
- to develop the evolution of key sources of economic systems competitive advantage formation;
- to reveal the nature and subordination of such concepts as “adaptability” and “flexibility” of organization, to highlight its essence taking supply chain as an example.

**1. From the concentration on a single entrepreneurship entity to open dynamic economic systems.** Economic science considers a separate enterprise as a complex production, economic and social system, because it is making efforts to meet the needs of society (environmental system), and consists of interrelated parts (industries, shops, stations, functional units, etc.) activities of which affect on the

final product. Enterprise as an economic system interacts with the external environment from which the system receives factors of production, necessary for operating activity (inputs) and which implements and performs activity results (outputs) – products, works and services.

According to leading economists, the basis for the operation of a modern enterprise should be a concept of enterprise as a kind of system integrator – an integrated economic entity, which combines in time and space different socio-economic processes and receives the effect through the use of systematic multiplicative effects. In an instable environment in order to achieve and maintain a sustainable competitive advantage, the enterprises must have properties that are typical for complex open purposeful systems: to perform certain processes within the life cycle of production, to respond to a changing external environment and ensure its own development (property of self-organization); to have typical for complex systems combination of the properties of integrity and separation, which, in some way, affect its functioning and development.

Growing competition at product markets encourages companies to integrate their efforts, tools, ability to obtain competitive potential, particularly in the form of supply chain. Foreign scientists reveal the essence of the concept of “supply chain” as “... network of related organizations in their work with organizations that are ahead of her, and organizations that act after them, and the realization of different processes and actions which create value for the final customer in the form of products or services “[15, p. 37]. According to the model changes of rivalry competition between single enterprises to competition between whole production chains there is a need of forming competitive strategy taking into account the characteristics of the different enterprises competitive advantages of industrial chains, managing supply and demand, relationships between suppliers and customers, establishing and maintaining long-term partnerships. Supply chain is described as a complex open economic system in which there is movement of material flow, information flow and financial means to create and transfer value to the final consumer. In this way the supply chain connects the benefits manufacturing sector with the sector of its consumption (Fig. 1).



*Fig. 1. Schematic representation of the supply chain*

Source: [13, p. 42]

Supply chain can be compared with played and experienced team, all members of which coordinate their actions in order to participate in competitions. The ultimate aim of supply chain management may be defined as recognition, identification of expectations performance in the sphere of service quality for all clients with regard to actions in favor of permanent costs lowering to a level that corresponds to optimize profit in whole chain [Vaselevskiy]. Achieving this goal thus creates conditions for obtaining competitive advantages, mainly by technical integration of systems which support the management of the information, goods, and money flows movement. In turn, institutional and infrastructural interaction of supply chain participants requires the integration of operational processes, maximal increasing of supply chain capacity by supporting difference of companies potential – its members and the maximization of value providing for customers to increase their loyalty.

Coexistence of chain activates and intensifies the need for finding reserves and hidden potential, especially in the area of cost savings and avoidance of waste, acceleration of order fulfillment, increasing flexibility of respond to changes of different nature in order to increase competitiveness.

**2. Evolution of key sources of competitive advantages.** Every economic system at the market tends to take an advantageous position in relation to competitors. Its competitive strategy is focused on how to achieve sustainable and profitable position, allowing the system to withstand the

pressure of the forces which determine the competition at the relevant market.

A variety of scientific papers on directions of competitive advantages creation, evidences about the objective complexity of the subject. Analysis of the global practice development of achievement commercial success by companies during the late nineteenth century and the beginning of the XXI century allows to single out several stages in the evolution of the key sources of competitive advantages formation. Each of these phases is characterized by specific demands of consumers concerning goods (services) of firms and thus firms focusing on specific aspects of strategic nature to better meet these requirements. Evolution of the value proposition at the market is schematically shown in Fig. 2, and the characteristics of each stage are presented in Table. 1.

Stage I. Up till the early twentieth century welfare of individual companies and entire countries largely depended on the possession of the production key factors. Material and technical basis for the production process in industry is the main funds. The main production funds determine the nature of industrial area material and technical basis at different stages of its development. During this period, the possession of land, raw materials, factories was considered as an attribute of prosperity. The development of countries was largely due to the presence of raw materials and energy. For example, the famous German Ruhr, rich in coal, helped to develop the iron- and -steel industry, which became the basis for engineering [6].

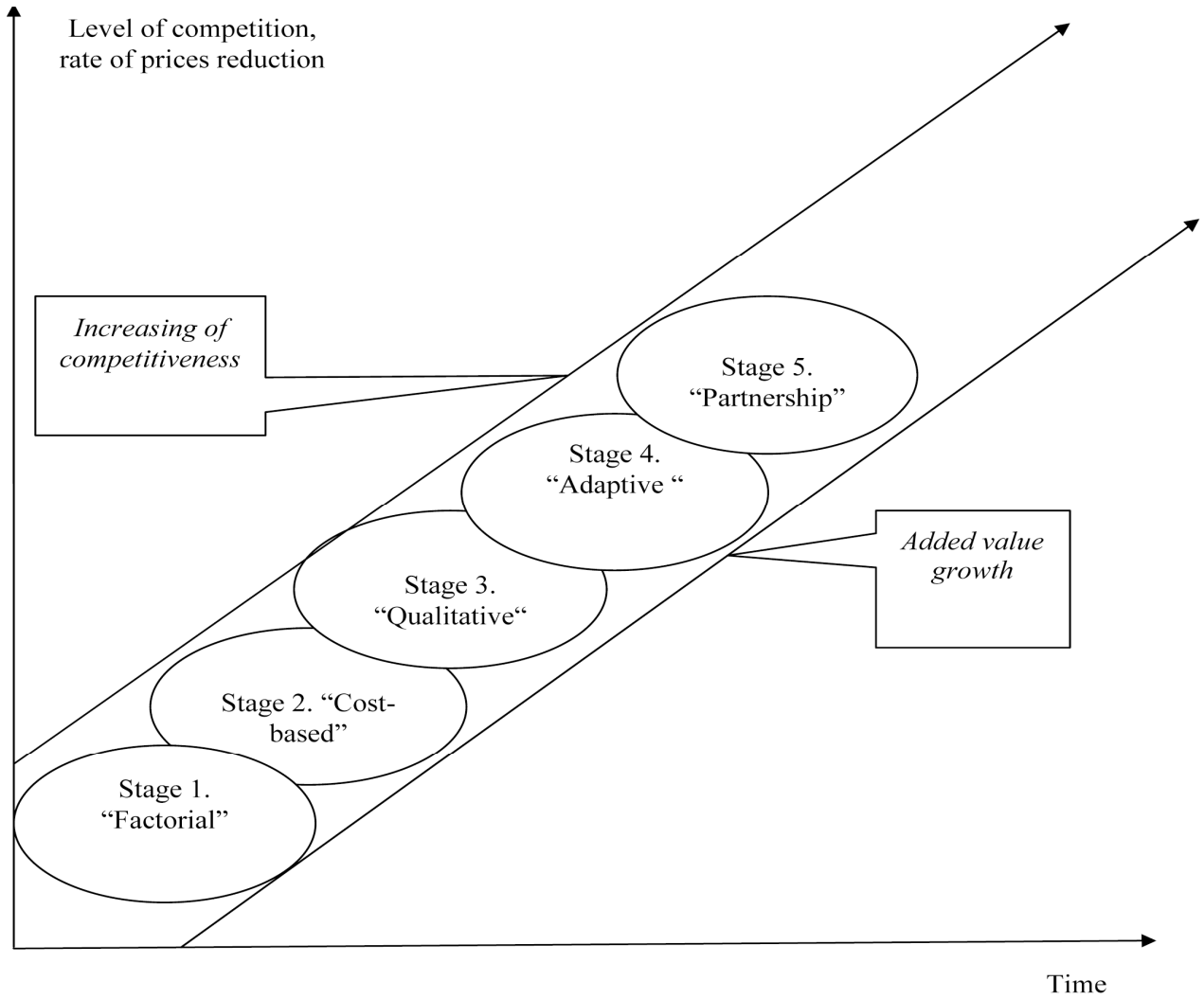


Fig. 2. Evolution of evaluative supply at the market

Source: author’s elaboration

Table 1

**Evolution of the key sources of competitive advantages formation**

№	Stage title	Approximate time bounds	Market demands	Key source of the competitive advantages
1.	“Factorial”	Till the beginning of the XX century	Goods at reasonable prices	Factors of production availability
2.	“Cost-based”	Beginning of the XX cent. – 50-ies	Minimum prices	Unflinching costs reduction
3.	“Qualitative”	60-ies-70-ies	Superior quality characteristics	Continuous quality improvement
4.	“Adaptive”*	70-ies-80-ies	Commodity modifications adapted to the changing requirements of consumers	Adaptability of production systems
5.	“Partnership”**	80-ies-90-ies	Supply chains competing	Partnership in supply chains
6.	“Innovative”	90-ies – beginning of the XXI cent.	Originality, uniqueness of products	Innovations
7.	“Elastic”**	Beginning of the XXI cent.	Quick response to dynamic market changes	Flexibility of supply chains

Note\*: steps are proposed by the author.  
 Source: added by the author based on [6].

Stage II. In the second phase (beginning of the twentieth century. – 50s of the twentieth century.) there is a task for industrial enterprises to lower costs and increase personnel labour productivity. The development of large corporations opened the possibility of using the benefits of standardized mass production to meet needs of mass undifferentiated markets at that time. Competitiveness of enterprises was achieved through the use of economies of the scale effect and experience, measures concerning reduction of the cost and selling goods at competitive prices.

Stage III. Subsequently, in 60s – 70s of the twentieth century close attention in business begins to be paid to ensuring the quality of products and services, and later – the quality of processes and systems. Systematic, comprehensive quality management principles, which are called “total quality management” (English – Total Quality Management, TQM) begin to develop. Internal and general quality management system in firms started to be formed gradually. Normative base for such systems creation became an international standard ISO 9001, the latest version of which was published in 2008 by the international organization of national standards bodies ISO.

Stage IV. Typical feature of the fourth stage (70–80 years of the twentieth century.) in the development of key sources of competitive advantages formation, in our opinion, is focusing of enterprise entities on adaptability of its production systems. With the saturation of commodity markets and increased competition on it, diversifying of consumer tastes and priorities – the prerequisite for the competitiveness of organizations is the ability to create and offer commodity modifications to the market, according to changing requirements of consumers.

The concept of adaptation in the scientific literature is used in different disciplines and areas of human activity. It comes from the Latin term “adaptatio”, which means the adaptation. In biology, adaptation involves adaptation of the organism to external conditions during evolution. The notion “adaptation” has long gone beyond biology and currently belongs to the general concepts, is widely used not only in natural, but also in the social sciences. Philosophers consider adaptation as “a manifestation of the unity of the internal (body) and external (environment), with its inherent contradictory moments” [14]. Just as in philosophy, from an

economic point of view, the adaptation is seen as a process of balance establishment of internal and external environment [12, p. 86].

Particularly topical in this period became the tasks of creating flexible manufacturing systems, with help to perform integration [1]:

- Equipment and all variety of manufactured parts in processing;
- Material flows (parts, products, fixtures, equipment, basic auxiliary materials, etc.);
- The processes of designing and manufacturing of products from concept to turn-off (merger of main, support and service processes of production);
- Service;
- Management through computer systems, data, application software packages, automatic control systems, etc.;
- Information flows to developing constructive management solutions;
- Staff through mastery of related professions.

Differentiation of consumers needs in the market required diversification of commodity supply while maintaining a competitive price level. The use of universal (non-automatic) equipment increased complexity of production, and therefore its price, which negatively affected the competitiveness of products and its perception by the market. In such a situation there was a need to create equipment to satisfy the following requirements: – universality, easy setup (functional invariance); – Automation; – Automatic changeover with team of management computer center (computers); – high accuracy and reliability; – automatic setup of tool in the course of operations. Based on the specified equipment in this period of time the flexible production modules (FPM) were established at many enterprises, integrated and flexible complexes and line (PC), flexible integrated station, shops, production plants, etc.

Stage V. We decided to define and name the fifth stage of competitive advantages formation in business (the 80-90s of the twentieth century.) as the “partnership”, as it was during the active interaction of business entities with counterparties of environmental (external) environment, the operation of which involved individuals, physical assets and entities that are out now: suppliers, buyers of products, intermediaries and other market counterparties and sometimes even competitors. Transformation processes, taking place in the

global economy require a radical restructuring of the entrepreneurship concept – from focusing on the own internal efficiency of the manufacturer to understanding the factors which determine the effectiveness of the partners activity. In this regard, the concept of relationships with partners and affiliate marketing is gradually becoming a new paradigm of management.

Stage VI. Namely at this stage of the evolution of competitive advantages (90-years of the twentieth century. – beginning of the XXI century), the strategic emphasis is made on innovations, because the development of a modern economy is becoming more dependent on the efficient generation, purchase, distribution and use of innovations. Implementation of knowledge through innovation and use of information is becoming a major factor in international competitiveness and thus creation of wealth and living standards improvement. Knowledge, innovation and its control – just as once the ownership of land, raw materials, factories – became the prosperity attributes. Consumers increasingly demand the products to differ from counterparts, reflecting originality and individual tastes of buyers. Innovations include a variety of areas of organizations activity. Some researchers among multiple competitive strategies distinguish basic strategy of “innovation” implementation.

Phase VII. The first decade of the new millennium marked by increased levels of unpredictability and complexity of the external business environment. Therefore, the first place in the competition comes to the ability of companies and entire supply chains quickly, often even in the mode “on-line” to respond to dynamic market changes. A key source of competitive advantages is the flexibility of the supply chain as a response to the increasing dynamics, complexity and unpredictability of the environment.

According to experts, the process of arising and perception of ideology by managers of each of the next new areas of competitiveness providing during the twentieth century – beginning of the XXI century has not only gradually-evolutionary as abrupt nature [6]. As shown in Fig. 1, after the opportunities exhaustion of market supply improvement and increase of its competitiveness at the market, there is need of new sources of competitive advantages emergence. To the extent

that, as a leading and successful companies achieved first significant success in the competition by obtaining and using a new type of competitive advantage, most followers also changed their strategy, wanting to imitate the leaders achievements. Due to this process of diffusion the new business models quickly gained distribution, and defined sphere of competitive advantages became the object of meticulous attention of the broad scientific public. On the other hand, it should be noted that new areas of competitiveness providing did not deny existing, but rather complemented, deepened and developed it. For example, innovative model updating of economic systems has not withdrawn from the agenda, but rather aggravated the problem of costs minimizing and improving quality.

**3. The influence of the time factor: from the adaptability of production systems to flexibility of supply chains.** Given the high dynamic environment economic systems have developed their ability to adapt to change. The results of the study of works of foreign and domestic scholars and empirical practical experience of the author, helped to highlight two features of economic systems in the context of their ability to adjust, namely adaptability and flexibility. The literature on the subject of investigations definitive generally accepted definitions of these concepts do not exist. In the field of management in most cases, the concept of “flexibility” and “adaptability” is considered as synonyms and learn “... from the standpoint of behaviors of the system and the external environment, organizational capacity for innovation and experimentation, willingness to change, collaborative learning and self-renewal, permanent ...” [8, 89]. Ukrainian researchers Z.V. Poplavskaya and S. Komarynets organization's ability to adapt is called “organizational flexibility” and Polish scientist Vasilevsky in the context of the supply chain uses the term “elasticity”. The existence of different approaches to use this conceptual-categorical apparatus requires deeper its scientific justification.

In theory, management changes distinguish different types of changes in the environment of the organization. Firstly, changes in the external environment can be divided by the criterion of “time” into two types: planning (strategic) and situational (dynamic) changes, or changes that arise

unexpectedly. Secondly, according to the susceptibility to *peredbachuvannya*, changes in the external environment can be divided into those that can be predicted, and those that are difficult to predict. Thus, changes can be planned in advance, while others are nothing more than a reaction to the unexpected and unanticipated events. So, there are two kinds of organizational changes in response to changes in the external environment – planning (strategic) and situational (dynamic).

Plans (strategic) changes – are those who previously developed and implemented with the intended purpose, specific goals, in a manner and within the prescribed time. When it comes to projected future changes, then adjust the way the economic system is to adapt its strategic plans. Planned changes – a deep medium-and long-term changes, which include vision and mission of the organization, as well as those aspects of its corporate life as development, quality, innovation and value in relation to staff, customers' needs and applied technologies. Strategic changes are made in the context of changes in the external competitive, economic, social and political environment and internal organizational resources, capabilities, culture, structure and systems.

Thus, the method of adjustment planned economic system to changes in the environment we consider the process of adaptation. After creating an economic system, its operation and success is only possible in accordance with the organizational structure, organizational culture, business models of the environment. Just as in nature, the market survive and become successful only those economies that produce the best shape of his operation. Their development, transition economies to higher levels of management due to the need to adapt. Thus, market evolution and adaptation – are processes that are inseparable from each other. Term adapting various scientists consider in different ways, which can be generally represented in three ways:

- as a property of the system to adapt to changes in functioning, likely in the future – adaptability;
- how the process of adaptation of the adaptive system to future changes, in fact, adapt;
- as a forecasting method based on the processing of incoming information and is suitable for forming long-term plans to achieve a specific optimization criterion – adaptive algorithms.

In our opinion, the successful adaptation of the economic system involves its ability to obtain the information and make realistic predictions for the future to advance the future of their behavior and structure to the optimal data market conditions. Thus, the main feature of such characteristics of the economic system as adaptability is its focus on the future because of the ability to highlight problems early, in time to decide to eliminate them, identify new trends change. The nature of the economic system is mostly evolutionary. Adaptation of the supply chain involves adapting its configuration and business models to expected market movements, often taking into account the time factor. Examples of strategies aimed at the formation time of competitive advantages are: increasing the speed of participants in the supply chain to respond to changing consumer demand, accelerate the process of developing new products, reducing production cycle, shortening the supply of goods or services, etc..

It is important to involve irreversible changes in the macro, such as areas of scientific and technological development, demographic trends, social and political changes, etc., as well as to predict the probable business chances in order to adapt its strategy and management decisions to these changes. The fulfillment of this goal requires, in particular [4, p. 61]:

- providing participants circuit current data regarding demand, sales forecasts, production schedules and orders, as well as other information related to the physical movement of goods;
- joint planning and implementation of sourcing chain defined function of its individual parts;
- coordination of the principles of separation of risk and the possible benefits that result from joint logistics activities;
- establish a central coordinator of the movement, ie links, which is the main initiator of the action, and monitors their implementation, in particular to avoid duplication and uncoordinated actions in the transportation and warehousing;
- refusal to practice shifting costs hold stocks at suppliers or customers in the optimization of resources along the entire supply chain.

In practice increasingly dynamism and complexity of the environment is manifested through situational changes that require rapid response to events in the process of implementation. Every economic system is subject to a large

number of situational changes that should adequately react. It is this ability to determine the flexibility of the system. The principal differences between the adaptability and flexibility of economic systems and management author systematized in Table. 2. On the flexibility of supply chain management as an open economic system is affected, including transparent and clearly defined operating procedures, serviceability of all elements of the chain, high operating efficiency, and above optimization angle client, market requirements and the nature of the whole chain [4].

Flexibility in an economic sense is versatile concept that different scientists examined from different perspectives and interests. Agree with the definition given in [8, p. 89] that “flexibility – the ability to react and change in response to environmental variability by creating new opportunities without undue expense, loss of time and productivity”, adding that it is responding to situational (dynamic) changes.

For competitive supply chain, the modern supply chains develop in three directions: first, cost savings and avoidance of waste (“slimming” supply chain), and secondly, increase readiness for adaptation (adaptive supply chain), and thirdly, the growth ability to respond (flexibility supply chain). Schematically, this is shown in Fig. 3. In practice, the supply chain can improve their ability to respond quickly to changes in the environment in different ways.

Firstly, supply chain flexibility should ensure its resistance to force majeure. You must provide the ability to change the participants in the supply chain if force majeure, for example, have in reserve suppliers and consider the design principles in favor of supply, to develop emergency plans and systems and preventive measures after the crisis on risk management. This requires training of highly qualified personnel in the field of risk management for dealing with crisis situations (accidents, strikes, wars or terrorist attacks, natural disasters, epidemics and diseases). As an example, the earthquake in Japan in the spring of 2011 led to the suspension of many plants not only in Japan but also a number of American and European car manufacturers, digital cameras and other products due to disruptions in the supply of components. Obviously, the widely publicized supply “just-in-

time” (“exactly on time”) that minimize inventories in this situation worked not in favor of either producers or resellers.

Secondly, it is important to improve the ability to respond flexibly to market demand fluctuations. This software flexibility is achieved through: the establishment of insurance reserves of inexpensive materials and components, for which demand is stochastic, but which are essential to ensure continuity of operation of the supply chain, the presence of flexibility in each link of the supply chain, as well as through collaboration with suppliers and customers in the design and redesigning processes, components, finished products in order to enable the development schemes “postponing differentiation in time personalization of goods”.

Situational changes occur regardless of desire or reluctance of management, they are not planned, but they can and must be considered in determining the future of the organization. It should be pointed out that a significant number of situational, unplanned change is neevolyutsiynyy nature and occur because the organization must respond to new situations and challenges surrounding. For example, competition may force the company – producer of sharply lower prices, strike – raise wages, etc. These changes are a way of quickly adapting to the economic system conditions prevailing, ie reactive. This occurs when management organizations are not planned but often unaware of their need at the time of occurrence, but still carries them to respond to any events and trends that may be threatening or vice versa – to open unexpected opportunities.

Since situational changes are usually the rash, the possibility of inefficient decision-making on them increases. Planned changes almost always take precedence over situational as provide time for preparation. The real art of management should be considered as a way out of unplanned situations with positive results and lowest cost through proper management of their occurrence.

While some environmental changes affecting the operation of the economic system, on the other it may itself affect or even cause them. Matrix of possible economic system to adapt to external changes is shown in Fig. 4.



Table 2

The principal differences between the adaptability and flexibility of supply chains

Sources of competitiveness	Priority in management	Horizon of management	The dominant stage of management	The tasks for development	The nature of development
Adaptability of economic system	The ability to predict	Planned period	Strategic planning	Adapting to change in the future	Mainly evolutionary
Flexibility of economic system	Speed of response and the availability of reserves	The actual period	Operational regulation	Quick response to the today's demands	Mainly the jump-like

Source: author's elaboration

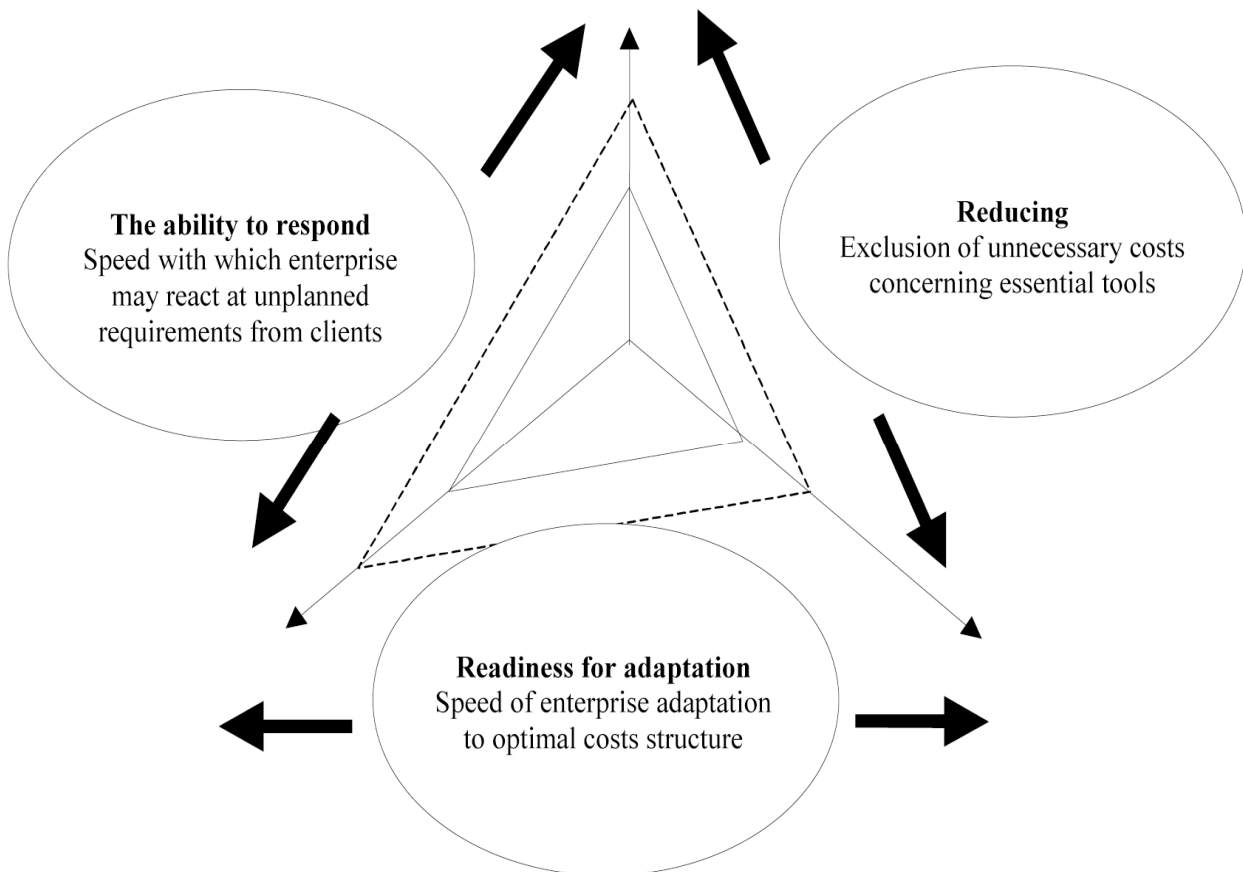


Fig. 3. Components of competitiveness of supply chains

Source: [20]

The ability of the economic system	Changes	
	Predicted	Unpredictable
Inability to affect changes	Passive adaptation	Fast flexible response
Ability to affect changes	Proactive adaptation	Proactive response

Fig. 4

Source: author's elaboration

Given the ability of the economic system affect the environment changes, its adaptation should be considered in two aspects: passive on the external conditions to which the system can not influence, active when the system itself influences the changes in the environment or even generates them. However, some scholars hold only passive concept adaptation, suggesting that modification of the environment is not included in the concept of adaptability [12].

Several authors stress the importance not only to adapt to rapidly changing conditions, but the ability to create new opportunities in the changes to achieve competitive advantage. Thus, it is not just about preventive and reactive measures in response to the changing environment, but also the formation of a strategic imperative, which enables the supply chain to overcome uncertainty, which can take different forms.

**Conclusions.** 1. The competition, which is influenced by sharpening competition both from direct competitors, and by producers of goods-substitutes, intensifying struggle in the market for the end user. This causes the need for model transformations rivalry between individual enterprises towards competition between whole supply chain.

2. The rapid increase in competition in the domestic and foreign markets, higher demands of consumers leads to the fact that in the coming decades could hope for prosperity is not a single enterprise, and a chain of entities are integrated into complex open economic systems. One of these forms of interaction contracting market is the supply chain, which, due to increased competition between them, must have a sustainable competitive advantage, particularly in reducing costs, improving product quality, flexibility and speed of supply, innovation and more.

3. Given the complexity neprohnozovanist and market dynamics among the main sources of competitive supply chains figures prominently their flexibility and adaptability. Flexibility – the ability of the economic system to respond quickly to situational changes in the environment that are difficult to predict, but which require urgent attention. Quick response supply chain appears as a reaction to the unexpected and unanticipated events. In turn, adaptability – the ability of the economic system to adapt to projected changes in the environment. Adaptation of the supply chain is done by routine response to expected changes.

4. Effective supply chain management helps ensure the reliability and flexibility of supply due to the elasticity of flow processes, ability to adapt to rapidly changing market conditions. However, remember that the decision on the level of flexibility of supply requires compromise agreement “time-cost” and synchronization of existing logistic processes all members of the supply chain in accordance with the dynamic changes that will be the subject of further research of the author.

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