

Developing a viable model of the enterprise taking into consideration the impact of the environment: studying economic and legal impact factors

Formación de un modelo sostenible de la empresa teniendo en cuenta el impacto del ambiente: un estudio de los factores económicos y legales

FEDOTOVA, Iryna V.¹,
 AZARENKOV, Grygorii F.²,
 TYMOSHEVSKA, Iryna P.³,
 PYSARCHUK, Oksana V.⁴,
 BOCHAROVA, Nadiia A.⁵

Abstract

The article is devoted to the actual problem of ensuring the enterprises viability on the basis of the methodical apparatus of cybernetic modeling of viable systems. On the basis of structural-level and systematic approaches, the basic levels and structure of a viable enterprise system are determined. Taking into account the influence of external and internal factors of environment the multilevel spherical model of ensuring the viability of the enterprise is proposed.

key words: enterprise viability, viable system model, recursive structure, spheres model

Resumen

El artículo está dedicado a la cuestión apremiante de garantizar la viabilidad de las empresas basándose en el aparato metódico de la simulación cibernética de sistemas viables. Utilizando el enfoque sistemático, escalonado y estructural, se determinan los niveles básicos y la estructura de un sistema viable de la empresa. Se propone un modelo esférico multinivel para garantizar la viabilidad de la empresa, teniendo en cuenta la influencia de los factores del ambiente externo e interno.

Palabras clave : viabilidad de la empresa, modelo del sistema viable, estructura recursiva, modelo de esferas

¹ Ph.D. in Economics, Associate Professor. Department of Management. Kharkiv National Automobile and Highway University, Kharkiv, Ukraine. Contact e-mail: irina7vf@gmail.com

² Ph.D. in Economics, Professor. Department of international business and economic analysis. Simon Kuznets Kharkiv National University of Economics, Kharkiv, Ukraine. Contact e-mail: grygorii.azarenkov@hneu.net

³ Ph.D. in Jurisprudence, Assistant. Department of Civil Procedure. Yaroslav Mudryi National Law University, Kharkiv, Ukraine. Contact e-mail: Coldsmell@gmail.com

⁴ Ph.D. in Economics, Associate Professor. Department of accounting and business consulting. Simon Kuznets Kharkiv National University of Economics, Kharkiv, Ukraine. Contact e-mail: oksana.pysarchuk@hneu.net

⁵ Ph.D. in Economics, Associate Professor. Department of Management. Kharkiv National Automobile and Highway University, Kharkiv, Ukraine. Contact e-mail: bocharova.n.a.xnadu@gmail.com

1. Introduction

In the conditions of crisis of modern economy, the requirements for the management of enterprises are growing and the problem of ensuring the viability of organizations is actualizing. The intensification of competition leads to the fact that enterprises need to adapt to the modern-day and shape the future more effectively than competitors. The ability of enterprises to coordinate their activities, achieve their goals and update faster than competitors is equated with viability. Research on the viability of enterprises, understanding what they are capable of under the different operating conditions are especially important with the constant change and modification of economic relations. The sustainable development and existence of an enterprise in the long-term prospects depends more on its viability.

According to research conducted by Scott Keller and Colin Price, at least 50% of an organization's success in the long run is driven by the viability of the business (Keller, S., Price, C., 2011). The problem of ensuring the viability of enterprises is relevant for enterprises functioning under conditions of significant instability of the economic environment.

In the course of its functioning the enterprise interacts with a number of stakeholders, in the process of relations with each of them conflicting economic interests arise. In order to congruence the interests of market participants it's important to understand the interaction of their interests, in particular in the context of the economic and legal aspects of this process. Thus, ensuring the viability of enterprises depends on many external and internal factors, which necessitates the use of a systematic approach in the study of the nature of impact of such factors. The systematic approach provides an opportunity to identify critical factors that affect the viability of enterprises, and also forms an appropriate strategy for managing its development (Awuzie, B.O., y Mcdermott, P., 2016). Effective management is required to ensure the viability of enterprises, and in this condition, new tools and methods that take into account the economic and legal aspects of the organization's functioning become particularly valuable.

Ensuring the viability of an enterprise involves the ability to adapt to the present and shape the future. Viable businesses are able to adapt to the current situation or solve urgent problems, but they also develop the ability to learn something new and continuously evolve themselves.

The goal of the article is to improve the theoretical approach to the formation of a multilevel model of a viable enterprise system, taking into account the factors of external and internal environment on the basis of the concept of viable systems.

This research has the following tasks:

- to summarize the theoretical aspects of the concept of viable systems and determine the basic levels of enterprise recursion;
- to identify external and internal factors that affect the viability of enterprises paying particular attention to economic and legal aspects;
- to form a multilevel model of a viable enterprise system on the basis of system and structural-level approaches.

2. Literature Review

The study of the viability of systems began in the second half of the XX century. W. Ross Ashby was among the first to formalize the concept of viability, more precisely, the ability to survive (Ashby, W., 1956). Based on Ashby's law of "requisite variety," S. Beer proposed a formalized Viable System Model (VSM) (Beer, S., 1972; Beer, S., 1979; Beer, S., 1985). A viable system is any system designed to meet the demands of survival in a

changing environment. A considerable number of scientists' works are devoted to the issues of ensuring the viability of the enterprise as a socio-economic system (Hoverstadt, P. y Bowling, D., 2002; Rios, J., 2010; Fedotova, I., 2013; Awuzie, B.O., y Mcdermott, P., 2016; Vahidi, A. y Aliahmadi, A., 2019). The development of an organization and its viability are influenced by various environmental conditions and factors. Previously, with the use of the concept of viable systems, the scientific studies was mainly focused on research concerning with the improving the internal environment of the enterprise. Some authors paid attention to the interaction of VSM with the external environment in terms of each level having a corresponding environment (Hoverstadt, P. y Bowling, D., 2005).

The attempts to look more closely at the interaction of VSM with the environment in terms of the Viable Systems Approach (VSA) have been made in the economic literature. This approach identifies two specific areas in which organizations are structured in this way: the governing body involved in decision-making strategies, and the operating structure involved in routine decisions regarding their activity (Golinelli, G., 2010). In addition, there was a logical shift from environment to context, that is the product of an initiative that involves and makes a subset of these resources effectively interact through combining them with external resources and / or new internal resources (Barile, S., Quattrociochi, B., Calabrese, M. y landolo, F., 2018). In the proposed conceptual model of "The Viable Systems Cycle", the authors considered the process of contextualization and determined that the ability of the system to survive depends on its ability to establish harmony relationships with the relevant entities in that context (Barile, S., Saviano, M., landolo, F. y Calabrese, M., 2014). But these studies did not sufficiently account for the impact of various environmental factors on the development of VSM.

There were attempts to incorporate factors of environment into the VSM model in the scientific literature (Vahidi, A. y Aliahmadi, A., 2019), but the authors have limited to consideration of interacting with the subjects of immediate environment of the entity and, partly, to some factors of the markets where operates (customers, suppliers, competitors capabilities, management consulting market and others). Thus, the theoretical and practical aspects of identifying the most important factors affecting the viability of the enterprise remain insufficient studied. Despite that many issues that are directly related to the viability of enterprises in interaction with the environment have been widely reflected in the economic literature, they have not been properly summarized and developed within the concept of enterprise viability. There is no commonality concerning with the issues of external and internal factors and components of ensuring the viability of enterprises. Current approaches to the formation of the model of viability of the enterprise, which took into account the hierarchical levels of its structure, both within the enterprise and in the external environment, are imperfect. The lack of a systematic approach to the formation of a multilevel viable enterprise model does not allow to make full use of the opportunities for the organization of effective interaction of all links of the system.

Thus, a systematic consideration of the interaction between the company and the individual factors that affect its viability is the most promising. The structure and composition of the internal and external environments of the enterprise need to be considered in more detail.

3. Methodology

The theoretical and methodological basis of this study was formed on the improve the formation of a multilevel model of a viable enterprise system on the basis of the concept of viable systems modeling, structural-level, system and metasystem approaches. The methodology of this article is based on Viable Systems Approach, which was used to form a recursive structure of a viable enterprise model. Based on the structural-level approach, the main levels of the viable system of the enterprise were determined. This research proposed to consider systematically the impact of certain factors of external and internal environments on the viability of the enterprise. Particular attention is paid to the impact of economic and legal factors on the viability of the

enterprise. The study is based on system and structural-level approaches which became the basis for the formation of a spherical model of a viable enterprise, which takes into account both the connections within the system and the multidirectional impact of environmental factors.

4. Results

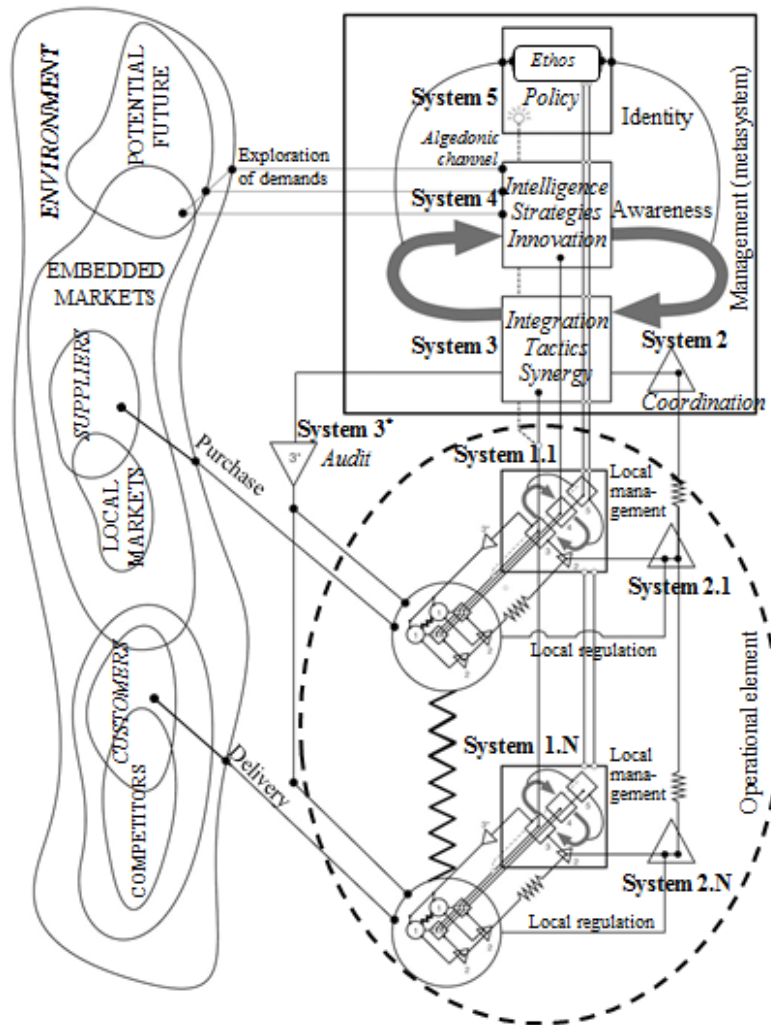
4.1. Viable System Model of Enterprise and its recursive structure

One of the most promising approaches to forming a multi-level enterprise model is to use the concept of a viable system proposed by S. Beer (Beer, S., 1994). The Viable System Model (VSM) offers the opportunity to design any organization scientifically as a system with the regulatory, training and adaptive capabilities that needed to ensure its survival (viability) in the face of changes that may occur in its environment over time, but they have not been provided in its design. A viable system consists of five interacting subsystems that can be reflected as aspects of the organizational structure. System 1 in the model of a viable system represents operational (autonomous) units of management of various production elements. Each System 1 first and foremost is a viable system according to the recursive nature of the system. System 2 plays the important coordinating role for other subsystems, providing information channels and bodies that allow the subsystems in System 1 to communicate with each other and with System 3. System 3 is responsible for controlling the performance level of each operating unit, for defining directives, allocating resources, rights and responsibilities of System 1 units, as well as to identify potential synergies and ensure synergies with Systems 4 and 5. System 3 * is located next to System 3, which is responsible for performing audit activities in operational units of System 1.

The bodies in System 4 are responsible for monitoring the environment, anticipating the future and identifying potential risks in order to control how the organization must adapt to remain viable. Finally, System 5 formulates the principles and goals of the system, playing a key role in maintaining its identity, and it is responsible for policy decisions within the organization to balance the needs and demands of the various parts of the organization and the management of the organization in general.

The whole viable system can be represented as part of a viable system (the parts that make up with operations or System 1). The breakthrough in developing the model was the understanding that this could only be achieved with a fractal (recursive) layered structure (Beer, S., 1994; Hoverstadt, P. y Bowling, D., 2002; Rios, J., 2010). Every viable system is the part of larger viable system. Recursion offers a new way of showing the purpose of a business enterprises or organization. Vertical deployment of the system supports the recursion of operational units into smaller subsystems (Hoverstadt, P. y Bowling, D., 2005; Rios, J., 2010). The goal is to reduce the diversity that each part of the system faces (system complexity decreases). A graphical method is used during the modeling of the viable enterprise system to make it more visible, as shown in Figure 1.

Figure 1
Viable System Model of enterprise



Source: adapted from (Beer, S., 1994) and (Rios, J., 2010)

Figure 1 presents three elements - the environment, the operating element and the metasystem, as well as the various relationships (interactions) between them. Fig. 1 shows that the operating element also has a structure of certain systems 1.1, ... 1.N, which are similar to a whole viable system. Every viable system is part of larger viable system. It illustrates the principle of recursion, where systems consist of smaller viable systems that are incorporated into a larger viable system (Beer, S., 1994; Rios, J., 2010).

Each element of the system is composed of: (1) a management unit (square shape); (2) operations (circular shape) responsible for interacting with the environment to offer their products and services; and (3) a system of local coordination (triangular shape) (Puche, J., Ponte Blanco, B., Costas, J., Pino, R. y de la Fuente, D., 2016).

Let us consider a viable enterprise system in accordance with its management structure. The strategic management system includes two subsystems: senior management system 5 and development and adaptation management system 4. System of goal setting 5 includes the owners of the enterprise, the board of directors or the directorate, depending on the legal form. System 4 includes the top management of the enterprise, which forms the directorate of development. The level of tactical management corresponds to the direct management activities and includes three subsystems. On the basis of system 3, a directorate of current activities is formed, which includes various heads by areas of activity, deputy directors or heads of

departments. System 3* performs monitoring, control and internal audit. System 2 executes interaction management, it regulates the interaction of units, stimulates or inhibits their operation, i.e. it is the center of regulation of the enterprise activity and conducts the interim results of all subsystems 1. Business process managers agree and coordinate the decisions.

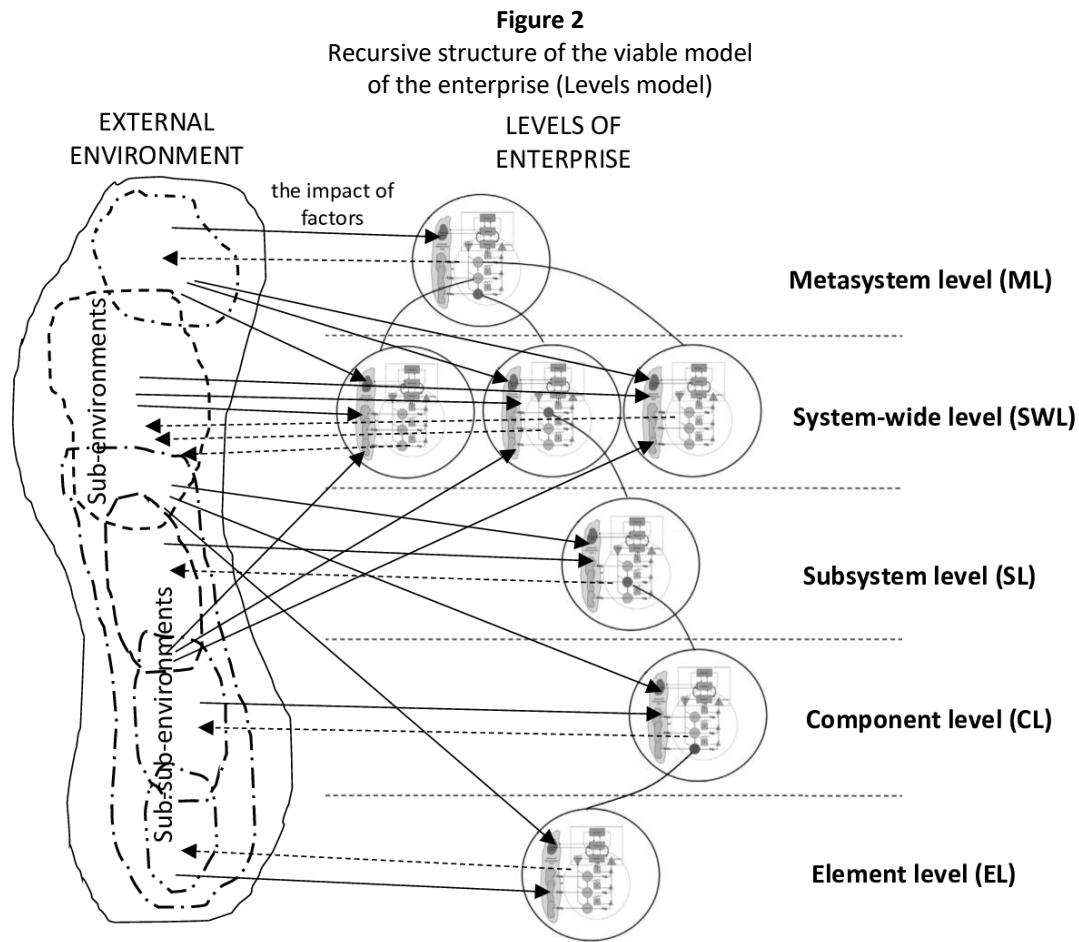
System 1 (operational element) can be represented in the form of basic business processes of the enterprise - systems 1.1,... 1.N (main, related, auxiliary, supporting) and subsystems of operational management of these processes. At the level of system 1, business process managers provide guidance in their areas of activity. Interaction and interconnection between subsystems take place through decision makers. In Fig. 1 it can be seen that the nested operational modules (business processes) resemble in their structure the main operation in which they are included, i.e. they have a fractal structure. For example, the main business process of the enterprise (manufacturing) can be represented as a separate viable lower-level system. This illustrates the principle of recursion, which is one of the key concepts of VSM.

The fractal structure of the VSM (Fig. 1) means that the same mechanisms are replicated at level and in each of the sub-systems and sub-sub-systems that we revealed in the unfolding of complexity (Hoverstadt, P. y Bowling, D., 2002). We should consider the decomposition of socio-economic systems at different rigid levels to reflect the recursiveness of the proposed enterprise model. Complex management systems characterized by a pronounced hierarchy and in the upper levels inevitably consist of many local management systems. Being a form of reflection of the processes of interconnection and interdependence of system objects, the concept of structural levels allows to reflect the connection of processes of systemic and development, the genesis of this object with its organization more deeply and organically. This means that decision-making is a multi-level activity, and not merely the prerogative of senior management as in a command and control system. This allows for strategy to be built up through the organisation as a series of conversational processes between different levels (divisional strategy, departmental strategy, and so on down to the level of teams and individuals) (Hoverstadt, P. y Bowling, D., 2002). Such a feature of the concept of structural levels is realized in its focus on the study of the internal differentiation of the system, the allocation of qualitatively diverse connections and interactions, which are one of the part of the functioning and development mechanism of the study object.

Some authors have already attempted to consider the levels of a hierarchy of a viable system as an individual organization and to present the basic levels of recursion (Hoverstadt, P. y Bowling, D., 2005; Ahmad, R. y Yusoff, M.B., 2006; Rios, J., 2010; Fedotova, I., Shynkarenko, V., y Kryvoruchko, O., 2018). The authors (Hoverstadt, P. y Bowling, D., 2005) presented expanding of a viable system model in the vertical direction, in the form of fractal levels, either of which has a corresponding environment. Thus, the authors (Ahmad, R. y Yusoff, M.B., 2006; Rios, J., 2010) proposed expanding of a recursive viable system in the vertical and horizontal directions, but they did not substantiate the number of structural levels. All these authors emphasized that as many levels as necessary can be selected to identify the system. This can greatly complicate modeling, as there is no single criterion for allocating structural levels of the system. In this article the authors developed the ideas (Rios, J., 2010; Fedotova, I., Shynkarenko, V., y Kryvoruchko, O., 2018) and proposed to deploy VSM in horizontal and vertical directions.

To determine the levels of the enterprise system it is proposed to use the criterion of differentiation of levels in accordance with the metasystem approach (Karpov, A., 2011). According to this approach, lower-level systems are embedded in the higher-level system (from a technical point of view) and the following levels are proposed: element level (EL) - component level (CL) - subsystem level (SL) – system-wide level (SWL) - metasystem level (ML).

Let's consider a structural-level enterprise model based on a recursive representation of the concept of viable systems. Each level of recursion is a viable system that is part of a viable higher-level system. Figure 2 shows the vertical deployment of the socio-economic system (enterprise) and its distribution at structural levels, which are the recursion levels of the VSM model.



Symbols:

- - the impact of the factors of environment on the structural part of the enterprise;
- - - → - the impact of the factors of the internal environment of the enterprise on the external environment.

Source: adapted from (Rios, J., 2010) and (Fedotova, I., Shynkarenko, V., y Kryvoruchko, O., 2018)

1. In relation to the problem of ensuring the viability of the enterprise, this means the selection of the following levels, starting with the highest level of the hierarchy:
2. The essence of the metasystem level involves the inter-organizational interaction of different enterprises within the strategic alliance what the enterprise belongs. The viability of the business of a particular enterprise comes from the ability to make decisions and to act, creating the structural and systemic conditions necessary for its connection with other viable entities in the supersystem context. The metasystem level can be represented in the form of a strategic alliance, value chain, network and other types of associations to which the enterprise may belong. If, for example, we consider the supply chain as a supersystem, then each node represents a System 1 operational unit (factory, transport company, wholesaler, distributor, retailer and other). Each supply chain enterprise interacts with the external

environment and with each other and can be represented as a separate viable system of a system-wide level.

3. At the system-wide level - the level of integrity, the individual enterprise is represented in general. On the one hand, an enterprise is a relatively independent, complexly organized system, characterized by certain features, and on the other - it is the part of a strategic alliance and it is included in it as in its metasystem. The enterprise integrates its subsystems, ensures the integrity, interconnection of its various properties, states, etc.; it carries out correlation and coordination of external (objective requirements, circumstances) and internal (its capabilities, resources, etc.). It actively organizes its interaction with the external environment. The external environment of the enterprise (sub-environments) includes customers, suppliers, competitors etc. (Fig. 1). The viability of the enterprise acts as the process and result of the interaction of metasystem level (economic environment) and systemic level (enterprise).
4. Subsystem level - the level of individual subsystems is formed to provide various functional manifestations of the system. It is formed by separate departments of the enterprise. At this level the integration of departments, functions, activities and flows of different types of resources within the system of a separate structural unit is formed. For example, a certain unit or division has services, departments or shops in its structure, dealing with certain activities of the enterprise, so in the external environment it can interact with various sub-environments.
5. The essence of the component level is to presents a set of components, consisting of elements, that have specific properties of this system. The component level includes individual processes, teams or departments of the enterprise. This level integrates individual operations into activities of production, sales and supply and other types of work within the enterprise. Thus, if the department or service is engaged in the sale of products, then its sub-sub-environments are consumers, if they are engaged in logistics – then the sub-sub environments are suppliers, etc.
6. At the elementary level bodies that are not subject to further decomposition are represented. This is the lowest recursion rate. It can be represented by jobs or workers performing certain operations. The organizer of this level can be workers that perform certain operations, interaction within the enterprise is formed between individual performers of certain operations or actions, and in the external environment – with the partners' personnel.

A vertical enterprise viability system can be a valuable foundation for understanding what a holistic system is and provides the enterprise manager with a roadmap that makes it easier to navigate enterprise sustainability practices. Each level has its own order and laws that need to be understood. The lower 4 levels belong to the socio-economic system of the enterprise, and the 5th level - to the inter-organizational interaction. Each higher level has an organizing influence on the lower levels. The lower levels supply resources to the higher levels and create boundaries for the existence of the enterprise within these limits. This model is recommendatory and may vary depending on the level of the object of study. The levels of recursion begin with the internal environment of the enterprise - an individual team worker, then the department staff, structural divisions of the enterprise, then move to larger models of interaction between the enterprise and the external environment in the form of inter-organizational networks, gradually moving into higher level relationships between industries within the country, between countries and so on.

The presence of the external environment reflects in the model the scope of the system operation, without which the basis of internal interactions of the organization cannot be taken into account. Fig. 2 shows that at each level the company actively interacts with the subjects of the external environment, which manifests itself in the form of multidirectional impacts. Subjects of environment create various factors that affect the company, and in turn, the company affects the activities of certain partners. It is offered to consider as impact factors of external

environment at the enterprise not the concrete subjects of interaction (legal or physical persons), but the conditions or forces which are formed in the course of interaction with a certain subject or impact of this subject on the enterprise.

The company must assess the threats and resources of the external environment, compare them with the current state of the company. Based on the analysis of external factors and existing resources, the company should make a choice in which markets the organization should develop, with which products it should ensure sustainability in terms of providing company with the necessary resources, and assess what needs to be done to maintain balance and viability. The VSM sets down criteria for organisations to become viable – i.e. capable of sustaining themselves in their chosen environment through time. A key to this is that throughout the structure of the organisation there are at every level, mechanisms for adaptation that allow that part of the system to adapt to both its external operating environment and the internal environment of the wider system of which it is a part (Hoverstadt, P. y Bowling, D., 2005).

The authors (Puche, J., Ponte Blanco, B., Costas, J., Pino, R. y de la Fuente, D., 2016) presented the impact of the external environment in the form of a number of noise sources, which were proposed to classify into kinds: (1) surrogate noise (geographical point of view, use of space, etc), (2) temporal noise (progressive deterioration, mutations in the environment, legislation, etc), (3) external noise (demand variability, raw materials, etc), and (4) system noise (latencies, faults, defects, errors, etc). The first three groups belong to the factors of the external environment, and the last fourth group – to the internal properties of the system. This division of factors is not correct enough, as there is no clear division into external and internal factors. Thus, it is necessary to separately identify the groups of factors that affect the viable system from the external environment, and to determine the factors that are formed inside the system and have an impact on the external environment. Therefore, we will consider the external and internal impact factors in terms of conditions and peculiarities of their impact.

4.2. The impact of external and internal factors on the enterprise viability

The living abilities of socio-economic systems and environments are linked to existing factors, so it is necessary to study and reflect the impact of these factors.

Ensuring the viability of enterprises depends on a large number of factors that arise and formed in the environment: internal (endogenous) - directly in the internal environment of the system, external (exogenous) - in the environment. Its relationships, interactions are extremely important and relevant not only for individual entities, but for the entire economic system. In some periods the influence of some increases, of others - weakens.

In order to form a system of external and internal factors that affect the viability of the enterprise, it is necessary to identify the groups of these factors. First, we will consider the factors of environment and their impact on the enterprise. External (exogenous) factors are the conditions which may not as a rule be changed but should be accounted for by the subject of an enterprise as they affect the state of its affairs, i.e., the factors outside an enterprise (Zinovieva, C.G., Kuznetsova, M.V., Dorfman, T.V., Limarev, P.V., y Limareva, J.A., 2016). Factors of the external environment are interdependent and create a system of influence on the viability of the enterprise. The level of adaptability to variability of the external environment will determine the level of viability of the enterprise.

It is customary to distinguish in the literature such groups of conditions as economic, legal, political, technical, social, natural and climatic, technological, organizational, market, administrative, industrial, psychological, ecological, etc. (Mescon, M.H., Albert, M. y Khedouri, F., 1988; Bowman, 1990; Yachmeneva, V., Vol's'ka, G., 2014; Matuzov, D., 2016; Kvasnytska, R.S., Dotsenko, I.O. y Matviichuk, L.O., 2018). Thus, it should be noted that there is a large variety of groups of conditions, and therefore groups of factors that affect the viability of enterprises.

To study the factors of environmental impact, we should rely on methods that will take into account existing different problems and versatility of the enterprise. To determine the main groups of influencing factors, it is necessary to take into account the already proposed directions that have been developed for strategic analysis by the following methods: PEST analysis (Political-Economic-Social-Technological) and its variants STEP, PESTLE, SLEPT, STEEPLE and others, TEMPLES analysis (Technology, Economics, Market, Politics, Laws, Ecology, Society), DRETS model (Demographic-Regulating-Economic-Technical-Societal) (Ho, J.K.K., 2014; Goud, B. y Goud, A., 2016; Shtal, T.V.; Buriak, M.M.; Amirbekuly, Ye.; Ukubassova, G.S.; Kaskin, T.T.; Toiboldinova, Z.G., 2018). These methods in a structured manner cover a large number of exogenous factors. Thus, it is proposed to distinguish the following exogenous factors of impact on the viability of the enterprise: economic, legal, technical and technological, social, demographic, cultural, political, informational, market, natural and ecological.

At the last time the impact on enterprises of external economic and legal factors of destabilizing orientation, especially at international level, has increased. This was especially evident during the international coronavirus crisis. The outbreak of the COVID-19 epidemic in different countries and the reaction of their governments clearly showed how political and legal factors at the international and national levels have affected both the world economy and the viability of individual enterprises. Due to the coronavirus pandemic, many countries have imposed a state of emergency or quarantine, and restrictions on people's movements and doing business. This has led to the partial or complete cessation of some industries and services, which in turn has affected the economic factors that affect the viability of enterprises. Measures taken by various countries to impose quarantine restrictions have caused enormous damage to the global economy in general and virtually all industries in particular. At system one-way impact of various groups of adverse factors the force majeure circumstances occur which negatively affect viability of the enterprises.

The impact of external environment factors, to a large extent, makes the economic agents and industries less stable, increasing the national economy dependence on them in general.

The company can operate at regionally, nationally and internationally markets, so it is necessary to pay attention to the legislation that regulates business and economic activity in a particular country and region. During interacting with stakeholders, company face with the specifics of economic and legal relations at different levels. National and international legislation is one of the main objective external factors that affect the development of the enterprise (Rensmann, T. (Ed.), 2017) . Enterprises are required to strictly comply with regulations at all levels. But, as practice shows, sometimes legislative acts at different levels (regions, states) contradict each other, causing uncertainty for the enterprises (Gorzela, G., Bachtler, J., Smętkowski, M. (Eds.), 2010; Black, E., y Bell, G. (Eds.), 2011), that directly affects its viability. In addition, the legislative changes can be adopted concerning specific industry issues (for example, the range of issues related to the introduction of certain sanctions and rules, changes in labor legislation and others). Also these changes can affect other groups of environmental factors (political, economic, natural and ecological, social, etc.), for example, the changes deals with tax policy regulations, employment, investor protection or environmental security and so on.

A special role belongs to the legislative, contractual and advisory rules governing the behavior of international business entities. They are developed by numerous international economic organizations or on the basis of multilateral interstate agreements and have supranational or international nature.

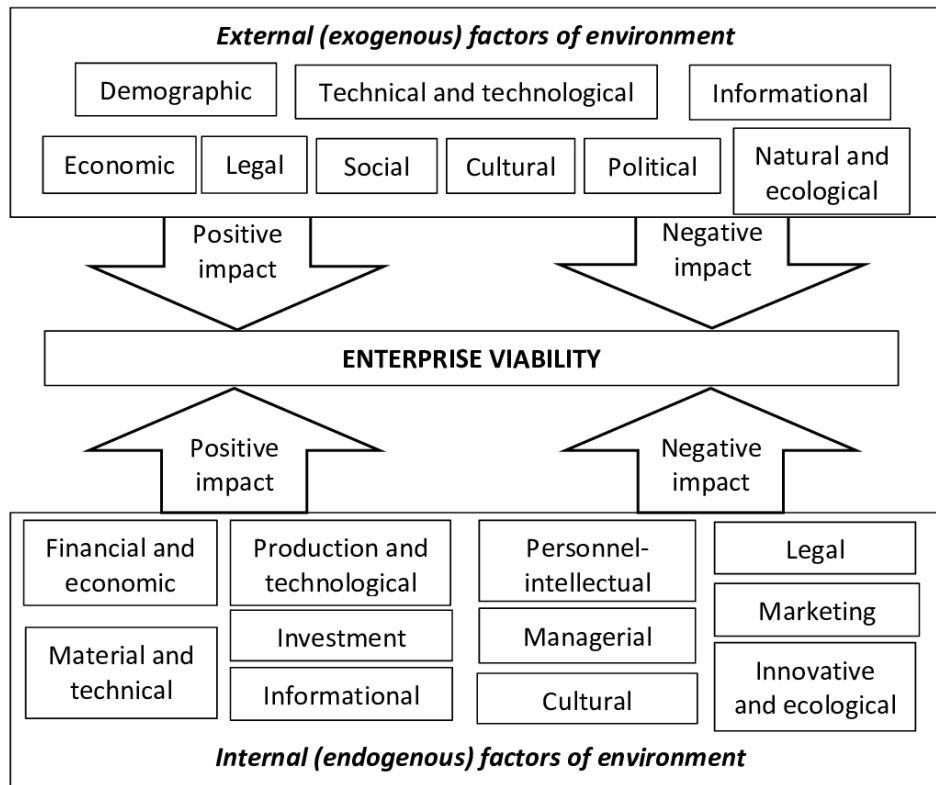
International factors affecting the social and economic efficiency of entrepreneurial activity include the internationalization of the world economy, the change in the value of dollar and euro in the world market, the growth of economic power of individual countries, the international financial system emergence, the opening of new large markets, etc. The entrepreneurial activity of an enterprise at the state level is influenced by the following economic factors: the state of the existing economic situation in the country; state of banking, monetary, financial and credit systems; state fiscal policy; inflation rate; the level of income and savings of the

population; the state of purchasing power of the population; the level of solvent demand; fluctuations in prices for raw materials, components, energy sources; state financial and economic policy; state control over monopolies and others. At the regional level the influence of specific factors is also possible: the state of the business environment in the region; state of entrepreneurial activity; availability of local raw materials and energy resources; development of transport and other communications; change of tariffs for transportations; the intensity of competition in the industry and the region; the existence of administrative barriers (imperfection of the registration process, complexity and length of the procedures for obtaining permits required for starting business activity, licensing, certification); bureaucracy of state and local authorities and others.

Based on the above mentioned, it is possible to divide factors of environment into three levels: regional, national and international. But an enterprise can interact with stakeholders at every level of the environment, so it is also important to consider the impact of direct influence on the enterprise's viability. Environmental factors of international, national and regional level can be divided into two main groups: direct and indirect influence. Global macro factors affect not only the enterprise itself but also its immediate environment. At the same time, the company is interacting with the factors of the immediate environment, and it has an adverse effect on such environment. The functioning of the factor in the environment is due to the need to achieve the goal that the enterprise or environment is facing. The process of interaction with the participation of a factor can be conditionally divided into two stages: 1) accumulation of resources; 2) spending of resources or a direct influence process. In doing so, the factor loses accumulated resources.

The ability of the enterprise to overcome crises, to win in the competitive struggle, to maintain economic stability and viability largely depends on the group of internal factors - on the state of its internal environment. Endogenous factors have a direct impact on the results of the enterprise activity and on each other, as well as reduce the negative impact or exacerbate the positive impact of exogenous factors (Matuzov, D., 2016). Based on the studies of different authors (Yachmeneva, V., Vol's'ka, G., 2014; Matuzov, D., 2016; Kvasnytska, R.S., Dotsenko, I.O. y Matviichuk, L.O., 2018; Zhussipova, E.E., Beisenova, M. et al., 2019), the following groups of internal factors were identified: financial and economic; material and technical; investment; production and technological; personnel-intellectual; innovative - ecological; legal; organizational and managerial; marketing; informational. Factors of the external and internal environment have different levels and directions of influence on the viability of the enterprise. In their orientation, the factors are stimulants (positive effects) or destimulants (negative effects). Each enterprise, based on the specific situation, should identify (predict) the most significant (dangerous) factors of external and internal influence and develop a system of measures for its timely detection, prevention or mitigation. The system of exogenous and endogenous factors influencing on ensuring the viability of the enterprise, are shown in Figure 3.

Figure 3
Exogenous and endogenous factors affecting the viability of the enterprise



Source: compiled by the authors

Thus, based on the system of isolated exogenous factors, we can form a mathematical expression of the environmental factors influence in the dynamics:

$$F(t) = \{f_1(t), f_2(t), f_3(t), \dots, f_n(t)\}$$

F - is the total multiple of the environmental factors influence on the viability of the enterprise;

$f_1; f_2; f_3; f_n$ - a subset of the influencing factors of economic, legal, cultural, natural and ecological, political, demographic, social and other groups;

t - point of time;

n - is the number of environmental factors groups.

The impact of environmental factors can be determined in dynamics by the following mathematical relation:

$$W(t) = \{w_1(t), w_2(t), w_3(t), \dots, w_k(t)\}$$

W - is the total multiple of the environmental factors influence on the viability of the enterprise;

w_1, w_2, w_3, w_k - a subset of the influence of financial-economic, legal, investment, production-technological, personnel-intellectual and other groups of factors;

k - is the number of groups of the internal environment factors.

The dependence of the viability of the enterprise on the influence of external and internal environment factors is as follows:

$$V(t) = \{F(t), W(t)\}$$

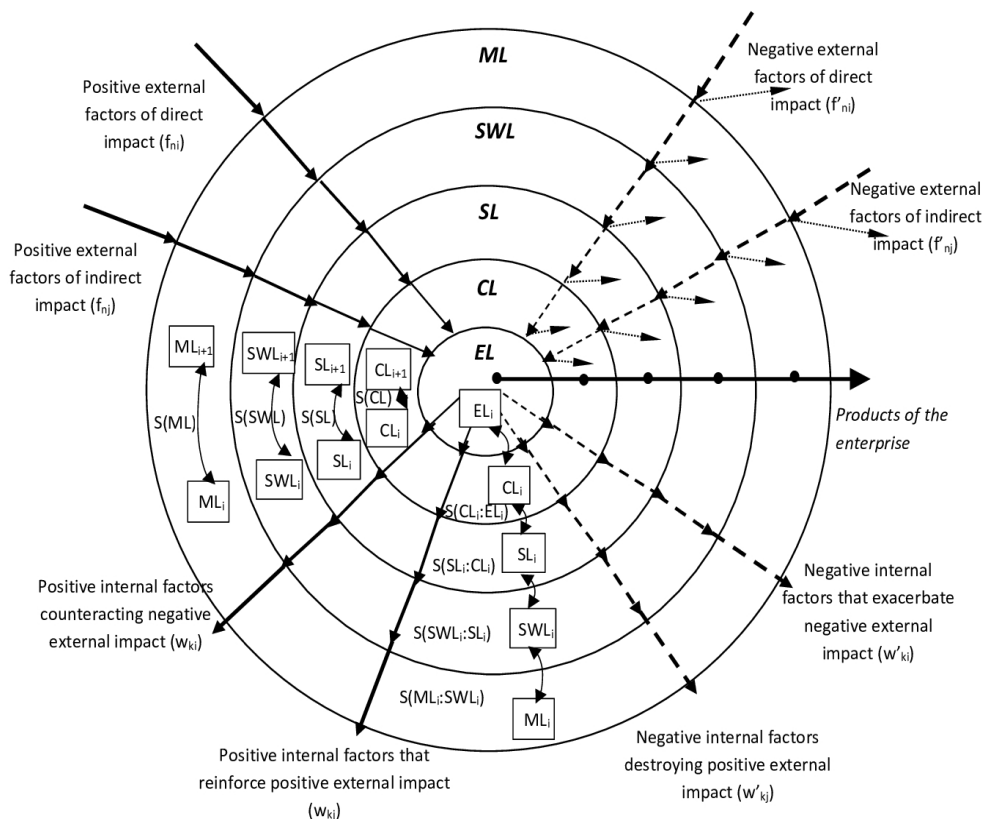
V - ensuring the viability of the enterprise due to the influence of external and internal factors.

4.3. Spherical structural-level model of a viable enterprise system

After determining the main factors that are influence in ensuring the viability of the enterprise, it is necessary to form a model of the system that will reflect the interaction of the external and internal environments factors of the enterprise in terms of a systematic approach.

Based on the structural-level recursive model of the enterprise, shown in Figure 2, there is a need to present a model of a multilevel enterprise system in its dynamic internal functioning and interaction with the external environment. In the view of the systemic nature of the enterprise, a spherical model of a viable enterprise system provided (Figure 4).

Figure 4
Spheres Model of the viable system of the enterprise



Symbols:

$EL_i, CL_i, SL_i, SWL_i, ML_i$ – constituent parts of the i -th rank, respectively element, component, subsystem, system-wide, metasystem levels;

S - connections with neighboring systems, located both in the middle of a certain level and between levels;

—→ - impact of positive factors;

---→ - impact of negative factors.

Source: compiled by the authors

It allows reflecting both the hierarchical dependence of different levels of the enterprise system and the interaction of the system with the environment. Each of the EL, CL, SL, SWL, and ML levels represents (in general) the area where all the diversity of the system distributed at the appropriate levels.

The spherical model includes a minimum of components and connections between them: the hierarchy of internal subsystems (EL, CL, SL, SWL, ML), connections with neighboring systems (S (SWL); S (SL)) and with the metasystem (S (SWL), S (SWL; ML)). The boundary layers that enhance or weaken the influence of the factors at each level lie between the levels. The boundary layer between the common system and the metasystem reflects the boundary between the enterprise and the inter-organizational network what it belongs. When the viable system interacts with the external environment, when the positive and negative factors received and externally exerted, the internal functioning of these connections begins.

The external environment can affect the system by the factors f_1, \dots, f_n . Factors W are formed in the internal environment of the enterprise and the system influences the environment through these factors. The internal forces of the system w_1, \dots, w_k counteract the factors affecting the external environment. Suppose that

f_n - external factors of environment that positively affect the system;

f'_n - external factors of environment that negatively affect the system;

w_k - factors of the system that positively influence the external environment and counteract its negative factors;

w'_k - factors of the system that negatively affect the external environment and exacerbate its negative effects, destroying the system from the inside.

Flows of external environmental factors in the form of resources entering the system, allocate between its subsystems (levels), manufacture products in the end. At the same time, along with the flows of positive factors such as necessary resources and other influences, negative flows also penetrate the system from the environment, worsen and destroy it. To reduce its influence, a boundary managing layer is introduced in the spherical system, represented by regulatory influence. But, even if it does not "save" the system, the system adapts to the influence of negative factors, trying to turn the damage into good. Thus, in the process of functioning, the enterprise must be able to process the useful flows of environmental factors and be able to resist the negative factors of environment.

If the set of environmental factors that negatively affect the system is found to be stronger than all the positive factors, the system breaks down. However, if the sum of external environmental factors that positively affect the system itself is greater, the system survives. As we noted previously, with their same focus, the influence of factors on the system increasing, that is, if an internal factor develops or improves a viable system and the external factor acts in the same direction, then, of course, the enterprise develops at an accelerated rate. Much worse when negative impact factors are summing up. Frequently one or more positive or negative factors give rise to a whole chain of unforeseen factors. If these are positive factors, the system accelerates its development. But with the strong influence of negative factors, it threatens destruction or even death. Thus, any socio-economic system is influenced by higher-level systems as well as interact with the environment. Management of the company's viability is possible only in the presence of a holistic management system and ranking of the factors that affect its viability. All factors are closely interrelated and it is difficult to assess the degree of impact of each. However, the management of the enterprise is able to formulate a general concept of its management and maintenance of viability, with distributions of powers, levels of responsibility among employees.

5. Conclusions

The problem of ensuring the viability of the enterprise is multifaceted and multidimensional. Its resolving depends on the availability of strategic resources, on the state of factors affecting the viability of the enterprise, the level of management and employees' motivation. Therefore, ensuring the viability of the enterprise directly depends on the list of conditions of enterprise functioning in order to prevent the possible impact of negative factors and use of positive factors, as well as achieving the maximum level of the development of the company.

The article advanced multilevel recursive model of the enterprise developed with using principles of construction of viable systems that allows comparing the needs and capabilities of the enterprise and realizing its potential. Based on the structural-level and metasystem approach, five basic levels of enterprise recursion identified: element, component level, subsystem level, system-wide level, metasystem level.

The main approaches to identifying the factors that influence the sustainability of the enterprise summarized. The system of exogenous and endogenous factors of influence formed, its orientation and possible levels of manifestation are determined.

Based on system and structural-level approaches a spherical model of a viable enterprise system proposed. It takes into account both the links within the system and the multidirectional influence of environmental factors. This model provides stability of functioning and adaptation to changing environmental conditions. With the proposed model of ensuring the viability of the enterprise, decision-makers will be able to carry out coordinated decision-making and implementation of decisions on the functioning of the enterprise and the inter-organizational network at different levels of management.

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