



Analytical support for enterprise's development management under conditions of economy digitalization

Kateryna Orlova *, Nataliia Ovander **

* Zhytomyr Polytechnic State University

103 Chudnivska str., 10005 Zhytomyr, Ukraine

PhD, Associate Professor, Department of Management and Entrepreneurship

** Zhytomyr Polytechnic State University

103 Chudnivska str., 10005 Zhytomyr, Ukraine

PhD, Associate Professor, Department of Digital Economics and International Economic Relations



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Abstract: The article defines the essence and structure of analytical support for enterprise's development management. The key indicators of Ukrainian enterprises activity have been analyzed, that made it possible to reveal the necessity of improvement of processes of managerial decisions substantiation and implementation. It has been defined that formation of the appropriate analytical support is an important precondition of managerial decisions rationality providing. It has been proposed to identify analytical support as a subsystem of general system of enterprise management, which is the organizational unity of informational, technical, personnel, methodological resources, which in their entirety provide support for managerial decision-making and implementation of decisions processes. The functions and forms of analytical support have been considered. It has been determined that the structure of analytical support for enterprise's development management includes the following components: informational, methodological, personnel, software. The peculiarities of formation and functioning of each defined component have been considered.

Keywords: management, managerial decision, decision-making, analytical support, informational component, software component, personnel component, methodological component.



1. Introduction

The current conditions of Ukrainian enterprises functioning are characterized by high levels of complexity and instability, which are accompanied by increasing threats of external origin, in particular, aggravation of competition, intensification of crisis processes in economy, decrease of solvent demand etc. These conditions put special emphasis on the issues related to ensuring the effectiveness, efficiency and rationality of managerial decisions. The level of substantiation, adequacy to external and internal conditions and relevancy of managerial decisions have a high impact not only on the efficiency but also on the long-term survival of the enterprise. Even minor mistakes in the process of substantiation and making managerial decisions can lead to extremely negative consequences and sometimes even to bankruptcy. Considering the mentioned, ensuring the rationality of managerial decisions is an important scientific and practical task. One of the key means of solving this problem is the formation of appropriate analytical support for the management system.

Analytical support forms the necessary informational and methodological basis, which, in its turn, ensures the adequacy and rationality of managerial decisions, increases the level of their validity and relevance. Thus, determining the essence and structure of analytical support for enterprise's development management becomes relevant in the context of the need to ensure the stability of the enterprise's functioning and development.

2. Materials and methods

The research is based on the scientific achievements of Ukrainian and foreign scientists. The importance of the studied range of issues led to a strong scientific interest in this problem. At the same time, it should be mentioned that a considerable part of publications of Ukrainian scientists considers analytical support in the context of accounting, instead the managerial aspect is not comprehensively highlighted. In the works of foreign researchers, a special emphasis is put on the implementation of IT solutions in management processes, in particular in the context of the implementation of decision support systems (DSS).

In particular, the work of A. Shtangret, O. Sylkin and M. Karaim (2017) is devoted to determining the components of accounting and analytical support for management of the enterprise's economic security. The scientists have proposed a mechanism for forming an accounting and analytical support for management of the enterprise's economic security. It should be noted that in this study the main emphasis is placed on the informational component of analytical support. O. Humeniuk's research (2015) was conducted from the point of view of formation of the necessary information base for different levels managers and defined the purpose, tasks and forms of analytical support for enterprise management.

In a comprehensive research of A. Asemi, A. Safari and A.A. Zavareh (2011) the features and stages of the management decision-making process are identified, the essence and characteristics of management information system (MIS) are substantiated, its role in management decision-making is defined. A separate object of research in this work is the decision support system, which is a software product for processing information, identifying alternatives and substantiating basic managerial decisions. Thus, this study focuses on the informational and software components of the analytical support.

The works of M. Babaei and J. Beikzad (2013) and H. Hakimpoor and M. Khairabadi (2018) are devoted to the peculiarities of the use of management information systems. In particular, M. Babaei and J. Beikzad (2013) substantiate the importance of MIS in the context of informatization of economic relations and increased role of communication. The study identifies the essence, types and role of MIS in decision-making processes. H. Hakimpoor and M. Khairabadi (2018) investigate the impact of MIS on the quality and relevancy of managerial decisions using artificial neural networks.

D. J. Power (2002) considers the peculiarities of the formation and functioning of the decision support system in the context of the types of problems faced by managers (structured and unstructured, routine and non-routine). The scientist puts a special emphasis on the features of construction of the decision support system taking into account its various dominant functionals.

An important component of the analytical support for enterprise's development management system is the methodological tools used in the substantiation and making of managerial decisions. The researches of D. Rigby and B. Bilodeau (2018), A. Afonina (2015), A.B. Qehaja, E. Kutillovci and J.S. Pula (2017) and B.A. Nouri and M. Soltani (2017) are devoted to the study of management tools (including analytical ones). The mentioned works consider the

peculiarities of the use of enterprise's strategic management tools, which, in turn, might be used in the decision-making process.

Informatization of economic relations causes the widespread use of IT solutions in the processes of enterprise's development management. In particular, the works of J. Williams (2017), D. Patel (2017), M. Haddara (2018) and D.M. Bahssas, A.M. AlBar and M.R. Hoque (2015) focus on the identification and characterization of various software products that can be used in decision-making processes.

At the same time, we believe that the complexity and relevance of the issues related to the formation of analytical support for enterprise's development management determine the feasibility of further scientific researches in the defined field, related, in particular, to the definition of the structure and requirements for the components of analytical support for management.

The conducted research involved the use of the following methods: methods of statistical and economic analysis – to identify the trends in the change of key indicators of development of Ukrainian enterprises; dialectical, system approach, analysis and synthesis, logical methods – to determine the essence and components of the analytical support for enterprise's development management; graphical and tabular – to provide the visual presentation of the research results.

3. Objective of research

The objective of the research is to substantiate the essence and components of the analytical support for enterprise's development management as of an important prerequisite for ensuring its sustainability and efficiency in the long-term perspective.

4. Results

The aggravation of competition, the growth of consumers market power, the intensification of crisis tendencies and the increasing level of external environment instability – all these factors determine the need to ensure the rationality, effectiveness and adequacy of managerial decisions. It should be mentioned that today the activity of Ukrainian enterprises is characterized by the presence of negative tendencies, which confirms the need to improve the processes of substantiation and making of decisions. The data of the State Statistics Service of Ukraine confirm the correctness of such conclusions (Table 1).

The data in Table 1 for 2014-2017 is provided excluding the data on the temporarily occupied territory of the Autonomous Republic of Crimea, the city of Sevastopol and the part of the temporarily occupied territories in the Donetsk and Luhansk regions.

The conducted analysis of enterprises activity indicators shows that there are ambiguous tendencies in the development of Ukrainian business entities. In particular, the number of enterprises fluctuates during the research period, but in general there is a tendency to decrease (by 26679 compared to 2012, and by 2745 compared to 2014), which indicates a decrease in the level of business activity in the economy. A significant decrease in the number of enterprises was observed in 2014, but in this context, it should be noted that since 2014 the data is displayed without taking into account the Autonomous Republic of Crimea and certain regions of Donetsk and Luhansk regions. A significant decrease was also observed in 2016. Absolute indicators and ratios of financial results show negative values in 2013-2015, which indicates a low level of ability of Ukrainian enterprises to withstand crisis phenomena and the need to diversify their activities and target markets. In 2016-2017, the situation improved significantly, but profitability remained low. Debt to equity ratio over the whole period is substantially higher than 1, which indicates that liabilities (debt) forms a main part in the financing structure. On the one hand, this indicates the possibility of attracting external financing to ensure the functioning and development of enterprises. On the other hand, it indicates a low level of financial stability of enterprises.

Indicators of the production component (capital investments and value added) generally show positive upward trends, which, combined with the decline in the number of enterprises, indicates an intensification of their development processes. The growth rate of sales in 2015-2017 is at a high level, but taking into account the level of inflation we can conclude that the growth is mainly due to the price factor.

Table 1: The indicators of Ukrainian enterprises activity in 2012-2017*

Indicators	Years					
	2012	2013	2014	2015	2016	2017
Financial aspect						
Enterprises number, units	364935	393327	341001	343440	306369	338256
Net financial result, m UAH	35067,3	-22839,7	-590066,9	-373516,0	29705,0	168752,8
Activity profitability, %	1,0	-0,7	-14,2	-7,3	0,6	3,0
Debt to equity ratio	1,8	1,9	3,1	2,5	3,1	3,1
Production aspect						
Capital investments, m UAH	229487,2	216986,9	178384,9	213478,1	281667,9	359159,8
Value added, m UAH	1015503,5	977145,0	1234090,1	1329264,5	1702670,5	2099504,8
Marketing aspect						
Sales volumes, m UAH	4203169,6	4050215,0	4170659,9	5159067,1	6237535,2	7707935,2
Sales volumes growth rate, %	x	96,4	103,0	123,7	120,9	123,6
Producers' prices index, %						
December to previous year	100,3	101,7	131,8	125,4	135,7	116,5
December						
Labour aspect						
Employees number, thous. people	7679,7	7406,5	6298,5	5889,7	5801,1	5812,9
Expenses for personnel, m UAH	374105,6	378223,2	354424,9	392558,1	434790,1	569937,3
Labour productivity, thous. UAH per person	547,3	546,8	662,2	875,9	1075,2	1326,0
Labour productivity to expenses for personnel ratio	11,2	10,7	11,8	13,1	14,3	13,5

* – excluding banks

Source: formed and calculated by the authors on the basis of State Statistics Service of Ukraine data (n.d.)

In the labour component there is a significant reduction in employees' number (by 1866.8 thous. people in 2017 compared to 2012, and by 485.6 thous. people in 2017 compared to 2014), which is due to both the decrease in the enterprises number and the personnel reduction, and the increase in the level of automation in the economy. The positive is the ratio between labor productivity and expenses for personnel. On the other hand, a considerable excess of labor productivity over salary may indicate an inadequate level of remuneration.

In general, the analysis of presented in Table 1 data showed that the activity of Ukrainian enterprises is characterized by both positive and negative trends. In its turn, the presence of negative phenomena necessitated the improvement of the system of enterprises' activity management, including in the sphere of substantiation and making of managerial decisions.

Simon (1997) determines that the decision-making process consists of 6 main stages:

- situational analysis of internal and external environment of enterprise functioning;
- definition of goals;
- identification of alternatives;
- evaluation of alternatives;
- decision making;
- reviewing the decision (as cited in Asemi, Safari & Zavareh, 2011, p. 171).

Thus, decision-making stages determine the necessary components of analytical support: situational analysis and identification of alternatives are based on relevant information resources;

evaluation of alternatives involves the use of methodological tools; all stages in the set – the appropriate personnel and software support.

H. Hakimpoor and M. Khairabadi (2018, p. 128) determine the following characteristics of managerial decision quality: decision accuracy, speed of decision-making and easiness of decision-making. Researchers determine that defined characteristics are significantly influenced by the management information system, which, in turn, is a component of the analytical support of managerial decisions.

Analytical support is a constructive basis of the enterprise management system, based on relevant information, methodological, personnel and other resources.

Analytical support, in our opinion, is a subsystem of general system of enterprise management, which is the organizational unity of informational, technical, personnel, methodological resources, which in their entirety provide support for managerial decision-making and implementation of decisions processes.

Based on the research of A. Shtangret, O. Sylkin and M. Karaim (2017, p. 128), we determine the functions of the analytical support for enterprise's development management system, namely:

- informational, which provides for the information needs of managers at different levels;
- accounting – aimed at reflecting in the systems of accounting and managerial accounting of objective data on the state of the internal and external environment of the enterprise, the prerequisites and consequences of managerial decisions;
- analytical – forms the basis for making and implementing managerial decisions;
- control, which provides an assessment of the reliability of information.

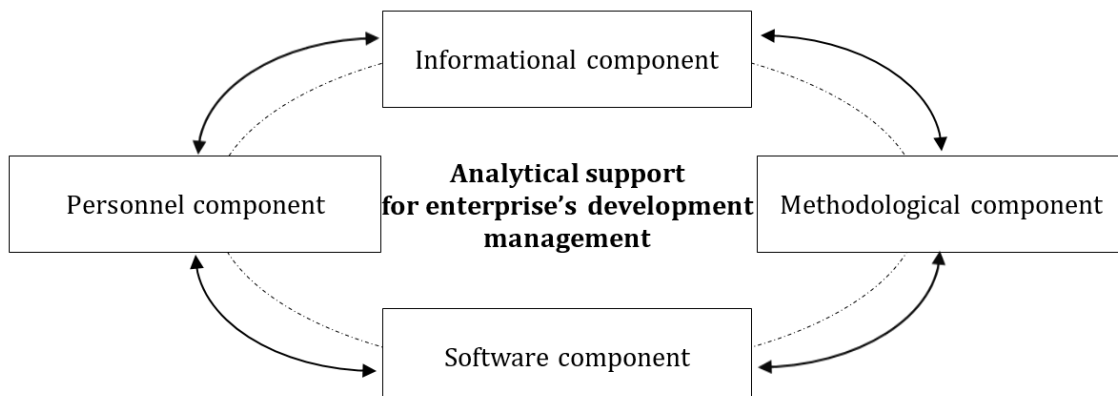
O. Humeniuk (2015, p. 214) identifies the following forms of analytical support for enterprise management:

- strategic – involves the collection and processing of external and internal information for the needs of strategy development;
- accounting – facilitates display and transfer of information to users about the main business processes and business operations of the enterprise;
- logistic – serves the decisions in the sphere of organization of material flows of the enterprise;
- engineering – aimed at assessing the quality and compliance of business processes with the goals of enterprise development;
- organizational – defines decisions in the sphere of organizational structure of management and personnel policy;
- marketing – forms the basis for decision-making and implementation of decisions in the sphere of interaction with consumers, promotion of products (works, services) of the enterprise to the market;
- informative – involves the collection and processing of information about the state of the enterprise management system.

Analytical support is a complex subsystem, which in turn has its own structure. The authors' vision of the structure of the analytical support for enterprise's development management is shown in Fig. 1.

According to Fig. 1, the main components of the analytical support for enterprise's development management are the following: informational, methodological, software, personnel. All components of the analytical support function in interdependence and interaction, so a rationally designed analytical support system should include all of these components.

Figure 1: Structure of the analytical support for enterprise's development management



Source: developed and proposed by the authors

The informational component is one of the most important, as the basis for the substantiation and making of any managerial decisions is timely, complete and reliable information. Therefore, the formation of adequate informational support requires a thorough and detailed approach, which in turn makes it possible to make rational managerial decisions.

The purpose of informational support is to meet the needs of managers at all levels in information, both within the firm as a whole and within its individual divisions (Asemi, Safari & Zavareh, 2011, p. 165).

The importance of informational support is defined by its role at all stages of managerial decision-making, which in turn determines the characteristics of information. D. J. Power (2002, p. 7) identifies the following essential features that information in decision-making must meet: timeliness and relevance; accessibility; accuracy; completeness; convenient format for decision making. In other words, "managers want the right information, at the right time, in the right format, and at the right cost" (Power, 2002, p. 7).

A. Shtangret, O. Sylkin and M. Karaim (2017, p. 127) determine the following criteria to be met by information:

- efficiency as a derivative of the speed at which information can be obtained (the faster the information was obtained, the greater is the potential for the effectiveness of management decisions);
- analyticity, that is, the information should be the result of pre-processing, including the identification of trends, the conduct of factor analysis using data from different sources;
- rationality, that is, the cost of collecting and processing information should be minimum possible;
- objectivity – the compliance with the criteria of reliability, completeness, etc.

Basic enterprise management processes – planning and control – are based on appropriate informational support. The performance of such functions involves the collection of internal and external information, its processing and transmission through appropriate channels of communication. Information processing results in the necessary, timely and adequate data available to decision makers (Babaei & Beikzad, 2013, p. 374).

Formation of informational support, in our opinion, involves the following steps:

- identification of information needs in terms of activity spheres, level of management and specifics of managerial decisions;
- collecting information from external and internal sources;
- evaluation of information for its reliability and relevance;
- initial processing and entering (if necessary) of information into data processing systems (information systems);
- use of information in the decision-making process of the enterprise development.

The methodological component includes, in our opinion, methodological approaches and tools that can be used to process and interpret the information obtained. Based on researches of D. Rigby and B. Bilodeau (2018), A. Afonina (2015), A.B. Qehaja, E. Kutllovci and J.S. Pula (2017) and B.A. Nouri and M. Soltani (2017) we can identify the following most common analytical tools that are appropriate to use in the decision-making process: benchmarking; stakeholder analysis; HR analysis; analysis of the employees satisfaction level; PEST-analysis; reengineering; product life cycle analysis; game theory; SWOT-analysis; balanced scorecard; cost-benefit analysis; scenario planning and others.

In general, a specific set of methodological tools is determined by a number of factors, the main of which, in our opinion, are the following:

- size, scope of activity and sphere of the enterprise functioning;
- type of management (strategic, tactical or operational);
- presence and availability of information;
- subjective factors related to the preference of analysts and decision makers, etc.

The software component includes IT solutions for collecting, processing and interpreting information, as well as for search and substantiation of managerial decisions. The role of IT in today's business is difficult to overestimate because it provides the ability to communicate, collect and process big data, to model economic phenomena and processes, to identify and evaluate alternative managerial decisions.

It should be noted that the software support includes both general and special components. In particular, one of the important common IT tools that forms the software component of the analytical support for enterprise's development management is MS Excel, which contains a powerful built-in data analysis suite. MS Excel provides extensive opportunities for grouping, analyzing and processing information, building models and trends, determining the impact of factors on indicators changes. Full use of the capabilities of the software mentioned provides extensive opportunities for executives and analysts.

An important management analytical support software solution is DSS, which is a specific software product aimed at collecting, processing information, identifying alternatives and, in fact, supporting managerial decisions. The use of DSS creates a number of competitive advantages for the firm, which is due to the following: increase the level of personal productivity by improving access to information and increasing speed of its processing; improving the quality of decisions and accelerating the solution of existing problems; improvement of interpersonal communication in the process of managerial decision-making; improving decision-making skills through the DSS training component; increasing the level of organizational control (Power, 2002, p. 32-33).

The high level of informatization of economic relations and the growth of volumes and dynamics of information flows have caused a considerable spread of tools of processing of big data. Big data, on the one hand, empower managers at different levels, on the other – processing it requires considerable time and resources. The development and implementation of digital technologies help to solve the problem of information processing. In particular, J. Williams (2017) identifies the following types of tools that can be used to process big data: IBM Infosphere Information Server, SAS Data Management, PowerCenter Informatica, Pentaho Business Analytics, Skytree, Tableau, Highcharts, Microsoft Power BI, etc. D. Patel (2017) proposes to use the following tools for processing big data in marketing solutions: Improvado.io, Mixpanel, Skytree, Karmasphere, Jaspersoft, Marketing Evolution and others. The use of these as well as of other tools contributes to a significant increase in the level of reasonableness and awareness of managerial decisions, and therefore increase their level of rationality.

Other software solutions that can be used in the process of substantiation and making of managerial decisions should also include ERP-systems that allow the integration of all business processes and functions within the enterprise development management. ERP-systems are aimed at providing a process approach to management and standardizing business processes (Haddara, 2018, p. 44). Bahssas, AlBar and Hoque (2015, p. 73) note that ERP-systems are software designed to integrate data sources and processes across the enterprise into a unified system. Such integration enables real-time organization and control of all key enterprise business processes, including production, planning, inventory management and development.

The company can use any other software that contributes to the achievement of the goals of operation and development, serves the decision-making process of management.

Personnel component is of a key importance in the system of analytical support for enterprise's development management, as it acts as a kind of link between all other components. The level of qualification, knowledge and skills of the personnel involved in the system of analytical support for enterprise's development management significantly influence the completeness of realization of the capabilities of other components. The collection, quality assessment, processing and interpretation of information, the use of necessary and appropriate methodological tools, the adequacy of the use of software depend on the professional qualities of the employees of the enterprise involved in the respective processes.

We believe that it is advisable to make the following qualification requirements for the personnel of the analytical support for enterprise's development management system:

- availability of appropriate education and skills;
- analytical mind;
- ability to work with big data;
- promptness;
- ability to make decisions and be responsible for them;
- stress resistance;
- striving for improvement and development, etc.

In turn, in the formation of the personnel component of the analytical support system, it is necessary to solve the following problems:

- clear definition of qualification requirements when forming the personnel of the enterprise;
- ensuring adequate assessment of the qualities and skills of potential employees in the recruiting process;
- conducting of periodic assessment of employees in terms of the compliance of their qualification level to the specifics of their functions.

The important thing in the formation and improvement of the personnel component of the analytical support for enterprise's development management is to provide opportunities for further training and advanced training.

It is important to note that a rationally built and effectively functioning system of analytical support for enterprise's development management requires the implementation of a comprehensive approach and organization of interaction between all of its components.

5. Conclusions

Competition aggravation, increase in the levels of dynamism and uncertainty of external environment factors determine the objective need to ensure the rationality and efficiency of managerial decisions. Analytical support for enterprise's development management forms an appropriate basis for substantiation and making of managerial decisions, which determines the importance of its adequate formation and use. A comprehensive approach to the formation of analytical support involves its structuring by informational, methodological, personnel and software components. A rationally formed and effectively functioning system of analytical support for enterprise's development management determines its prospects for long-term and competitive functioning. Prospects for further research are in the field of specifying the requirements for the formation of individual components of analytical support for enterprise's development management, as well as in the sphere of ensuring the rationality of the relevant process.

Appendix A. Supplementary material

Supplementary data associated with this article can be found, in the online version, at <https://doi.org/10.14254/jems.2019.4-2.2>

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