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DEFINITION OF THE ROLE OF BUSINESS MODELLING IN THE BUILDING OF A MANAGEMENT INFORMATION SYSTEM

Summary

The complex method of introduction of management information systems is proposed on the basis of creation of a complete business model of the company, which is excellent in that it allows for efficient designing of management information systems in accordance with its concept, provides further automation of management information systems based on the organizational and methodological approach of project management, and allows increasing the effectiveness of the process of implementing the management systems of the new technology.

Introduction

The development of automated management information systems begins with the collection and analysis of information. The analysis of information refers to the main functions, processes, documents, the structure of the enterprise. The usual approach to the analysis of enterprise activity involves the creation and analysis of various models (functional, process, informational, etc.). The peculiarity of the development of management information systems is the need for complex analysis, which requires the use of a plurality of different types of models that reflect different aspects of the activity. In order to ensure the integrity of the simulation and analysis process, it is necessary to have the possibility of integrating the simulation results into a general project or general model [1].

Part 1. Business simulation in the construction of a system of intra-management information

In [2] it was emphasized that at the stage of “business modelling” at the enterprise, the task of precise identification (formalization) of its activity should be solved by creating a complete (or complex) electronic business model of the enterprise, which in turn consists of several models [2; 3]. In the process of business modelling in the formation of management information systems, strategic model, organizational model, functional model, a model of business processes, financial structure and information model should be developed.

The necessity of implementation of the stage of diagnostics of business processes and business modelling is underlined [2; 4; 5; 6]. That is, the opinion about the importance and necessity of business modelling processes of enterprises' economic activity in the process of automation of management information systems is expressed. Agreeing that the general methodology for designing information management systems should be based on business modelling, it should be noted that the specialists do not sufficiently specify their role in the construction of such systems.

Based on the analysis of the work of specialists, the following sequence of execution of the construction of a complete business model has been defined: construction of a strategic model; development of organizational and functional models; construction of a financial model; business process modelling; construction of an information model.

The necessity of business modelling processes for designing the management information systems is substantiated by the following. In the process of forming a strategic model, strategic maps are developed that determine the range of strategic indicators that should be part of the management information systems. The correctness of constructing a strategic model depends on the correctness of building a subsystem of key indicators of management information systems, as well as organizational and functional models. The process of building a financial model is based on the last two models. The key elements of the financial structure are the financial responsibility centre, which are a part of the systems of management information systems (a subsystem of accounting and processing of

management information). In addition to the centre of financial responsibility, the management information systems include other liability centres (non-financial ones), which are determined by the organizational and functional model. Due to the simulation of business processes, the composition of the information model is determined, which includes coders, classifiers, registers, and a separate subset of elements of this model is used to record management information, therefore, at this stage, the components of the subsystem of accounting of management information in the management information systems are determined. Schematically, the role of business modelling in the process of constructing systems of management information systems is presented in Figure 1.

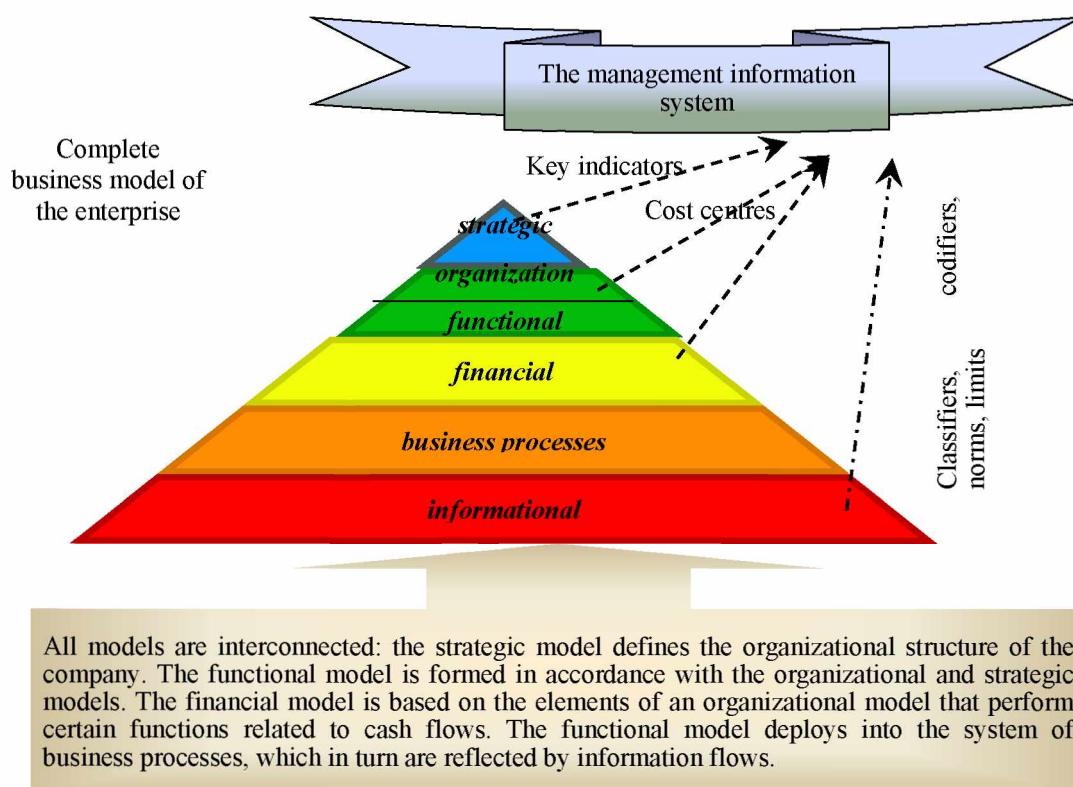


Fig. 1. The place of business modelling in the process of building management information systems

Part 2. Methodology for constructing a strategic model of organization

In the strategic model, the strategies and goals of the company are fixed, without them the construction of the management information systems is impossible. There may be various goals in an organization, especially if you have in mind the organization of different forms of ownership and types of activities.

In [7], the classification of goals of the organization is given by: orientation, criteria and time (current, medium term, long-term goals). The focus is on the goal of functioning (maintenance of the working environment of the organization and units – the creation of a permanent inflow of resources, maintenance, continuous monitoring of the activities of members of the organization), the

goals of improvement (increase in productivity, increase in the share of goods in the market), growth goals (growth, expansion, training, and progress – increase in the number of items introduced into the production of new products, the introduction of new ideas in management, fundamental changes in organizational structure, etc.).

By criteria – productivity (number of units of production, profit per one employee, costs for their production per unit time); market criteria (introduction and consolidation in the market for a new product, increase in the share of this product in the market by 10%, preservation of the existing sales volume); resources (loan reduction for a certain amount, forecast of financial injections aimed at the reorganization, increase of productivity, reduction of staff turnover); profitability (increase of net income from invested monetary unit, level of profitability, size of dividends); renewal (adaptation to changes in external conditions – development and introduction of a new, more efficient technological process, a new system of services, etc.); social responsibility (measures aimed at improving working conditions, rest, ensuring acceptable relations within the collective).

The classification of goals by direction is central to strategic management, while goals are combined into complexes based on the principle of achievement of the system of a definite state; the classification of goals according to the criteria is more important for the management of the organization, because it is on the basis of such goals the construction of a tree of goals, which serves as a benchmark for managers in the management of the organization [7].

The global goal of the organization (mission) is the benchmark, the planned result of the organization's activity. In turn, an organization is a system consisting of a plurality of system units. Therefore, the task of applying the method of constructing a goal tree is to transform the main purpose of the organization into the purpose of individual units, working together for one result, thus the general purpose is decomposed into separate components. The following stages of building a tree are known [7]: formation of the main goal of the organization (mission); decomposition of the main goal of the organization for the second level objectives (input goals, process goals, output goals, system goals); decomposition of the objectives of the second level according to the specific technological tasks within each target program.

The development of goals of the following levels occurs when the requirement for the necessity and adequacy of the goals of this level is strictly fulfilled – the achievement of all the allocated goals must necessarily lead to the achievement of the corresponding objectives of the previous level; Among the goals of the following levels, there should be no redundant goals, due to the inevitability of inefficiently growing organization structure and there are additional unnecessary costs. Achievement of each goal should be organizationally ensured, that is, for its implementation, it is necessary to create units whose employees are oriented towards the achievement of this goal, are provided with the appropriate resources and carry out actions aimed at its achievement [7].

The formation of a strategic model must begin with the definition of goal orientation, which allows accurately determining the strategic direction of the activity of both the whole organization and individual units, influencing the choice of organizational model.

The next step, in accordance with the defined purpose of the directivity and the above-described method of constructing a tree, is the formation of a tree of the purposes of the organization with the use of specific criteria purposes.

Then it is necessary to move on to the development of strategic maps, which are a visual model for integrating the goals of the organization into four components of a balanced system of indicators. The methodology for developing a strategic map is known.

According to [8], the authors of the concept of BSC originally represented the scorecard in a tabular form in the form of an information table whose main purpose is to provide an idea of the company's strategy and the current state of achieving strategic objectives. As a rule, the scorecard contains information in three forms of presentation – in the text, graphic, and numeric. Information tables require the construction of a system of interconnected tables since the details of the strategies begin with the first level common to the company and end with the structural elements of the lower levels. The process of constructing strategic maps can be automated, while the implementation of the BSC software program should provide some opportunities.

Part 3. Methodology for developing the organizational and functional structure of the company

The modelling of the organizational structure is the basis for ensuring the efficient operation of the management information systems, budgeting system. According to the existing definition [9], the organizational structure of the company is a hierarchy of the functional units of the company with a description of internal relations; the organizational structure reflects from which functional units a company is formed, which levels of subordination exist in it, which staff in which units are included. Two types of models are used to construct an organizational and functional model – tree-like and matrix [10].

In most cases, the organizational model is created in accordance with the functional structure of the enterprise. In the process of construction, it is desirable to use the following principles: 1) the level of detail of functions corresponds to the level of detail of the organizational units; 2) the interconnection of an organizational and functional structure takes place when forming a matrix-distributor of functions by organizational units.

Under the functional model is a hierarchical list of functions performed by the company. The main function of the company is the provision of products and services. Therefore, the description of business directions, products, and services is initially carried out. Further division of functions can take place by type: basic, management and security [11; 12].

Due to the examination and description of functions, the identification of the functional structure is realized and a unified terminology describing the functions of the enterprise is to be developed, which should be harmonized. The survey and the following description of functions are carried out in two ways – designing from above and designing from below. That is, according to [12], the basic functional areas are separated from above, the functional duties of the employees (divisions) are described below, and the link to the functional areas is carried out.

Since the construction of a strategic model is carried out with the distribution of goals in directions, then the distribution of functions can also be carried out in directions, for convenience, because the composition of the functions being implemented comes from goals and strategies.

Further detail of functional areas is carried out by the method of vertical decomposition (by the levels of the hierarchy) and by the horizontal distribution method (according to the stages of implementation – information gathering, decision-making, implementation, accounting, control, analysis, regulation) [12]. Each function has its own executive, for example, for management functions: manager, specialist-analyst, technical executors; accordingly, they are responsible for: the adoption and organization of the implementation of decisions; preparation of decisions and analysis of deviations; a collection of information, accounting, and communication. Functions are regulated by official, special instructions, and rules.

The principles of forming a functional structure are the following: preventing the mixing of goals, the functions themselves and the criteria for the quality of their implementation in formulating the function's name; the exclusion of duplication of functions arising from the inaccuracies of symbols or similar wording; compliance of the function to the responsible person (centre, division); conformity of functional and strategic models; optimum detail.

Thus, the method of constructing an organizational and functional structure looks like this. First, it is conducted an examination and a description of the directions of activities, products (services), which produces (renders) the company, then it is necessary to describe the composition and consolidation of the hierarchy of the organizational units, modelling the organizational structure, consolidating the directions of activity, production of products (services) by the organizational units by the method of pair projections.

Then they conduct an examination and description of the functions of the enterprise, modelling the functional structure, attaching them to the organizational units by the method of forming a matrix-distributor. The final stage is the approval of regulatory documents. The modelling of organizational and functional structures is carried out within the framework of the general plan for the introduction of the management information systems. The report on the construction of organizational and functional structures may contain the following main sections: structural organizational chart, a matrix of consolidation of organizational units and functions, hierarchical list of functions.

As the organizational and functional model defines the basic structures of the company, functions and areas of responsibility (including process owners for those elements requiring a process description), therefore, the next stage of implementation of the management information systems is the development of a process model, which in turn affects the refinement organizational and functional models, recognizing possible areas of detail and re-grouping of functions (responsible persons, centres, divisions).

In order to respond promptly to changes in the organizational structure and functions of the company and their reporting in [13], it is recommended to create an appropriate internal order (“Ordinance on the Maintenance of Organizational-Functional Model”), which states that all internal documents that are associated with changes in the organizational structure or functions, should be approved only after making the appropriate adjustments to the business model.

The correction of the model is possible in the following typical cases according to [13]: redistribution of functions in the case of admission (dismissal) of employees; reduction (increase) in the number of organizational units by the results of analysis and refinement of functional load; when changes related to the implementation of the strategic plan for the development of the enterprise or with the situational reorganization of activities (for example, with changes in the structure of sales, related to the expansion of the product group or the organization of own production of individual items); with changes in the management of the company associated with the introduction of new control circuits; with changes in the main business processes (rationalization, automation of business processes). Means of bringing changes in the organization of activities and organizational changes to the company’s staff can be written (fax) and electronic (use of the local network, e-mail, Intranet technology) with the preliminary conclusion of the mailing list, as well as through the creation of a document approval hierarchy.

Organizational and functional structure models should be actively used in making managerial decisions in the field of organization of activities (for example, using the analysis of the distribution of functions by organizational units and functional loading units, employees).

Part 4. Principles of building a financial organization model

Under the financial model in business modelling understand the precise description of the enterprise in terms of sources, the structure of the formation of its income and expenditure with an appropriate distribution of responsibility [2]. That is, at the stage of constructing a financial model, the following tasks need to be solved: the definition of the structure and composition of the main management financial statements, operating budgets and overhead cost estimates; definition of schemes of consolidation of data of management financial reports and budgets, cost classification and cost structure; construction of the financial structure of the enterprise with the allocation of centres of financial responsibility; determination of accounting policies (application of methods of valuation of assets and liabilities, etc.), account plan and analytical accounting ciphers.

Before proceeding to the collection, processing, and evaluation of management information, it is important to clearly identify, which departments will provide the necessary data. For this purpose, create the financial structure of the enterprise, which is a set of functional units of the company associated with a single business process for the purpose of financial management, accounting and reporting – financial responsibility centres [9; 14].

According to the definition of financial liability centres, individual companies, structural subdivisions, departments, departments or groups may be centres of financial responsibility. Their managers are responsible for certain areas of work and the solution of the tasks. The effectiveness of the centres is determined, as a rule, by comparing the planned and actual performance indicators. The financial structure is based on the general hierarchical principle of the tree construction method. The results of the development of the financial structure are recorded in the “Regulation on Financial Structure”.

Before formulating the financial structure, it is necessary to analyse the scheme of financial (resource) flows [15]. As a rule, all financial flows are locked on some key subunit, from which it is necessary to start the analysis. Thus, the first stage – definition of the top (centres of financial responsibility of the first level) Financial (resource) flows pass through certain units that are elements of the financial structure of the accounting centre.

Financial responsibility centres are divided according to the type of participation in the formation of financial flows to financial responsibility centres, the centre of financial accounting (centres of financial responsibility), profit centre, income centre (investment centre, place of origin).

Distribution can occur by the matrix method as shown in [16]. At the second level, the enlarged areas of activity are allocated – directions of business activities, projects, divisions, enterprises (branches). Such an enlarged accounting centre may contain several legal entities. At the third and fourth levels, separate legal entities are distinguished, and within them separate departments, subdivisions, programs. Subdivisions at the following levels also detail the place of costs and centres of financial responsibility of the lower level (shops, departments, etc.). The final stage of building a financial model is the consolidation by the centre of accounting of specific items of profits (expenses), of the main budget documents (revenue and expenditure budget, cash flow budget, balance sheet), and approval of data consolidation methods.

The principles of building a financial structure are: the financial structure is an extraordinary set of elements of the financial structure, therefore, each organizational (functional) unit can enter only one centre of financial responsibility; elements of the financial structure may be separate projects, expenses (financial results) which do not belong to any organizational (functional) unit; optimal detail of levels of the financial structure – the degree of detail determines the time and labour costs for the preparation of budgets and reports; the compliance of the functions performed by the items of expenditure (profits).

To interpret the data management accounting in [14] it is proposed to use its own principle of codification of financial responsibility centres according to levels of organizational and functional subordination.

Typically, a management company consists of units operating in several functional areas. In addition, the organization has several branches, each of which consists of units that conduct the same activities as the management company. On this basis, it is possible to form the financial structure of the holding.

The authors recommend assigning a certain level of financial responsibility to each centre. Thus, the first level corresponds to the management company and its territorial branches, the second level – units, grouped according to the functional directions of the activity of the whole holding, and the third level – separate structural divisions of the management company and the branch.

The company can use six-digit codes for coding the financial responsibility centre in the information system to be implemented: the first two digits indicate the holding's territorial subdivision (10 – Management Company, 20 – Branch 1, etc.). The first two digits “00” in the code of the financial responsibility centre mean that the whole holding is concerned. The second two figures indicate the direction of activity: 01 – Administration; 02 – Marketing; 03 – Information Technologies; 04 – Logistics; 05 – Warehousing; 06 – Procurement; 07 – Sales. The second two digits “00” in the code of the financial responsibility centre mean that it is all areas of activity. The last two digits indicate the unit number within the functional direction or the territorial unit. The third two digits “00” in the code of the financial responsibility centre mean that it is a question of all divisions within a functional direction or a territorial unit.

Part 5. A methodology for constructing a business process model for a company

The construction of the process model allows us to collect and systematize information about the structure of the company and its business processes, which can be used for their further optimization. Methodically grounded identification of functional and process models will allow assessing the existing level of the management system, as well as choosing the direction of development of management information systems. Since the availability of the organizational-functional model is a necessary starting point for the start of process modelling, most of the techniques for describing business processes begin with a description of the organizational-functional model. Known methods for describing business processes are in the form of a description of the steps of a phased implementation of the construction of a process model [17; 18]. It should be noted that [17] provides a detailed description of the phase of link detection and consolidation of enterprise processes, and the superficial stage of identification, and vice versa [18] details the identification stage. Using the methods outlined in [17; 18], the following sequence of constructing a process model is proposed, which includes surveys, modelling, and technology [19-22].

Since the stage of building a business process model is a part of a general plan for introducing of management information systems, which includes identifying the structure of the organization, general directions of activity and operation of the company as separate stages of implementation of the management information systems preceding the examination of business processes, then it is possible to accept by default that This stage has already been completed and, therefore, the following steps should be taken [23-29].

Since the general principles of organization functioning, the structure of its divisions, directions of activity, rules of interaction between the company and external organizations, the main business processes at the upper level have already been identified, it is more convenient to identify the processes of the enterprise start with describing the business processes of individual units, as proposed in [18]. For this purpose, it is very important to conduct a preliminary request for information on the operation of the units. This information can be obtained by writing a written questionnaire to key employees according to a specially designed form or by filling out their own forms after using the interview method.

The main purpose of the business process is to convert incoming resources (data) into output results. The main characteristics of business processes are the following: the input stream of data and resources, the output result, the process owner, the recipient of the result, the resources involved in the implementation of the process, control indicators of the efficiency of the process and the mechanism of implementation. Therefore, forms for the questioning of units should include the following questions [18]: the name of the unit; documents defining the working conditions of the unit and the performance of specific functions; function performed by the unit; documents coming from outside and necessary for work; documents that appear as a result of the unit's work. The obtained data is systematized and presented in a summary report containing a general list of business processes of the organization at the upper level and a description of activities of divisions. Further, the existing business processes of organizations are classified by type (main, provisioning, development, management) and their owners are allocated.

At the end of the survey, the divisions, as in [18], should go to the third level – a detailed survey of the business processes of specific owners. The survey is also conducted by interviewing and questioning methods. The following items should be reflected in the form [18]: the name of business processes; conditions for launching the business process; documents and data necessary for the execution of the business process and the source of their receipt; documents created as a result of the implementation of the business process and their recipients; actors involved in the business process; resources that are necessary for the process (if any); outsourcing; the result of the business process (if any); the result of the business process; the purpose of the business process, its role and place in the company's overall tasks (processes); problems that arise during the business process; deadline; sequence of process execution steps.

The result of the business process surveys is the documentation, the following list of documents is possible, besides the completed questionnaires: the top-level business process diagram, a general overview of the processes of the divisions, the general scheme of the process, the detailed scheme of the process, the scheme of instructions, the scheme of routing forms (documents) within the framework of business process. In order to avoid possible inaccuracies, it is also worth checking the completed questionnaires by process owners. Thus, a survey of business processes at the upper level, on the second and on the third, was conducted.

The purpose of the modelling of business processes is to systematize information about the company and its business processes in graphical or tabular form. The process model should reflect the structure of the business processes of the organization, the details of their execution and the sequence of document circulation [18].

During the simulation, the iteration process (reconciliation, making adjustments and refinements) should be repeated until the full confirmation of the comprehensiveness and uniqueness of the model. Further optimization of the existing process model can be based on the analysis of quality indicators of business processes: effectiveness, efficiency, adaptability, productivity, duration, cost.

Part 6. Formation of the enterprise information management system

Large corporations as objects of economic research are determined by their scale, branching structure, and variety of economic operations, which requires prompt acceptance of optimal management decisions at each level of management in many areas of activity. In spite of the fact that they work in a certain segment of the industry, in many cases, for the purpose of optimal use of resources or for the purpose of profitable investment, the involvement of enterprises related to other sectors of the national economy is involved in the corporation. The research of the corporations' activities is necessary to specify the conditions for the production of information systems and to formulate a comprehensive understanding of the sphere where information was collected and the results of the experiment were obtained.

The main business direction of the corporation (a group of companies), "Olymp", is the production of alcoholic and non-alcoholic products (in terms of production, it occupied a significant place among the five leaders of the Ukrainian alcohol market, and the supply of products was carried out abroad). But for the sake of resource, transport security, execution of social programs and profitable investment in its composition, in addition to distillery enterprises also included enterprises from other spheres of the national economy, in particular, enterprises of the oil and gas industry (gas stations), transport (ATP), construction enterprise, enterprises of recreation (boarding house, restaurant, hotel, club, sauna), a perfume company, a food processing enterprise (poultry), and a spit storage facility.

The Olymp distillery consisted of eight manufacturing plants located in Donetsk, Odesa, Kharkiv regions and the Autonomous Republic of Crimea and employing more than two thousand employees, employing production capacities of about thirty two million bottles per month. Accordingly, the management of the

corporation is controlled by several legal entities-enterprises, which are separate financial institution accounting centres. The plants of the corporation have been successfully transformed and adapted to the new conditions of production. That is, the object of scientific research is characterized by branching out the structure, geographical coverage, and scale of the tasks to be solved, so it is sufficient in volume and perspective for objective research.

The main task of the study is to create an optimal model of management information systems, which should be used promptly when making managerial decisions at any level in the process of corporation activity.

The process of activity involves the exchange of resources, information, results of activities between individual participants and requires the establishment of interconnections and patterns between structural elements; therefore, the system analysis was used for the study.

Since the main task of the study is to build a real model of management information systems, then to implement such a task it is necessary to use methods of modelling and experiment. Formation of the model requires the development of a certain method of its development and description of the structure of the system (its elements). The description of such a technique is a scientific novelty of this work. Description of the structure of the management information systems can be made on the basis of refinement of available data of the last literary sources. The very construction of any structure requires the use of methods of synthesis and analysis, the method of constructing a tree, decomposition, etc. Decision-making involves the presence of certain goals or problems of management in any direction, so the process of studying the question of setting up the management information systems requires the use of modern scientific approaches, in particular, the problem approach. Implementation of the management information systems for corporations in its scale requires taking into account other modern scientific approaches: marketing, normative, standardized, process, functional, complex, integration, etc.

In the process of scientific research, different types of primary information and primary sources were used, since information can be used in the quantitative measure when making managerial decisions, and can be based on a qualitative type of information (thoughts, judgments, expert assessments and forecasts). Undoubtedly, as the main primary sources during the survey, it is necessary to use both internal documentation (regulatory, reporting, technical, normative) and external (informative and normative – press, research, laws, regulations, orders of authorities, etc.). Among the informative sources, sources (data) are selected as a way of assessing and selecting the extent to which management information can be used in the process of accounting or the adoption of managerial decisions at any level.

Therefore, in order to solve the problem of selecting a software product in the process of automation of management information systems, it is recommended to use the proposed criterion for assessing the quality level. The developed criterion for assessing the level of quality of software products of the new technology

(automated management information systems) is used when the price factor corresponds to the buyer's capabilities, which is different from the fact that an effective model of quality indicators of the management information systems is used, which reflects the maximum achieved level of possibilities of automated management information systems in modern conditions, and allows you to make a choice to the buyer.

To solve the problem of the effectiveness of the creation of management information systems at domestic enterprises, the importance and role of the business modelling of economic activity of enterprises on the formation of components of the management information system have been emphasized and specified. Agreeing with the opinion of experts about the soundness of the methodology of designing the management information systems on the implementation of the method of successive construction of the complete business model of the enterprise, the methods of creating the components of a complete business model (strategic submodel, organizational submodel, functional submodel, financial submodel, submodel of business processes and information submodel) are specified. The strategic model captures the strategy and goals of the company; it includes the tree of the company's goals and strategic maps. The financial model allows you to proceed with a quantitative estimate of the resources consumed by the enterprise in the course of its activities. It includes a financial structure – an ordered hierarchical structure of financial responsibility centres. Established that:

- 1) the strategic model defines the organizational and functional structure of the enterprise since the organizational centres must meet certain goals of the activity and perform certain functions;

- 2) organizational and functional models of the company, in turn, determine the composition of the centres of financial responsibility, i.e., determine the financial structure; the centres of responsibility are elements of information management systems, on the basis of which expenditure management is carried out, control over the implementation of plans, tactical and strategic decisions are taken; the functional model defines the model of business processes, the description of which enables to analyse the ways to improve existing business processes and an impetus to change the organizational and functional structures and, therefore, management information systems;

- 3) the model of business processes determines the information model since it establishes process owners, input (source) information, regulatory and normative documents;

- 4) the information model is the lower level of detail of the full business model of the company; when creating an information model, handbooks are being developed, diverse classifiers, codifiers, norms, limits, management plan of accounts are introduced; with the help of coding, the links between scheduled and actual indicators are established, electronic forms of documents are created, the hierarchy of approvals (signatures) of documents is also encoded – thus the order of document circulation is determined.

All this is extremely important for the creation of management information systems, as many of the above elements of the information model include certain elements of the internal management information system.

Conclusions

The construction of management information systems based on the full business model of an enterprise allows for the reorganization and improvement of management, ensuring the efficiency of business processes, and enhancing the competitiveness of business activities.

The complex method of introduction of the management information systems on the basis of creation of a complete business model of the company (which includes submodels of business processes, organizational, functional, and financial structures, strategic and informational submodels) is proposed, which makes it possible to carry out efficient design of the management information systems in accordance with its concept, provides for further automation of management information systems on the basis of organizational and methodical approach of project management and allows increasing the effectiveness of the process of introduction of management systems of new technology.

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