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INTELLECTUALIZATION OF ENTERPRISE MANAGEMENT USING BUSINESS INTELLIGENCE INSTRUMENTS

Об'єктом дослідження є процес інтелектуалізації менеджменту, зокрема використання системи інформаційного забезпечення управління знаннями підприємства. Для українського рівня економічного переділу такий процес може вважатися інноваційним, проте необхідним. Процес управління знаннями пов'язаний з абстрактністю підходу для менеджменту різних підприємств та тривалістю впровадження системи його інформаційного забезпечення.

У роботі розглянуто передумови та перспективи розвитку бізнесу в нових економічних умовах, де знання, інформація, швидке реагування на її обробку грають ключову роль, а Інтернет забезпечує розвиток гострої і масштабної конкуренції. Проведено аналіз сучасного стану інтелектуалізації менеджменту на українському ринку. Визначено основні характеристики впровадження, організації та контролю управління знаннями на підприємстві. Впровадження проекту системи інформаційного забезпечення на підприємстві ускладнено впливом теоретичної та методологічної невизначеності. В ході дослідження використовувалися підходи моделювання процесу управління знаннями підприємства.

Досліджено основні вимоги до інтелектуалізації управління процесами на підприємстві, сильні та слабкі сторони використання Business Intelligence – систем у менеджменті. Досліджено взаємозв'язок між обробкою знань та виконанням бізнес-процесів всередині підприємства.

Для їх реалізації запропоновано пакет програм Intelligent Business Performance Platforms (IBPPs), який включає три компоненти: Business Intelligence (BI), Business Process Management (BPM) та Business Rules Management (BRM). Завдяки цьому забезпечується можливість якісно корелювати моніторинг та контроль бізнес-процесів та управляти системою прийняття рішень, тобто реалізовувати управління знаннями на підприємстві.

У роботі розглядаються явища віртуалізації економіки, аналізуються прикладні можливості використання інструментів Business Intelligence. Таким чином, автор приходить до висновку, що інтелектуалізація менеджменту є головною умовою ведення ефективного бізнесу на сучасному етапі розвитку суспільства, проводить ретроспективний аналіз та віднаходить оптимальні інструменти Business Intelligence.

Ключові слова: *інтелектуалізація менеджменту, Business Process Management, Business Rules Management, управління знаннями, Business Intelligence.*

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1. Introduction

The traditional definite cause-and-effect analysis used in the study of the simplest forms and phenomena is no longer capable of embracing the multidimensional and multifaceted interconnectedness of the complex systems that today are economic and economic systems. Probabilistic nature, combination of fast and slow processes, multi-parameter, short-term and long-term criteria of management efficiency require the synthesis of new approaches, methods and tools for managing complex systems. They are modern economic systems. The urgency and need for new, intelligent, management technologies in the economy is constantly increasing, which has already led to the emergence of completely new tools and structures that provide integrated management to the highest levels of aggregation.

Management as a modern management system is a set of measures to achieve the goals of the company in the most optimal and profitable way. Management apparatus in each industry will have its own features that meet the specifics of the work [1]. But the basic essence of management can be reduced to three basic actions, namely: making management decisions, their implementation and control. It is difficult to overestimate the role of software in management, given the importance and responsibility of its functions.

2. The object of research and its technological audit

The object of research is the process of management intellectualization in particular the use of the information system of knowledge enterprise management.

Although the Internet really does have a high priority, the new economy is not about using it. Its essential feature is the development and use of new knowledge.

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It is not only and not so much about innovative developments, but first and foremost about basic research and their applied embodiment.

In almost all fields of science, and in particular in economics and informatics, there is a trend of advancing technological means of development relative to their theoretical substantiation. The same situation exists in the field of intellectual systems based on the paradigm of knowledge processing (expert systems, linguistic processors, training systems, etc.).

Therefore, one of the most problematic places in the intellectualization of management is that the theoretical grounding also requires the management of knowledge, experience and management mechanisms for a particular market or industry.

3. The aim and objectives of research

The aim of research is to justify for implementation the processes of intellectualization of enterprise management by means of Business Intelligence.

To achieve this aim, the following scientific objectives are defined:

1. To conduct an analysis of the current state of the knowledge management software market at the enterprise level.

2. To identify the advantages and disadvantages of the existing enterprise knowledge management process.

4. Research of existing solutions of the problem

From the first steps, the science of data and knowledge analysis was aimed at modeling poorly formulated meaningful problems that do not use the traditional mathematical apparatus. On the other hand [1], this technological branch is actively developing as an industrial software industry in the conditions of fierce competition, where it is sometimes more important to quickly introduce new ideas and approaches than their analysis and theoretical elaboration.

There is a need to develop the theoretical foundations of science on the methods of developing systems based on knowledge – knowledge engineering. The first steps in the creation of the methodology (the works of [2, 3]) were actually pioneering. So there was a knowledge engineering, a science devoted to theoretical and practical problems of designing knowledge bases – obtaining and structuring knowledge of specialists for the further development of intellectual systems or systems of knowledge management.

The problems of development of enterprise management, formation and management of their intellectual potential and capital, knowledge are considered in their works of many scientists, for example, in [4, 5].

Optimization of management can include the development of specialized programs for any area of work. For example, for a company that distributes any product, a sales agent program will be helpful. With its help, it will be much easier to keep track of agency fees and to exercise full control over sales agents. Especially if the enterprise is large and has a well-developed large-scale trading network. For holdings that typically have an active workflow and a large flow of incoming and outgoing correspondence, an office manager program will be helpful.

Optimization of management systems includes a number of measures, the first of which will be the introduction of professional information systems. To date, management, as a form of management and control apparatus of the company, should be prompt and attentive in the performance of their work. For example, accounting management function in a modern company is simply impossible without an automated system of data management and control.

Control in management is the monitoring of compliance with the actual indicators set criteria and their deviation from the plan with the subsequent analysis and development of appropriate measures. Control in the management system is one of the main functions and requires special care when performing. Control function management is a system of measures that include monitoring and verifying the compliance of the actions performed with the goals of the company, as well as developing a work plan. In a general sense, this function is responsible for achieving the company's goals.

The paper used the experience of marketing research in the industry, presented in [5]. The control function in the work of the manager, depending on the time interval of the work, has three varieties:

1) preliminary control – occurs before the start of work, at this stage is given a plan of work or a set of rules for their implementation;

2) current control – occurs in the course of the task, fixing the current indicators;

3) final control – measures the performance of the goal, and provides analysis and planning.

Accounting for «long» cause and effect relationships is only possible in the intellectualization of management (Fig. 1).

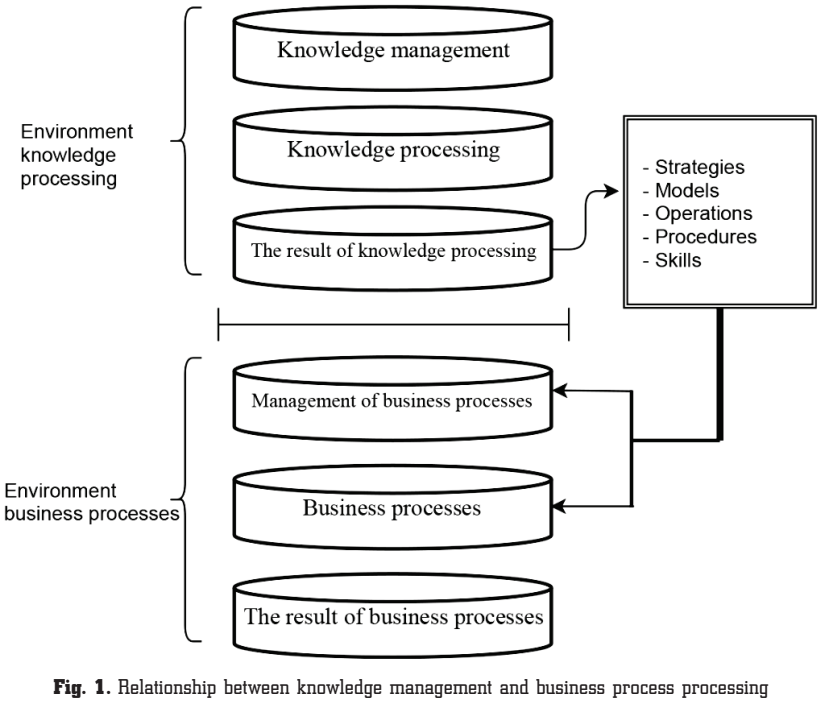

Fig. 1. Relationship between knowledge management and business process processing

It can be said that the level of intellectualization of management is precisely measured by the length of cause and effect relationships to which the management system is able to respond. Conversely, a de-intellectualized system can only respond to what has already happened and that it is too late to correct, and any attempt to anticipate it in the future is rejected.

Knowledge management is essentially the management of knowledge-related processes or the management of knowledge processes. There are two emerging approaches to knowledge management that differ significantly from one another [3]. The first approach (first generation approach) assumes that valuable knowledge already exists in the organization, that is, they are already created, and all that needs to be done is to properly capture, encode, and disseminate it. According to this system of views, knowledge management activities begin after knowledge is produced. Therefore, the purpose of knowledge management in this case is not to improve the process of production (creation) of knowledge, but only its use (application in practice). Proponents of the second approach (second generation knowledge management) are of the opinion that knowledge does not exist in finished form. In fact, they are continuously produced in the knowledge processing [4].

In the traditional economy, the geography could work for the producer, since the client from one city was practically not available to firms from other cities and regions. These geographical restrictions have destroyed the Internet. As a result, the number of competitors is growing exponentially. The whole world is a real or potential client of the firm, and at the same time any firm of the world economy is a real or potential competitor. From these prerequisites comes a management and marketing strategy: it is necessary to fight for the customer throughout the world market space, and to focus on the same space, it is necessary to build a competition strategy. This leads to an unprecedented expansion of opportunities for success on the one hand and increased risk on the other [5].

Leveling up the geographical and national factor in the present is manifested in the increase in the radius of influence of individuals and non-governmental organizations. There are a large number of virtual coalitions around the world that unite like-minded individuals to help each other share information, develop and implement their strategies. Non-governmental organizations are heavily promoted by the Internet, so this indicator has a steady upward trend. Knowledge as a factor of production leads to the emergence of new forms of business that are constantly interacting with market players in real time.

The current level of scientific research in the field of intellectualization of enterprise management, planning of state programs and measures for their implementation in the countries of the world are given in very fast [5].

For the first time, the new economy creates the conditions for the practical implementation of the perfect competition model, as it generates sufficient information, an unlimited number of buyers and sellers, reduces operating costs and eliminates all barriers for new entrants. The variety of trading venues meets the needs of industry or market participants. To interact with them, catalogs are created and auctions are held that allow to build a large number of buyers and sellers from around the world and eliminate excess products in a timely manner. Standardized commodities of one industry are traded on electronic exchanges. At the same time, the Internet provides a great deal of transparency, which UBS Warburg experts have figuratively called the «naked economy» [5].

The intellectual saturation of the economy is so high that the value of individual companies is made up of intangible, intellectual assets. For example, according to experts, the total value of Coca-Cola is 90 percent of intangible assets, with 85 percent of their total value being brand value (more precisely, brands), and only 5 percent is the value of other intangible assets, such as technical and technological patents, licenses, copyrights [6]. The power of Sosa-So1a brand information is so great that, in terms of market success, the image and name itself are forcing customers to respond to products [5]. Finally, one of the most important aspects of management intellectualization is the increased role of information.

Information becomes critical both for the buyer when choosing from a wide variety of products that have extremely complex functions and for the manufacturer in determining what is essential for the buyer. In addition, business life becomes complex and information-rich due to the increase of legal and legislative regulation of relations. In the field of production and in the field management and marketing it should be added the complication of relations between different business participants, with the advent of a large number of new and complex (high) technologies.

Management automation is impossible without professional software that meets all the requirements not only of modern business, but also the individual requests of a particular enterprise. The general characteristics of management automation are given in [6]. A company-specific program for the manager will be most effective in comparison with standard systems [7].

One of such areas of the socio-economic activity of society is the production of intellectualization of management and knowing management [3, 8]. One of the attempts of modern levels of knowing management is the study [9]. The system of management methods in management is a complex of organizational-administrative, social-psychological and economic measures used to achieve the enterprise's goals. Management information systems can be used effectively by management to improve the quality and speed of their tasks.

All this has led to the emergence of new trends and concepts of modern management, which are aimed at providing information to business participants and to assist in the implementation of complex intellectual tasks [10].

5. Methods of research

During the work general and special research methods are applied:

– analysis and synthesis – for ongoing analysis with the formation of a problem, the definition of goals, the definition of hypotheses and the relationship between knowledge and business processes in the enterprise;
– analogies and comparative comparisons – to determine the characteristics of implementation, cost ratio and cost estimates of existing corporate enterprise management systems;
– decomposition method – for decomposition of knowledge chains at the enterprise during planning, implementation and control of business processes at the enterprise.

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6. Research results

Definition of a new economy, representing it as a «knowledge economy», «knowledge-intensive economy», «knowledge-based economy», «weightless economy». At the same time, one should be aware that these terms narrow the essence of the new economy somewhat, because they leave the production of new knowledge outside the sphere of economic processes. A consequence of this theoretical fuzziness is the underestimation that knowledge production moves from the service sector to the direct production sphere.

In the science of modern management distinguish the following features inherent in the organic style of management:

– intellectualization of management processes;
– internationalization of management;
– democratization of governance;
– the determining role of organizational culture;
– systemic and situational management principles;
– readiness for different kinds of changes;
– administration is based on knowledge and experience;
– flexible structure; multidirectional communication.

Distinctive features of new management in the knowledge economy are:

– changes in the nature of management associated with its mechanistic functional representation. On the one hand, it becomes an integrated process that integrates all common functions. And on the other hand, it acquires a differentiated nature associated with the appearance of many specific species management;
– appearance of a number of special functions, such as knowledge management, corporate culture, development management, intellectual support of management process, intellectual leadership in management of teams and projects, management of intangible assets [2];
– education in the management system of the corporation «knowledge of the structure» or intellectual technology structure, consisting of a network of project teams, which combine carriers of unique competencies, capable of solving unstructured problems, multicriteria management problems and formulate sound options for development;
– turbulence and dynamism of external and internal factors that have acquired a continuous nature. It forces managers to apply mega mechanisms of adaptation and proactive behavior in order to minimize multidimensional and multiple risks. The prevention and neutralization of which in the modern economy becomes one of the priority strategic priorities;
– attention to the final results, efficiency, quality and competitiveness of management activities, not the functions and process of management;
– a radical change in the content and nature of the relationship between staff and management: not to manage staff, but to create the conditions for self-realization;
– purpose to create conditions for the formation and development of human capital and intellectual environment [3];
– decentralization of management, use of mechanisms of participation of carriers of unique competences and knowledge in decision-making, intellectualization of decision-making process and functional sphere of management;
– autonomization of business activities of business entities within network structures and application of management mechanisms based on shared corporate values and self-management by decentralized units, investment centers of intangible capital and other centers of responsibility;
– increasing the importance of the elements of the intellectual, human, social capital of the corporation in the formation of the potential of the integrated management system. The nucleus of development capital and effective changes of capital adequates to the realized vector (strategy) of development, as well as change of the basis of economic power of the corporation;
– increasing the social orientation of integral and partial entities in the internal space of the corporation and conducting effective social communications in the external environment towards the stakeholders, the local community and towards society as a whole;
– increase of productivity of creative work in the management of the corporation on the basis of accumulation of knowledge, competences and other elements of intellectual capital in information and communication technologies and corporate information systems.

An important aspect of increasing the intellectual level of saturation of economic life and management is the virtualization of the economy. The answer to the challenges of modern business conditions was:

– knowledge management as a new paradigm of intellectual management, aimed at acquiring and improving the efficiency of use of intellectual capital of the company;
– management of learning, intellectual organizations, capable not only to develop their capabilities in the field of production and economic activity, but also to increase intellectual potential.

The intellectualization of social life is a complex and internally contradictory phenomenon. In the first stages of the formation of a knowledge society, there are significant changes in the ways in which organizations of the economy and the social sphere function. Soft knowledge economy organizations are able to adapt to the logic of another innovative project, they set meaningful goals, orient themselves in their business environment, profess certain values and seek to find their unique social mission. The functional composition of management as the management objects become more complex, in particular, the knowledge economy corporation, is filled with new content. In a knowledge economy, the quality of managerial decisions becomes a critical factor in the management system, on which the competitiveness, efficiency, quality and effectiveness of corporate governance of a new type of corporation depends on the comprehensive validity [1].

The processes of intellectual analysis can be divided into three large groups: dependency search, forecasting, anomaly analysis.

Dependency search is a database lookup for automatic dependency detection. The problem is the selection of really important dependencies from the vast amount of existing data.

Forecasting assumes that the user can present records to the system with blank fields and request missing values. The system itself analyzes the contents of the database and makes a plausible prediction about these values.

Anomaly analysis is a process of finding atypical data that are strongly deviated from persistent dependencies. This technology is especially widely used in financial and business applications.

Traditionally the following stages are distinguished:

1. Preparation of the initial dataset. This step involves creating a set data, including from different sources, selection of training sample, etc.

2. Data processing. Data may contain gaps, noises, anomalous values, etc. In addition, the data may be redundant, insufficient, etc. In some tasks, it is necessary to supplement the data with some a priori information. The data should be qualitative and correct in terms of the method used. Moreover, sometimes the dimension of the initial space can be very large, and then it is desirable to use special algorithms for reducing the dimension.

3. Transformation, data normalization. This step is necessary for those methods that require the output to be in some particular form [4].

4. Data analysis. At this stage, different algorithms are used to find knowledge: neural networks, decision trees, clustering algorithms, and association definitions.

5. Data post-processing. This is the interpretation of the results and the application of the acquired knowledge in business applications.

The focus is on how best to capture, encode, and disseminate organizational knowledge, including by maximizing the translation of tacit knowledge into the explicit. In essence, it is about an effective system of delivering available knowledge to the consumer (a person, a group of persons), that is, to promptly inform them about existing knowledge in the organization. In fact, this is not much different than traditional company information management activities. Knowledge management differs from information management due to the presence of meta-information, knowledge assertions, and assertion statements (meta-assertion). It is meta-affirmation (validity estimates, application history, generalizations) that can give a user access to arguments and evidence that are, or are not, worthy of these claims. In order to provide such opportunities, the main purpose of the second generation approach to ultrasound is to provide a link between business processes and knowledge. Considering [3] there is another classification. Information technologies in knowledge management are divided into enterprise resource planning systems – ERP, customer relationship management systems – CRM, information support systems for analytical activity – BI, intercompany communication systems – ICE.

In order to successfully manage a large enterprise that exists in a highly competitive changing business environment, automation of decision making, control of business processes, and tracking of compliance with certain rules and restrictions are required. To address this challenge, the implementation of the Intelligent Business Performance Platforms (IBPPs), which has three components, is promising: Business Intelligence (BI), Business Process Management (BPM), and Business Rules Management (BRM). BI – business data analysis tools for management decision making (there is no established translation of the term into Russian yet, most often using English trash – business intelligence) [9]. They help companies highlight the most important knowledge that needs to be influenced to optimally manage different processes, while BPM enables companies to streamline their business processes. For example, a BI system can track sales of a specific product in a region for a certain time, and a business process monitoring system is used to find out how long it takes to complete a specific order.

BI and BPM are often combined with BRMS systems, which are responsible for analyzing and coordinating business processes and making complex decisions, subject to certain rules and constraints. Three technologies – BI, BPM and BRMS – can be integrated with Intelligent Business Performance Platform (IBPP) [10].

IBPP technologies provide the ability to monitor real-time business processes and compare key performance metrics for a given type of business in a particular industry. Often, enterprises implement the elements of a given system in full, but only individual, most importantly, are finding Business Intelligence Systems (BI).

BI technologies evolve, more and more employees are gaining access to management decisions. If at the dawn of BI-systems development only analysts engaged in the preparation of quantitative data on the basis of which decisions were made by senior management. Senior managers had access to the latter, then over time the number of decision-makers increases. This process includes business analysts, managers, individual employees, managers data processing and even external shareholders.

Thus, IDC analysts reflect the same trend as PricewaterhouseCoopers analysts.

7. SWOT analysis of research results

Strengths. The combination of data on BI technology and knowledge management's level allows to more fully disclose the topic. Conducted research allows to determine the relationships between business processes and intellectualization of management in the new economy.

Unlike existing ones, BI systems will not only help to understand the current situation, but will also begin to point out the actual steps that need to be taken at this point in time. In fact, such functionality is already emerging in the most advanced BI systems, and business users can not only learn about current trends, but also get recommendations on how to use the situation to increase the set KPI.

The combination of data on technology and marketing research allows to more fully disclose the topic. Conducted research allows to determine the prospects for the development of BI systems according to business processes.

Weaknesses. For a broader disclosure of the topic the role of manager-user of BI should be explored. This role is underrated. It is the ability to correctly understand the links between the services of BI allows to establish clear analogies with business processes. Only senior managers can do this. The disadvantages of using AI in management intellectualization are that BI implies the use of different functionalities. For example, text education can play an important role in education, and working with data directories in retail.

Opportunities. Further research will be focused on using the results of the analysis of the BI-market conducted in the work for the further forecasting of its development. Expandable visualization is an opportunity to use for knowledge management. The dramatic increase in the amount of data used in business intelligence has led to the need to simplify their presentation. Previously, BI specialists used to work with data columns and simple diagrams, but nowadays the role of visualization is increasing. previous experience will allow a more reasonable approach to the visualization of the economic measures of the management.

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Threats. The threats to implementing such technologies are that not every business can bear the cost of using them. In 2019, users prefer to work with BI on prepayment. This scheme is chosen by 90 % of respondents to the survey. The cloud approach eliminates the risks of payback problems and also tries out a new product using test licenses. BI developers also support Trial Schemes, as they increase the potential for further licensing even by small companies that would not have previously considered using BI in their practice. Leaders in the field of cloud BI, according to analysts, are Amazon AWS, Microsoft Azure, Google Cloud and IBM Bluemix.

8. Conclusions

1. The analysis of the current state of the market of knowledge management software at the enterprise level. In particular, an overview of the concepts of «new economy», «knowledge economy» is conducted, within which theoretical grounding for management intellectualization is considered. Systematization of literature data on the characteristics of intellectualization of enterprise management trends shows that the intellectualization management is at the initial stage of its formation. But today, DI technologies are very fast practically developing.

2. The advantages and disadvantages of the existing business knowledge management process based on Business Intelligence technologies are identified based on current statistics of its global use. The system analysis of the intellectualization of enterprise management shows that the high cost of BI-technologies on the IT market should provide the low demand to using new type enterprise management. But trend is opposite due to speed and quality of decision-making proccess.

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