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DESIGN OF MANAGEMENT INFORMATION SYSTEM FOR OIL AND GAS COMPANY IN CRISIS AND POST-CRISIS CONDITIONS

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Summary. *The absence of a balanced automation strategy of an oil and gas company has the greatest negative impact at the strategic level of the company's management, where the price of a manager's error is the greatest [1-4]. Therefore, this publication defines the principles, characteristics, architecture, specific industry problems and the strategy of creating an information system of a Ukrainian oil and gas company. In particular, the developed concept of the information system architecture of an oil and gas company provides for the allocation of 3 macro-levels (subsystem of technological process management; subsystem of tactical management; analytical subsystem of top management [5-7]) and 4 macro-functional blocks (subsystem of exploration and production management; subsystem of transport management; subsystem of management implementation; subsystem of the control apparatus).*

On the basis of the developed strategy for configuring the information system of the oil and gas company, it can be concluded that: the construction of an effective information system of the oil and gas company is possible through the integration of purchased and self-developed components; specialized software that helps manage the oil and gas company's mission-critical business functions is a potential focus of the oil and gas company's competitive advantage (most often BI and DSS) [8-12].

The scientific and practical results presented in the article regarding the methodology and configuration of innovative architecture of information systems and information technologies in an oil and gas company in post-crisis conditions should be taken into account when reengineering corporate information systems for the oil and gas industry in Ukraine in crisis and post-crisis conditions.

Moreover, the obtained results are relevant and applicable not only for local companies, but also for international oil&gas corporations on emerging markets in the context of global and regional macroeconomic and edipemical crisis phenomena.

Keywords*: management, information system, oil & gas production company, design*

Innovative architecture of information systems and information technologies in an oil and gas company in post-crisis conditions.

Mega-mergers, global expansion, constant price pressures and responsibilities to create long-term value are motivating oil and gas companies to make changes in the way they store, access and process technical and business information [13, 14].

Today's business paradigm and the influence of external economic factors on the oil and gas industry require the ability to access databases and knowledge from geographically distant engineers of exploration and development companies; require more effective cooperation of asset management personnel within the oil and gas company with service companies, partners and suppliers from outside the company; require more and more decisions to be made in real time [15]. As a result, a new, Big Data IT architecture is emerging and oil and gas companies are experimenting with radically new business models [16-19]. These new business approaches promise greater economies of scale and unprecedented levels of productivity and profitability.

Extrapolating recent global trends, two correct conclusions can be drawn: broadband Internet, which is available today in megacities and already sufficiently developed oil and gas production regions, will be available all over the world in the future; the throughput will grow exponentially to the point of infinity. As the world's telecommunications infrastructure becomes faster and better connected, the physical location of an oil and gas company's information assets will quickly become irrelevant [20].

These changes will provide opportunities to basically replace today's internal IT resources with safe, cheap external resources: deaggregation of the main components of modern hardware and their distribution via the Internet will be achieved (with the help of the proposed IT architecture of the oil and gas company of the future).

One early form of remote service providers is known - Internet providers. The new IT infrastructure will be built around four additional categories: data as a service, software as a service, hardware as a service, and knowledge service providers. knowledge as a service). This architecture will evolve over the next three to five years into the dominant business model for global oil and gas exploration and development business processes [21-23].

With an ever-shrinking workforce in the industry and an influx of young, inexperienced workers, oil and gas companies will also need remote access to expert knowledge in various technical and economic areas. Therefore, oil and gas companies of the future will enter into agreements for the provision of remote access services to applications, hardware, and knowledge, as well as to data.

Let's take a closer look at each component of this new architecture in more detail, keeping in mind the main goal - efficiency.

Data as a service providers will provide instant, secure access to any type of stored data. External data as a service will have two directions: storage of initial intelligence data and storage of processed data - so data as a service will be narrowly specialized. Data models and industry standards must evolve for each type of data as a service. Future data as a service for storing processed data will be organized in two dimensions: by type of processed data and by customers. data as a service will

significantly reduce overall production costs in the oil and gas industry, freeing up funds for more important investments, and the direction of their development is innovation in improving such indicators as: availability, quantity and quality of data. Providers of remote Services regarding the use of Applications (software as a service). Until today, every user in an oil and gas company has many applications? installed on his workstation or on the internal server: technical programs (for seismic interpretation, analysis of well logging data and well curvature planning, etc.), personal software (text processing, spreadsheet and project management applications), Business software (for human resources management , finance, accounting, etc.). So every company has duplicate copies of application software.

Like external data as a service, software as a service will be narrowly specialized: some will specialize in technical application programs (Landmark or Paradigm), others will provide clients with access to Microsoft and Lotus tools, and others will provide financial and business software (SAS, PeopleSoft). software as a service should also provide service support for oil and gas companies.

Providers of remote hardware services (hardware as a service). To keep data and attachments in memory and perform necessary operations, users will need instant access to the appropriate amounts of memory and processor power from the hardware as a service side. Users will need scalable computing power, memory volumes, etc., which will depend on the current task - from a single processor for word processing or graphics for presentation, to parallel multiprocessor architectures for modeling deposit behavior or deep seismic migration [24-29]. Companies such as Intel and Sun can obviously participate in the development of hardware as a service for the oil and gas industry. At the initial stage, hardware as a service components will be temporarily integrated. In addition, certain applications or data volumes require a significant amount of hardware within the corporation. As a result, even the latest innovations in information technology for the oil and gas industry are designed with a legacy IT architecture in mind.

Providers of remote knowledge services (knowledge as a service) - is a network of specialized intellectual labor engineers. With the help of specially designed user interfaces and search engines, oil and gas companies will be able to find, consult and hire an expert worldwide. Through knowledge as a service funded by oil and gas industry companies, service oil and gas companies and technology developers will provide access to the knowledge of their specialists. Independent consultants will include everyone from field modeling specialists to international tax and legal experts. Universities will provide access to the knowledge of professors, graduates and research laboratories. knowledge as a service can even help oil and gas companies catalog the unique areas of expertise of their own exploration and development professionals located around the world. Any authorized member of knowledge as a service will be guaranteed access to any multidisciplinary project involving many companies [30-34].

Thus, innovations in knowledge management and the corresponding change in the business model of the oil and gas company of the future will provide: economies of scale; effective global collaboration in real time; low IT costs in the industry. Oil and gas companies will be able to operate around their core business - analysis and interpretation of exploration and development data - and outsource all

related activities, including data management and storage. Thus, the virtual energy company becomes a reality.

Information system configuration strategy of an oil and gas company

For more than a decade, leading software providers for oil and gas companies have been striving to build fully integrated end-to-end physical, financial, gas and energy information systems. That is, software products that customers can take out of the box, install on a computer and start using immediately, regardless of the size and content of the company's operations (an example of this approach is the word processor Microsoft Word). However, today it is impossible. Of course, buying modules separately is more expensive than a set at once, but how can you save on something that will not be able to be used effectively later? According to this scenario, there are two problems: firstly, such universal software packages (such as Microsoft Word) are oriented to the horizontal market, and the oil and gas industry has a vertical structure; secondly, clients do not expect to receive a competitive advantage in the industry from such software (for example, from the use of word processors). Competition requires information systems to be different. Specialized information support for oil and gas companies is being developed in order to increase efficiency. After all, if all companies are equally effective, then no one will get a competitive advantage from their information system. Software that helps manage an oil and gas company's mission-critical business functions can make a big difference in a company's profitability. The difference between one company's information system and another can be the difference between a company's profitability and losses.

Software providers for the oil and gas industry have realized that they can only satisfy about 60-70% of customer needs, but if they design an IS that allows the customer to buy the remaining 30-40% of unsatisfied needs from other suppliers or develop independently and then integrate, then everyone wins. That is, consumers should be able to buy the best component in each subclass of software from different suppliers or software developers. However, each oil and gas company has certain unique areas where it is necessary to develop a special software component in order to most accurately meet the information needs of this company (in detail, the components of an oil and gas company are discussed above). These unique areas often become a potential center of competitive advantages of an oil and gas company (most often it will be DSS) (Fig. 1.).

An oil and gas company's unique mix of IS components will likely differ from its competitor's IS and potentially provide the competitive advantage it needs to succeed. As a result, the integration of components becomes a key aspect in building an oil and gas company's IS. there are several methods of integration, and choosing the most appropriate one is very important.

Therefore, oil and gas companies should choose the option according to which the software for the oil and gas company is both purchased and developed (necessarily with interactive interaction between the customer and the executor). First of all, the team that makes the purchase decision must have a realistic level of expectations (requirements). After all, it is unrealistic to hope to find a ready-made comprehensive information system for an oil and gas company that will fully satisfy all the various requirements of its departments. Often, specialized software

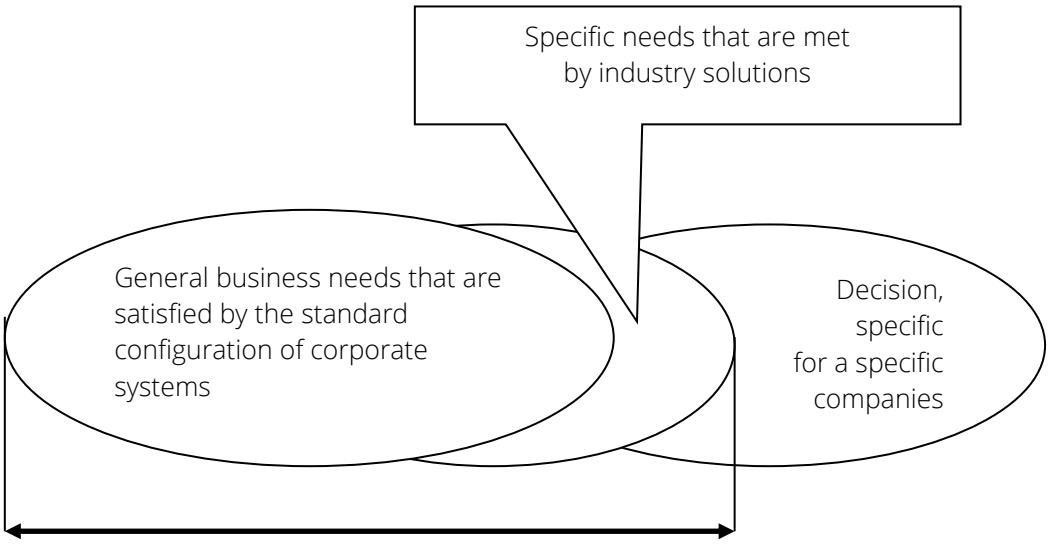

Fig. 1. Dia components of the oil and gas company and the needs of the industry

development companies try to convince oil and gas companies that their software is better in everything than others. Therefore, when analyzing proposals, oil and gas company specialists should investigate the specific advantages and disadvantages of each software supplier. It is important to determine how flexible the proposed system is in terms of integration with other packages and in terms of individual customization. Software providers who do not have a plan to integrate their products and are not ready to consider their information system as a set of components are unlikely to support it in the future. It is important to carefully analyze software providers for oil and gas companies in relation to the integration of their package with other best-in-class software components of competing providers. Research has shown that the most successful oil and gas companies have selected the best components in each functional subclass of their information system and then integrated them. Of course, this means that about 70% of solutions are used from ready-made software packages, and the rest - 30% - are developed by our own IT departments and then integrated.

So, we can conclude that it is unrealistic to build a universal "boxed" effective software package for an oil and gas company. However, the construction of an effective information system of an oil and gas company through the integration of purchased and self-developed components will have the effect of increasing the economic efficiency of the oil and gas company as a whole (Fig. 2.)

Conclusions. Відсутність стратегії збалансованої автоматизації нафтогазової компанії чинить найбільший негативний вплив на стратегічному рівні менеджменту компанії, де ціна помилки управлінця найбільша. Тому особливої актуальності отримують задачі комплексного визначення принципів, характеристик, architectures, specific industry problems and strategies for creating innovative information systems of Ukrainian oil and gas companies. In particular, the development of the concept of the architecture of the information system of the oil

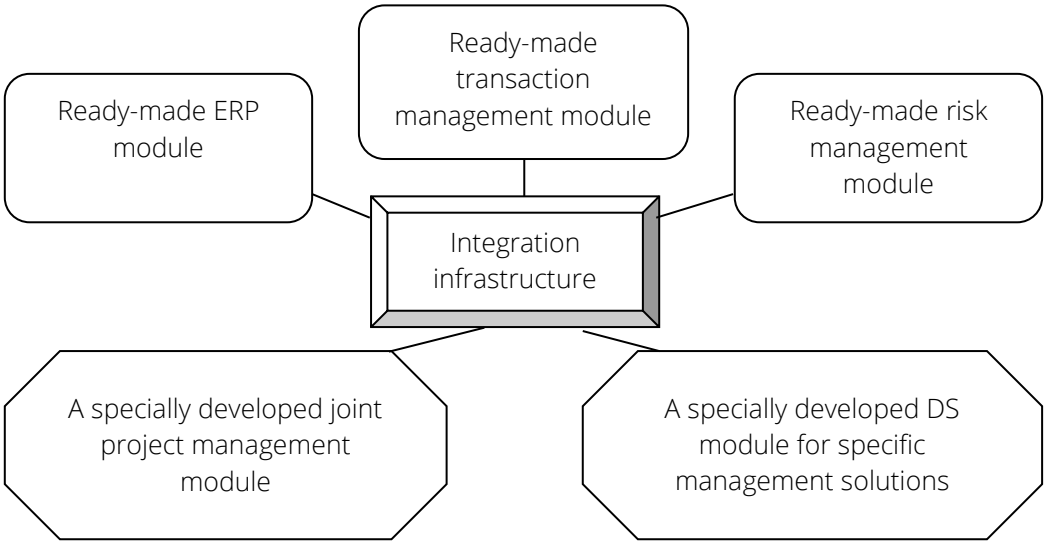

Fig. 2. An example of a software integration scheme that provides a competitive advantage to an oil and gas company

and gas company, which involves the allocation of 3 macro levels and 4 macro-functional blocks, is recommended.

Of particular importance is the issue of researching the complex impact and developing a system methodology of Internet-oriented supporting technology in the processes of supporting management decisions of an oil and gas company: determining favorable factors and obstacles; definition of new business models; places of creation of additional value; areas and mechanisms of effective use; application restrictions; features of the concept of information security.

In the oil and gas industry, DSS built according to the hybrid approach have the greatest application potential [35-38]. They are a powerful tool for solving complex specific problems of an oil and gas company.

Oil and gas corporations and organizations must use a complex of methods and algorithms in their operational, tactical and strategic management to maintain their effectiveness in the face of local and global crisis phenomena, market liberalization, globalization, increased competition, reduced consumer loyalty, further development of Internet technologies and Big Data and adaptive synergistic models of system analysis and system dynamics [40-41].

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