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Architectural and design approaches to the development and implementation of information systems in the context of adaptive enterprise

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Abstract: Today the level requirement and classes of information systems, must first of all determined by the level of technological maturity. The article noted that the technological maturity of the organization, standardization and formalization of the development and implementation of new technological solutions, ICT-related areas require urgent attention. Also consider two innovative elements that are essential in the creation of an information system (IS).

Key words: Information system; Project approach; Architectural approach; Technological maturity; Business environment

1. Introduction

The progress of modern civilization is directly related to scientific and technical revolutions and introduction of information and communication technologies (ICT) into all aspects of everyday life that constitute grounds for transition to information society - a new stage of modern civilizations development.

In recent years Kazakhstan has made significant progress in ICT sector. Currently favorable conditions are created for science intensification, transfer of technologies, increase of investments in research and product development, cooperation of businesses and universities, introduction of intensive ICT's into various production spheres.

The organization of various types and fields of activity can be represented as a business system in which economic resources will be transformed into goods and services by means of various organizational, technical and social processes.

Today's companies are complex artificial systems that require constant and significant efforts concerning its management.

Another important aspect in favor of use of project management tools in IT spheres is in attaining a common vision of IT management and services in organizations. The IT specialists are generally known to be persons of technical knowledge and a final element in the project execution but very often they fail to provide the company management with wanted information in understandable language, for example, in explaining technical details to a manager when the latter introduces new software systems for operation activities. That is why managers and lead IT specialists must have appropriate knowledge in the field of project management and skills to communicate with managers in understandable manner otherwise technological solutions taken by the company management will be chaotic and random.

Nursultan Nazarbayev, the President of Kazakhstan, speaking about ways of modernizing educational system in the republic, dwelled on the necessity of introducing into learning and education processes update methods and technologies like project management tools that will considerably increase the efficiency of scientific research and educational processes and will enable to solve a problem of synthesis of education, science and practice [2].

2. Results and discussion

The article examines two innovative elements: architectural and design approaches. Under these approaches, planning, organization and management are functions that are vital to the creation of an information system (IS).

The architectural approach to the development of complex systems, which is increasingly used to describe the new realities of the business organization and its interaction with the sphere of information technologies, in particular in the development of the information system that is used to organize business management. One of the most important functions related to the management of the business is ensuring management with communications. The matter is that in the process of project or operational activities management 90% of working hours of today's top manager or the project manager should be given to communications, both from the external environment and in the company.

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Therefore it is expedient to consider the first innovative block - IS creation for ensuring management with communication in a business environment, and as well as for reducing the risk degree of made decisions. During the development of such IS as one of its main functions, provision of the accounting contacts between the head and members of team is supposed (respondents, the content of the contacts, and the follow-up actions according to the results of contacts). The essence of the architectural approach, in our opinion, is not in the development of IS as a single system and but it is a synchronization with the mandatory requirements of a particular company, its structure and content of the business direction.

One more aspect connected with architectural approach, is a synchronization of rates of updating the information and communication technologies (ICT) in the company with available tangible and intangible assets. As it is impossible to introduce super modern IS in the organizations that don't have the appropriate equipment and the staff, having working skills with similar systems.

It's successful to implement complex information systems which provide the operator with the connection with the subjects of communication, the competitive advantages of the company, it is only possible in the presence of general ideology of development of IS, are application of project approach, and also the use of modern techniques on development and management of IT-infrastructure. Today, we can surely say that there is a change of paradigms of the business computerization. As in the time processes ERP, SRM system replaced the functions of the ARM, so now their place is taken by developing business system, i.e. we are talking about the adaptive enterprise. The object of research is the process of developing IS for ensuring parties' communication of business processes of operating and design activities. Earlier approach to the development of IS was the fact that the specification was formed from the aspect of the operating activities, objectives were set and then the separate group of programmers, system engineers have developed and implemented this system. Today, in the conditions of the adaptive enterprise, the approach itself to the development and implementation of IS is principally changing. It is the second innovative element.

The organizational and program-technical environment for optimization of processes of planning and project management received the name ISPM - the information system of project management.

ISPM provides the manager with instruments of development of the verified administrative decisions covering various levels of management of the project in all phases of its life cycle, allowing the provision of the management efficiency and implementation coordination of the project works.

The need of use of project management in the field of ICT of any organization should be noted; it is an achievement of the general vision of leadership and the relevant service. It is known that IT - experts, possessing technical knowledge and being a final link at project execution, however cannot always provide necessary information to the management in an understandable form for both sides For example, explaining technical details at making decision on introduction of a new software system.

It is advisable to use a project-based approach in order to solve the problem. Of course, from all processes of the PMBOK® standard developed IS has to carry out support, first of all interactions of certain interested parties.

Besides, IS creation is a multi-stage process. The great number of experts of different profiles participates in the development of big manufacturing IS. Management of the IS project is considered as set of the interconnected processes. *Management processes* refer to the actions connected with the solution of specific objectives of project. Table 1 shows the use of specific project management processes at each stage of the development of IS.

Table 1: Use of UE processes at IS development stages.

Stages of the project life cycle of IS development	Processes of project management				
	Group of initiation processes	Group of planning processes	Group of execution processes	Group of monitoring and management processes	Group of completing processesя
I stage — preproject	+	+			
II stage — project		+		+	
III stage — introduction			+	+	
IV stage — the functioning analysis		+	+	+	+

The following number of factors influencing success of the project should be considered in the IS developing:

► Requirements of users
► New technologies
► Market competition
► Requirements to safety and others ...

On the basis of the project approach in practice, developed a set of strategies of respond to the project risks on the IS development (Table 2).

Table 2: Strategy risk of reaction to project risks

Development risks	Strategy reaction
Deficiencies in the architecture	Review, pair programming, architectural prototype
Deficiencies in the interface	UI prototype (design prototype)
Misunderstanding of requirements	Functional prototype
Critical failures of software and hardware interface	Architectural prototype
Incorrect documentation	Studying of Standards
Organizational risks	Strategy reaction
Change of requirements	Approval of all claims prior to the development of all stakeholders; iterative approach to software development
Communication with the Customer	The Regular planned meetings and demonstrations
Availability of performers	Planning, staff reserve
Qualification and efficiency of performers	Trainings, training
Intra team communication	Team building
Organizational risks	Strategy reaction
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As the development of IS has to be considered as a part of constantly developing business – process, and accordingly, management of the development process such as IS is the most convenient to carry out, using standards of project management, as the international standard ISO 21500 is adopted in September, 2012. It is necessary to allocate two aspects of IS development:

- IS has to become a part of business environment;
- The primary process in the development of the business environment is the management process, and the main process of the management itself is communication. Therefore we choose as an actual task the development of information system for ensuring communication in process of development of companies or organizations.

As an "alive" and the real object we took the department of "Computerization of Technological Processes and Management of Projects" (CTPandMP) at KazNTU named after K.I. Satpayev, where the developing of similar IS is conducted. The department sets the task to reach the level of technological maturity of the project management not less than 3-4 levels within years 2012-2015. This is a very difficult task, because it requires a number of issues. The levels of technological maturity with the summary characteristics are shown in Fig. 1.

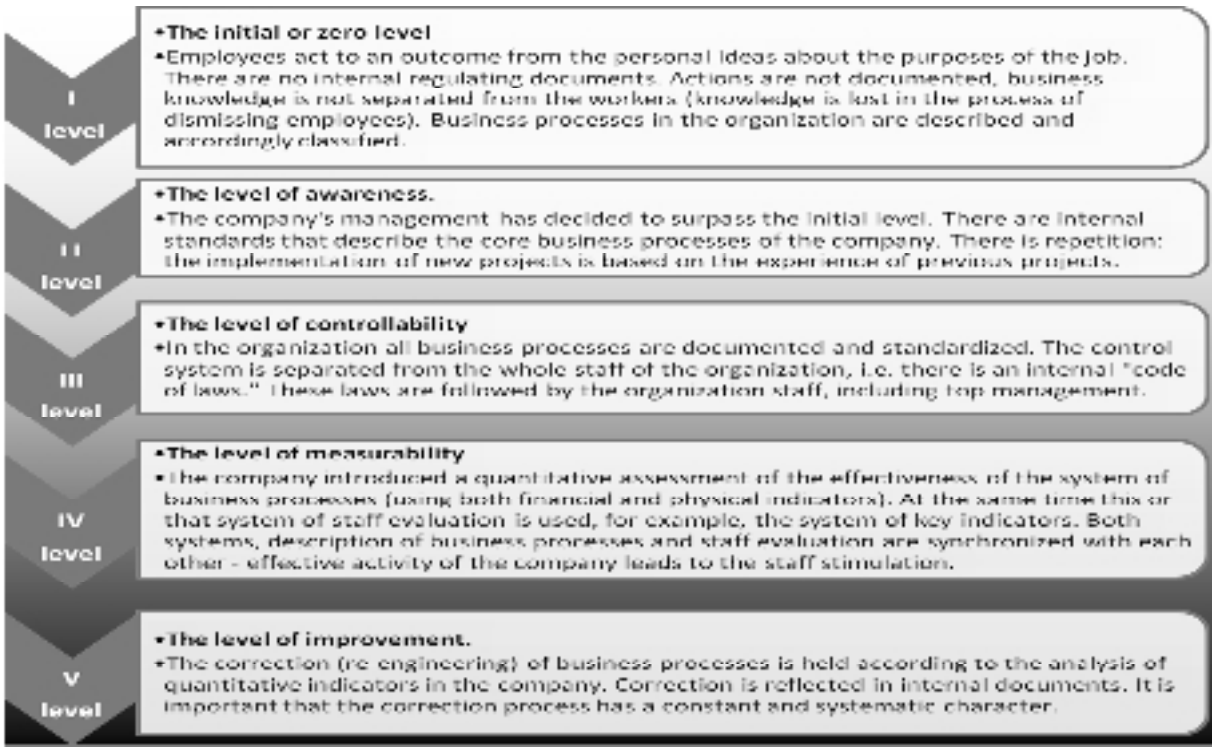

Fig. 1: Summary characteristics of each level

If we talk about the level of technological maturity of project management at the department of CTPandMP, it should be noted that employees act in terms of its strategic objectives, the fact that the business processes in the organization are described and, accordingly classified, but in the constant practice hasn't used yet. One can say that the department is on the second level, where there are internal standards, accumulated knowledge base. There is repetition: the implementation of new projects is based on the experience of previous projects.

It should be noted that the technological maturity of the organization, standardization and formalization of the development processes and implementation of new technological solutions connected with ICT areas require urgent attention.

These questions are relevant for Kazakhstan as a whole. The introduction of any ICT has to be linked to the state of technological maturity of the company and management processes. Very often, companies spend rather big resources to ICT implementation which later, first of all, do not carry out the conceived functions fully or sometimes simply are not in demand in the market.

3. Conclusion

Therefore, today there is an urgent need to create structures that will provide advice on project management, assessment of the level of the technological maturity and rendering assistance on ICT introduction according to the achieved level of an administrative maturity of the company.

Thus, the main conclusions are that today the requirements to level and classes of introduced information systems, first of all, have to be defined by the level of the technological maturity of the company, and as well as the extent of regularization of the basic processes and a management processes. It is necessary to impart culture of project management, portfolios and programs at all levels of management of the companies, for obtaining the most effective solutions in the field of development and introduction of modern ICT..

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