

Evaluation of effectiveness of information systems implementation in organization (by example of ERP-systems)

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Abstract. ERP in a modern enterprise information system allowed optimizing internal business processes, reducing production costs and increasing the attractiveness of enterprises for investors. It is an important component of success in the competition and an important condition for attracting investments in the key sector of the state. A vivid example of these systems are enterprise information systems using the methodology of ERP (Enterprise Resource Planning - enterprise resource planning). ERP is an integrated set of methods, processes, technologies and tools. It is based on: supply chain management; advanced planning and scheduling; sales automation; tool responsible for configuring; final resource planning; intelligence business; OLAP technology; block e-Commerce; management of product data. The main purpose of ERP systems is the automation of interrelated processes of planning, accounting and management in key areas of the company. ERP systems are automated systems that effectively address complex problems, including optimal allocation of business resources, ensuring quick and efficient delivery of goods and services to the consumer. Knowledge embedded in ERP systems provided enterprise-wide automation to introduce the activities of all functional departments of the company as a single complex system. At the level of quality estimates, most managers understand that the implementations of ERP systems is a necessary and useful procedure. Assessment of the effectiveness of the information systems implementation is relevant.

1. Introduction

Enterprise Resource Planning (ERP) is a system of planning and resource management. This system provides information support for management decisions.

Companies need the ERP system for control and management of business processes. The instrument panel reflects the actual state of the company. In this case, the entrepreneur does not need to delve into the essence of each problem - the system shows the direction of the enterprise.

The entrepreneur can monitor the work of the entire company online, regardless of the size of the company. The ERP system allows the top management to free up time in order to deal with the strategy.

The advantages of the ERP system:



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reduction of the workload because it is not necessary to enter repeatedly the same information into the computer;

significantly enhanced control;

possibility of qualitative data analysis, which is especially important for decision-making in the rapidly changing environment and business growth.

The interest of Russian business in ERP systems is constantly growing. Many businesses reach a stage of development when one of the critical factors is the introduction of the information system, when the quality of its work affects the business significantly. If the handling of the business keeps pace with its development, the increase of share in the market is hampered by the lack of established business processes. Sooner or later this leads to serious issues. Therefore, in such cases, the ERP system is built in accordance with the strategic and tactical goals of the company becomes a necessary platform to sustain growth.

In the period of the intense development, the costs are rising steadily and constantly and the income reaches a certain level of stability. Any economic theory suggests that company growth is losing margin. Sometimes the thin thread that separates income from expenses is torn. In the end, the company has a huge momentum, all the trappings of success but actually, it operates at a loss. The profitability of the business in the 90s was achieved by 100-200%, but it was impossible to control many things. Now the fight is on for each profit percentage and requires constant monitoring, which can be provided by the automation.

Thus, according to statistics, the usage of the ERP system allows one to reduce the time spent on routine operations for search, input and processing of data by 20-80%. The ERP system helps to focus on those processes that bring the main income. Thus any operation is reflected in the system and evaluated from the point of view of efficiency.

The first-generation ERP system is the SAP R/2. This system provides the benefits of centralized data processing in real-time. The second-generation system is SAP R/3. SAP R/3 provides a new level of quality control. The center of attention was not data and business processes. The system allowed standardizing the internal business processes of the company and increasing their effectiveness. Now these systems are replaced. SAP ERP is a business generation solution, which uses the opportunities of the Internet and other new technologies for productive cooperation and efficiency of business processes within the entire ecosystem of the business.

If the ERP system of the past-generation was focused on improving the efficiency of internal processes, the ERP-generation solution is designed to optimize integrated, end-to-end business scenarios, which include not only the internal processes of the enterprise, but also business processes, business partners and customers. It improves the performance of all participants in the business and gets the most out of a close and productive cooperation throughout the integrated business environment.

2. Materials and methods

Applying the ERP system allows using one integrated program instead of several disparate ones. A single system can manage processing, logistics, distribution, inventory, shipping, invoicing and accounting.

Implemented ERP system is a system of access differentiation to information designed (in conjunction with other measures of security companies) to counter both external threats (e.g., industrial espionage) and internal ones (e.g. theft), The ERP-system, which is implemented in conjunction with CRM-system and quality control system, is aimed at meeting the needs of companies in the funds management business.

Disadvantages.

The main difficulties at the ERP system implementation phase arise for the following reasons:

The distrust of company owners to high-tech solutions, in the end - poor support of the project, and this is making the project unwieldy.

The resistance of departments in the provision of confidential information reduces the effectiveness of the system.

There are many problems related to the functioning of the ERP system, due to insufficient investment in staff training, as well as in connection with the imperfection of the inclusion policy and support data accuracy in ERP.

Restrictions:

Small companies cannot afford to invest enough money in ERP and train adequately all employees.

Implementation is quite expensive.

The system can suffer because of the "weak link" problem - one department or a partner can disrupt the efficiency of the entire system.

The problem of legacy systems.

It is a misconception that sometimes it is difficult or impossible for ERP to adapt the workflow of the company and its specific business processes. In fact, any ERP system implementation is preceded by a stage of describing business processes of the company. In particular, the ERP system is a virtual projection of the company.

3. Results and Discussion

The total license cost, the costs of implementation, maintenance and ownership for all three of the chosen information systems were calculated to make an objective comparison and to identify the most suitable system. This allows one to make a reasoned choice in favor of one of the systems. In SAP R/3 the cost per seat is \$6000, in BAAN – \$3000, in Oracle E-Business Suite – \$5000. For the convenience of calculation one should translate this amount into rubles at the rate of \$1 = 60 rubles.

Table 1. Data for automated workstations

Department	The number of jobs (q)	The cost per seat, RUB. (pl)		
		SAP R/3	BAAN	Oracle E-Business Suite
Sales	1	360000	180000	300000
The procurement division	1	360000	180000	300000
Department (unit) management inventories	2	360000	180000	300000
Department (unit) production management	2	360000	180000	300000

Source: data from websites of the companies

3. Determining of the total cost of the license.

Determining the total cost of license acquisition according to formula 1.1:

$$PL = q_1 p_{11} + p_{12} q_2 + \dots + q_n p_{1n}, \quad (1.1)$$

where PL is the cost of the license for the system.

SAP R/3: $PL = 1 \cdot 360000 + 1 \cdot 360000 + 2 \cdot 360000 + 2 \cdot 360000 = 2160000$ RUB.

BAAN: $PL = 1 \cdot 180000 + 1 \cdot 180000 + 2 \cdot 180000 + 2 \cdot 180000 = 1080000$ RUB.

Oracle E-Business Suite: $PL = 1 \cdot 300000 + 1 \cdot 300000 + 2 \cdot 300000 + 2 \cdot 300000 = 1800000$ RUB.

4. Determining the implementation cost.

The cost of implementation is usually determined by the vendor based on the scope of work. The calculation of the cost of works is determined by formula 1.2:

$$PIMP = PL \cdot KIMP, \quad (1.2)$$

where PIMP – the cost of implementing the system,

KIMP – coefficient of implementation is set based on the class system on the scale of application.

Calculating the factor of implementation, it is set independently based on the table 3.

Table 2. The cost of implementing the system in relation to the total cost of the license

№	The class system in the scope of	K_{IMP}
1	Table (single) IP	0,0 – 0,3
2	Office (group) IP	0,1 – 0,5
3	KIS	0,5 – 2,0

Source: Fedotova E. L. Information technology and systems: tutorial. [Information technology and systems: a tutorial]. Moscow, NIC Infra-M Publ., 2013, 352 p.

Using the coefficient of integration, which is equal to 1.0 for SAP R/3, for BAAN – 2.0 and the coefficient of introduction is equal to 1.3 for system Oracle E-Business Suite.

SAP R/3: $PIMP = 2160000 * 1.0 = 2160000$ RUB.

BAAN: $PIMP = 1080000 * 2.0 = 2160000$ RUB.

Oracle E-Business Suite: $PIMP = 1800000 * 1.3 = 2340000$ RUB.

5. The cost of maintenance

It is determined by the provider based on the set of parameters (technical support, upgrades, advice, processing). The cost of support is usually determined based on 1-year maintenance system according to the formula 1.3:

$$PMAIN = PL KMAIN, (1.3)$$

where PMAIN is the cost of maintaining the system

KMAIN – ratio support is set based on the class system on the scale of application.

Calculating the ratio of maintenance, it must be set independently on the basis of table 4.

Table 3. The cost of the system maintenance in relation to the total cost of the license

№	The class system in the scope of	K_{MAIN}
1	Table (single) IP	0,0 – 0,2
2	Office (group) IP	0,0 – 0,3
3	KIS	0,1 – 0,5

Source: Fedotova E. L. Information technology and systems: tutorial. [Information technology and systems: a tutorial]. Moscow, NIC Infra-M Publ., 2013, 352 p.

Using the support ratio, which is equal to 0.3 for SAP R/3, BAAN and from 0.5 to 0.4 for Oracle E-Business Suite.

SAP R/3: $PMAIN = 2160000 * 0.3 = 648000$ RUB.

BAAN: $PMAIN = 1080000 * 0.5 = 540000$ RUB.

Oracle E-Business Suite: $PMAIN = 1800000 * 0.4 = 720000$ RUB.

6. Determining the cost of ownership

Cost of ownership has a more long-term character in comparison with the cost of maintenance. To determine the cost of a three year old ownership one should use the formula 1.4:

$$TCOPUR = PL + PIMP + PMAIN * 3, (1.4)$$

where TCOPUR (total cost ownership) – cost of ownership of the purchased system.

SAP R/3: $TCOPUR = 2160000 + 2160000 + 648000 * 3 = 6264000$ RUB

BAAN: $TCOPUR = 1080000 + 2160000 + 540000 * 3 = 4860000$ RUB

Oracle E-Business Suite: $TCOPUR = 1800000 + 2340000 + 720000 * 3 = 6300000$ RUB

Thus, the cost of ownership of the information system SAP R/3 is 6264000 rubles, for BAAN system – 4860000 rubles, for Oracle E-Business Suite – 6300000 rubles.

SAP R/3 system does not have the cheapest cost of ownership, but when choosing the system one should take into account other qualities of the information system, such as localization, support cost, implementation time, number of consultants and customers. All these factors of SAP R/3 information system are superior in comparison to other two systems. So JSC "Pharmstandard-Ufavita" gets maximum benefit by implementation of SAP R/3 information system.

Calculation of the payback period of the SAP R/3 project using formula 1.5:

$$P = I_0 / CF, (1.5)$$

where P is the payback period, in months.

I_0 – the amount of initial investments, RUB.

CF – the amount of the average monthly net profit, RUB

The amount of the average monthly profits is taken from financial results to IFRS for the 1-lugoda 2016, posted on the website of PJSC "Pharm standard".

$$P = 6264000 / 777727 = 8.1 \text{ months.}$$

The payback period of the SAP R/3 project will be 8.1 months.

4. Conclusion

The introduction of SAP R/3 allows JSC "Pharmstandard-Ufavita" to solve a number of problems and to optimize greatly the whole process, to save substantial funds, to reduce costs and to increase profitability of the enterprise.

The value of the game theory is that it is almost the only method of operations research that allows finding the optimal solution in a conflict situation for both sides. The optimal solution is achieved through the application of precise quantitative methods for resources usage optimization. The value of the game theory increases with the usage of the computer equipment. This permits to speed up the computationally intensive processes. Thus, the game theory acts as a tool for finding optimal solutions in conflict situations on the markets of raw materials and finished products [5].

The usage of the game theory in enterprise management with information technology is economically feasible due to the fact that in the future this will enable the company to reduce production costs of goods and services [61].

The usage of information technologies in enterprise management and the usage of the game theory allows the enterprise to be competitive and to produce the necessary products in the right quantity at the right time.

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