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RISK ASSESSMENT FOR ERP SYSTEM IMPLEMENTATION

RAFIK NAFKHA [a)], DARIUSZ STRZĘCIWILK [b)]
[a)] *Department of Informatics, Warsaw University of Life Science*
[b)] *Department of Applied Informatics, Warsaw University of Life Science*

In this article, based on the results of questionnaire sent to 50 companies with different employment size, events affecting the failures of the ERP system implementation were identified and their risk level as well as additional costs related to preventive actions (reducing the probability or effects of the problem occurrence) were investigated. To evaluate the risk values of chosen ERP system implementation tasks, PMI (Project Management Institute) standard was applied.

Keywords: ERP implementation system, risk value, risk assessment

1. Introduction

Information systems suppliers, in particular ERP (Enterprise Resource Planning) systems, avoid clearly in their presentations risk analysis of the system mainly for two reasons: the first is the lack of or limited knowledge regarding the risks in individual sectors of the economy, while the second reason is related to sales and marketing. Risk has always aroused panic among both customers and retailers offering the system. Disclosure of threats by the supplier in the first steps of the sale may be subject to conflicts of interest. One general principle that is in force is that the risk in the first stages of the project is a forbidden word. Unfortunately, in the next stages of the system implementation, it becomes the not needed word and for its analysis is too late, it remains only mitigate the impact of rising incurred costs. This article presents, a sample list of risks for typical ERP systems implementation and the risk assessment calculation method, that can be

useful running own risk implementation analysis, especially for medium and small enterprises (MSP).

According to Lyytinen [7], there are two essential areas in which risk of the information system project can arise [2]:

- The development of the system, where risks arise from user objectives definition, the incorrect conceptualization of the system, the incomplete view of the organization and the difficulty to predict the impact of the system, the inability to create complex solutions for given specific industry, etc.
- Use of the system, in which the risks include inability to create or use appropriate technical solutions , to collect and maintain relevant data, a negative impact on working conditions, changes (authority, qualifications or scope of the work).

A special case of projects are the ERP implementation projects, which are subject to adjustment previously produced software to the specific conditions of the company in order to achieve certain benefits. Risks in these projects arise on each stage of the implementation of the ERP system [4]. According to report (Business Software Report, Management Institute of Warsaw, 2001) and analyzing the implementation management system suppliers methodology [8], the implementtation of a ready system is usually implemented in five phases:

- preparation of the organization for change – work out a project organization and the rules for its implementation,
- determination the business concept - elaborate a list of business processes that will be implemented by the system,
- implementation - development of a prototype solution ,
- preparation for work in the target environment - installation, launch (test integration of the prototype, user training, data transfer , preparation of the working environment) and transmission system operation,
- start and supervise the work of the system in the real environment.

In the following article, based on the results of surveys sent to 50 companies with different employment structures, we identified events affecting the information management system implementation failures that occur at every level in the life cycle implementation project. These events are grouped in categories and on their basis, an estimated level of risk and additional costs that will be incurred with the launch of tasks related to actions that reduce the probability or effects of the problem, will be adopted.

2. Factors affecting the risk

The main impacts of risk found in the literature [2] are: over budget, time overruns, cancelled prior to completion, unsatisfactory business performance, insufficient system stability, weak or less than the required features and functions, a low degree of integration, failure to achieve strategic goals and inadequate financial and economic results. Identifying sources and risk factors requires an understanding of their causes and mechanisms by all participants of the implementation team. Gaining this awareness is a condition to work on identifying the risks in order to eliminate, reduce and control the risk intentions. The identification of potential risk factors, is one of the essential elements of the risk management process. Errors made at this stage of the analysis may adversely affect the credibility of risk assessment [10]. The identification, which results will be the final specification of risk factors must be carried out very honest and reliable. Omission of potential threats which are important for the project implementation, may reduce the effectiveness of risk analysis, and even undermine the legitimacy of the project management. Unfortunately there is no universal method of identifying key risk factors which guarantees reaching established goals. A good rule is to use own experience and the information delivered from the institutions that collect statistical data, suggestions and opinions of experts in a given field, own practical experience and theoretical knowledge. Quantification of risk factors, ie, its quantitative indication is not only important but also very difficult element of the project management. Most analysts and theorists engaged in risk analysis "run away" from the problems of quantification. They lead arguments about the risks and make only superficial qualitative analysis. Unfortunately, this leads to control the risk, and do not manage what can be described quantitatively.

In this article, to identify the implementation project key risk factors, we asked both customers and experts in the field of ERP systems implementation to indicate repeated and common in their opinion, implementation failures factors. Participants in the study indicated more than 42 different problems occurring during the implementation of the ERP system. In this study only 25 of them have been identified as having a negative impact on the time, budget of the project and product conformity with the project objectives. To evaluate the risks first for each event, the number of problems indicated by the study participants are summed. Then an importance of validity, according to the methodology in Section 3, was adopted. Table 1 shows the critical risk factors ranked by the number of reported problem.

Table 1. Types and quantities of identified problems

Id	Critical risk factors	Number of reported problem
1	Lack of Top Management commitment and support	20
2	Poor project management team	19
3	Lack of Departmental cooperation	19
4	Unclear goals and objectives	18
5	Incorrect project management	18
6	Ineffective communications	17
7	Improper management of expectations	17
8	Incompetent project leader	16
9	Lack of vendor or supplier support	16
10	Improper change management, risk and scope of the project	15
11	lack of knowledge of their own business processes	15
12	incorrect system selection	12
13	Analysis and data conversion	12
14	Limitation in resources	12
15	Insufficient training of end-users	10
16	Lack of new business processes familiarity	10
17	Non-acceptance of organizational structure change and business processes	10
18	Poor integration of the infrastructure systems	9
19	Poor conflict management	9
20	Using tools supplier	8
21	Ineffective project cost and time management	6
22	Lack of metrics for evaluating project efficiency and benefits	6
23	Lack of competence of ERP's consultants	5
24	Data losses	2
25	Insufficient testing phase	2

3. Project methodologies

The probability value estimation and consequences of risk occurrence consist in identifying project implementation tasks at risk of failure implementation. Next one should find answers about the impact of threats on one of completed tasks as well as to whole project (schedule, budget, quality, ect). In order to carry out a comparative analysis, each problem has been prescribed a certain value on a scale of 1 (least important) to 5 (the biggest problem). The final value of each problem is the sum of all values fulfilled by various participants in the interview. Since the

determination of the probability is done intuitively and based on PMI standards [9], the intuitive probability scheme is defined as presented in Table 2.

Table 2. Likelihood Value Guidelines

Range	Likelihood	Designation	Interpretation
1 - 4	0,1	very low	Very unlikely
5 - 8	0,3	low	Probably will not occur
9 - 12	0,5	medium	Equal chance of occurring or not
13 - 16	0,7	hight	Will probably occur
17 - 20	0,9	very high	Very likely to occur

Please note that there are no verifiable method that will accurately determine the threat likelihood therefore, the only attempt was to determine the range to which the likelihood belongs. Each risk is assessed for its impact and a response plan must be generated to avoid the risk or take advantage of an identified opportunity. To achieve determined project objectives a degree of risk impact should be defined. The following sizes, as presented in Table 3, indicating risk impact on project tasks realization are taken into account.

Table 3. The degree of risk impact

Points	Risk impact	Degree of the impact on the project / task description
0,05	very small	Need to change tasks plan (problems with the implementation are important only for task manager)
0,1	small	Increase of task time and cost (problems with the tasks implementation are taken into account by the Project Manager). Delays in the implementation do not affect project date realization or budget.
0,2	medium	Tasks project time and cost will increase and then will force a change in project schedule or budget. Tasks will be not achieved and a correction of the project plan will be necessary.
0,4	critical	Project goal is not achieved. An arrangement with the sponsor is needed. Project time and cost increases
0,8	dangerous	Negative effects on the design environment (the whole company, processes, systems, ect.). Effects exceed the expected project benefits.

Based on PMI Methodology [9], the risk weight is calculated as the product of the risk likelihood value and the degree of risk impact, please see Table 4.

Table 4. The matrix of the likelihood and impact of risks in the project for a given risk tolerance

Likelihood						
0,9	Very high	0,045	0,09	**0,18**	**0,36**	**0,72**
0,7	High	0,035	0,07	0,14	**0,28**	**0,56**
0,5	Medium	0,025	0,05	0,10	**0,20**	**0,40**
0,3	Low	0,015	0,03	0,06	0,12	**0,24**
0,1	Very low	0,005	0,01	0,02	0,04	0,08
		0,05	0,1	0,20	0,40	0,80
		Very small	Small	Medium	Critical	Dangerous
		Degree of the impact on the project / task (Time. Cost, quality				

Survey participants filling the questionnaire do not need to be familiar with risk management, it is sufficient that they present significant implementation threats in their opinion. The grouping and the formalization of the risk list is made by an expert in this area. In this article and in order to group different implementation tasks, a risk categorization has been provided:

1. Organizational **(O)** – subcategories include (top management, business processes, strategy, employment policy, company culture, process planning, finance, staff).
2. Project **(P)** – subcategories include (project management methods, quality and implementation team, business development, project integration).
3. Technical and technological **(T)** – subcategories include (system functionality, support, critical IT infrastructure,).
4. External **(E)** – subcategories include (legislation, the economic situation, exchange rate, competition, lobbying ....).

After summing up indicated scores and assigning ratings to each risk factor, it is necessary to evaluate its effects in order to apply any simplest strategies for its elimination or restriction by adding an appropriate cost estimation (to handle emerging problems) to estimated before schedule "margin of safety".

4. Application of risk assessment method on the example of Sap Sprint implementation

The scope and cost of the proposed example is specified using SAP Business All-in-One the Configurator (http://www.sap.com/solution/sme/software/erp/all-in-one/buy/rds.html), enabling the calculation of the predicted and the estimated SAP Business All-in-One rapid deployment solution price including hardware, software and system implementation (without software maintenance cost).

SAP Business All-in-One is a complex, integrated ERP solution, prepared by SAP partners for medium-sized companies. Implementation scope for a typical enterprise SMEs (Small and medium-sized enterprises) adopted in this example includes the following areas: activities related to logistics process in terms of sales, distribution and invoicing including , offer to the customer, customer contract, customer order, sales, refunds and claims adjustment.

Activities related to process of ensuring supply including: warehouse management, purchase offer, a supply contract, batch management, stock transfer, inventory and purchase settlement.

Financial Accounting and Management which includes: general ledger, accounts receivable and suppliers, liquidity management, accounting and reporting of fixed assets for finance.

The following assumptions and cost estimation are adopted: total number of employees 100, number of users 20, licenses cost 214 200 PLN, services 300 000 PLN, total solution cost 584 200 PLN.

After working out an implementation timetable for the adopted case, which established the duration and the resources assigned to the project tasks, the next step focus on tasks identification that are risky during their implementation and then assign each of them to adopted in Table 2, range of risk allocation. Examples of risky tasks for the adopted implementation are shown in Table 5.

The risk analysis purpose is to determine the quantitative value and identified risks impact on the project implementation. All data are collected in a risk register and updated with score risk value and measurable financial and non-financial consequences reducing identified risks. Ending risk factors analysis, we are able to a risk response planning. In general, risk response plan means a plan which aimed at minimizing the project risk and maximizing its positive effects. When planning risk responses, one should indicate person or group of persons, responsible for implementation tasks and associated with them risk factors management. Among risk handling strategy, we distinguish the following risk management approach: risk avoidance (eg. limitation of the project scope, increasing resources or avoiding unknown subcontractors), risk transfer of (insurance or guarantee transfer), risk minimization (eg. use of less complex processes, making prototyping, ect.) and risk acceptance which means conscious decision of not taking activity associated with risk management, eg. due to low influence of the identified risk factors. In the adopted example, we use a technique that avoid risk by making changes in the initial stage of the project, clarifying requirements and obtaining additional information, expertise and internal training in order to eliminate the risk and protect the project objective. Table 6 shows risks and costs of introducing preventive actions of grouped project tasks.

Table 5. Types and risk values of selected tasks in the different phases of the adopted SAP project implementation

Nr	Tasks	Cat	Critical risk factor	(P)	(I)	RS
1	Strategic Analysis	O	Unclear goals and objectives, lack of Top Management commitment and support.	0,9	0,4	0,36
2	Preliminary project plan	O	Unclear goals and objectives, lack of Top Management commitment and support.	0,9	0,4	0,36
				0,9	**0,4**	**0,36**
3	Pre-implementation analysis including modeling	P	Incompetent project leader, lack of Departmental cooperation, lack of knowledge of their own business processes.	0,7	0,4	0,28
4	Business processes modifying according to accepted company needs.	P	Non-acceptance of organizational structure change and business processes, lack of new business processes familiarity.	0,5	0,4	0,2
				0,60	**0,40**	**0,24**
5	License purchase	Z	Delay of license delivery.	0,1	0,4	0,04
6	Needed shopping and infrastructure preparation	Z	Lack of co-operation with supplier, delay of devices delivery.	0,5	0,4	0,2
				0,3	**0,4**	**0,12**
7	Installation and Technical Configuration	T	Poor integration of the infrastructure systems.	0,5	0,4	0,2
8	Installation and functional configuration – Logistics	T	Lack of dedicated resources, module is not in time.	0,5	0,2	0,1
9	Installation and functional configuration - Materials Management	T	Lack of dedicated resources, module is not in time.	0,5	0,2	0,1
10	Installation and functional configuration- Financial Accounting and Management	T	Lack of dedicated resources, module is not in time.	0,5	0,2	0,1
11	Administrators training	T	Delay in training, lack of competent trainers.	0,5	0,4	0,2
12	Training users with regard to purchased modules	T	Insufficient training of end-users.	0,5	0,4	0,2
13	Data migration	T	Lack of prepared appropriate forms, lack of supplier tools for data conversion , loss of data.	0,3	0,4	0,12
14	Data input	T	System not ready yet, lack of data prepared.	0,3	0,4	0,12
15	System performance testing	T	System not ready yet, ineffective project time management, lack of metrics for evaluating project efficiency and benefits.	0,1	0,4	0,04
16	System testing in terms of system functionality including interfaces	T	System not ready yet, lack of all functionality system testing.	0,1	0,8	0,08
17	Technical support during system startup	T	Lack of supplier support , lack of competence of ERP's project team fine-tunes.	0,7	0,4	0,28
				0,41	**0,38**	**0,16**

P – likelihood, I – impact, RS – Risk Score

Table 6. Risk and costs of introducing preventive actions

Nr	Preventive actions	Cost	(P)	(I)	RS	Cost	(P)	(I)	RS
1	All stakeholders identification. Kick-off.	5000	0,5	0,4	0,28	5000	0,3	0,4	0,20
2	Internal training, coaching	3000	0,5	0,4	0,28	3000	0,3	0,4	0,20
			0,5	**0,4**	**0,20**		**0,3**	**0,4**	**0,12**
3	High power decision for PM. External consultants support, Process modeling training	3000	0,5	0,4	0,20	3000	0,3	0,4	0,12
4	Collecting supplier references	---	0,5	0,4	0,2	2000	0,3	0,4	0,12
			0,5	**0,5**	**0,20**		**0,3**	**0,4**	**0,12**
5	Collecting supplier references. Early orders and transfers in time.	---	---	---	---	---	----	---	---
6	Additional technologies testing before implementation work.	---	0,5	0,4	0,12	---	---	---	----
			0,3	**0,4**	**0,12**		**0,2**	**0,4**	**0,08**
7	Determine the necessary time dedicated for project implementation. Provide separate room.	---	0,5	0,4	0,12	---	---	---	---
8	Determine the necessary time dedicated for project implementation. Provide separate room	---	0,5	0,2	0,06	---	---	---	---
9	Determine the necessary time dedicated for project implementation. Provide seperate room	---	0,5	0,2	0,10	---	---	---	---
10	Collecting supplier references. Client management support and co-operation with supplier .	---	0,5	0,2	0,10	---	---	---	---
11	References and trainers certificates		0,5	0,4	0,20	1000	0,3	0,4	0,12
12	References and trainers certificates. Additional targeted training		0,5	0,4	0,20	2000	0,3	0,4	01,2
13	Collecting supplier references. Request data migration methodology	---	---	---	---	---	---	---	---
14	Determine the necessary time dedicated to preparation and data input	---	---	---	---	---	---	---	---
15	Making simulation tests	---	---	---	---	---	---	---	---
16	Functionality testing in particular phases of the project	---	---	---	---	---	---	---	---
17	Collecting supplier references. Request additional consultancy or support	2000	0,5	0,4	0,28	2000	0,3	0,4	0,12
			0,4	**0,38**	**0,15**		**0,26**	**0,38**	**0,10**

A summary of measured key risk indicators shows table 6. The proposed preventive actions reduce the risk score - in case of acceptance a risk reduction cost at level 12 000 PLN. (which represent 4% of the implementation budget). In this case the total project risk likelihood (calculated as ratio between total risk likelihood and total tasks number) is reduced from 0,55 (high) to 0,42 (medium level) and the Risk Score is reduced from 0,22 to 0,17. When the preventive actions value increases to 16 000 PLN which represent 5,2% the whole implementation budget, then total project risk likelihood is reduced from 0,55 to 0,27 (low level) and the Risk Score from 0,22 to 0,11 (acceptable).

Table 7. Risk indicators for the implemented case

Lp	Risk indicators	Initial	Cost = 12 000 PLN	Cost = 16 000 PLN
1	Risk likelihood	0,55	0,42	0,27
2	Risk impact	0,40	0,40	0,40
3	Risk Score	0,22	0,17	0,11

According to risk management theory [5], the risk owner decides how to deal with risk. If the threats reduction cost does not exceed 5% total implementation budget, which represent in most cases an acceptable risk level, the project is realized without any corrections. In the adopted example, additional cost of 16 000 PLN reduces the ERP system implementation failure probability by 2 levels and increases the system implementation budget by approximately 5,2% of total implementation cost.

5. Summary

Successful management systems implementation is dependent on many factors related both to the type of activities carried out by the company, and the way of managing project and in particular the selection and use of risk management methods. There are no verifiable methods that will accurately determine system implementation failure or success likelihood, but we can determine the interval in which the success/failure likelihood of each task is located. Risk assessment according to adopted in this paper method for risk assessment consist in the identification of risky tasks that can lead to implementation failure. Next for each of them a range of risk value was adopted. Since the risk score determination depends on risk impact value, based on the experiences and statements of specialists in one hand, and applying PMI standards on the another hand, appropriate values of risk impact were pointed for each task. According to problem likelihood appearance, risk impact on the task realization

and finally depending of Risk Score value, an appropriate preventive action was taken. These steps shows that adopted risk assessment for ERP system implementation method can be appropriate.

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