

APPLYING ISHIKAWA APPROACH FOR MODELING ERP RISKS-EFFECTS

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ABSTRACT

Implementation of Enterprise Resource Planning systems (ERP) presents many risks and often severe effects, which must be identified and analyzed. This work shows how Ishikawa approach can be used to model risk factors and their effects on ERP projects, on the one hand and on the organization, on the other. A real case study regarding three large companies and involving a panel of experts and practitioners is presented to illustrate application of the method. We can present this research according to the following general question: What are the probable risks of ERP projects and their effects on the project and on the organization?

Keywords: ERP, Risks Management, Risks Assessment, Effects, Ishikawa

1. INTRODUCTION

An Enterprise Resource Planning system is a suite of integrated software applications used to manage transactions through company-wide business processes, by using a common database, standard procedures and data sharing between and within functional areas [1]. However, several surveys have shown that a high percentage of ERP implementations are classified as failures [2][3][4]. It is a complex and risky adventure. The failure factors are not well known, but they can possibly lead to real effects: many companies have failed in ERP projects. Among these enterprises, there are Mobile Europe, Dell computer, Dow Chemical, which retread from the project [5]. it is also possible for the project to lead to the bankruptcy of the company as the case of FoxMeyer Drug [5][6]. According to the investigation conducted from September 2012 to January 2013, ERP often result in failure, 53% of projects exceeded the budget set, 61% exceeded the deadline and 60% realized less than 50% of expected benefits[7], another study called chaos manifesto conducted by Standish Group[8], shows that : 21% of software projects are failed and abolished before they are completed or delivered but never used; 42% of projects cost more than the expected estimate, exceed the schedules and / or shortage of features; 37% of projects are completed on time and estimated costs. These failures are primarily caused by the absence of certain prerequisites that are necessary for the success of ERP implementation [5][9][10].The

study of Glomark-Governan,[11] which covers 250 companies worldwide found that before the implementation of ERP systems ; 85 percent of organizations have not prepared an objective analysis of costs, benefits , and the risk factors that result in the failure of the projet :exceedind budget and time,and not meeting desired features [12][13][14] [15][16].

This article aims to identify all risk factors of ERP project, and their undesirable effects on the project and on the organization.To address this problem we can summarize the methodology of our research in the following way:

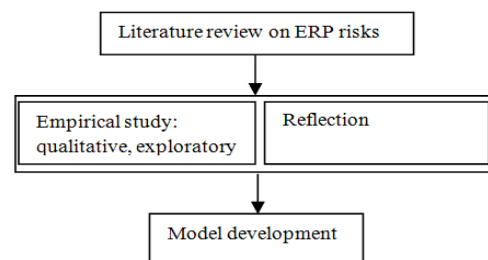


Figure 1: Research steps.

2. THE ISHIKAWA METHOD

The Ishikawa diagram (also called fishbone diagram or Causes and Effects diagram) provides decision support. This analysis method is applied to the risks; it is a comprehensive and rigorous analysis technique. Each branch receives from other causes or groups prioritized according to their level



of importance or detail. Thus, all causes that can produce failures are identified and eliminated. It is used to represent the relationship between effect and causes of a problem

2.1 Risk factors

The risk assessment has to be considered early in the project by developing a list of probable risks that can lead to failure. However, some minor and serious risks may occur during the project that requiring treatment. This step consists in identifying potential risks and any events that generate risks, which could lead to non compliance with objectives.

The literature on risk factors (RF) in ERP projects is closely linked to the success factors (SF). Indeed, if knowledge of the (RF) is essential for managing risks during an ERP project, another perspective is to focus on the (SF); elements that ensure the success of ERP projects. The review of the contributions shows that the authors treat the (SF) more than (RF). This justifies our focus on a comprehensive study of risk factors. According [17] risk is the possibility that a project is not executed in planned deadlines, cost and specifications. These deviations from the forecasts are considered highly unacceptable.

We present in the following table a broad review of the literature on risk factors of ERP projects:

Table 1: Literature Review On Risk Factors

| Risk Factors | References |
|---|--|
| Lack of commitment / expertise of the top management | [14][18][19][20][21][22][23][24][25][26][27][28][29][30][31][32][33][34][35][36][37][38] |
| Poor project management | [14][39][40][41] |
| Inappropriate staffing: Inadequate distribution of roles and responsibilities, insufficient members | [18] [21] [22] [24] [27] [29] [42] [43] [44] [45] [46] [47] |
| Poor consultants | [14][20] [29] [39] [41] [48] |
| Inadequate project manager | [14][20] [40] [41] [43] [45][48] [49] |
| unrealistic Planning of the project deadlines | [21] [43] [49] |
| Poor estimation and management of financial and material resources | [14][18] [22] [50] [51] |
| Conflicts between organization and consultants | [39] [41] |
| Lack of expertise / involvement of key users | [14][29] [39] [41] [48] [49] [52] |
| Lack of expertise of the project team with the system and the processes | [22] [25] [29] [53] |
| Users' resistance to change | [21] |

| | |
|---|---|
| Lack of expertise of the integrator | [29] [48][52] |
| Poor risk management | [14] [20][39] [41] [42] [48] |
| Inadequate BPR (Business Process Reengineering) | [14] [39] [40] [45] [54] |
| Ineffective strategy thinking and planning | [14] [41] [48] [49] |
| Gap in the requirement definition | [10] [45] [55] [56] |
| Inadequate selection | [14] [16] [39] [40] [41] [57] [58] |
| Misfits between the IT and business strategies | [59] [14] [22] [29] |
| Inadequate management of the adaptation of ERP | [41] [59] [60] [61] |
| High rate of system customization | [10] [22] [39] |
| High degree of complexity of the ERP | [62] |
| Insufficient and inadequate training of end-users) | [10][14][19] [29] [39][45][61] |
| Technical issues: Issues related to the installation and operationalization ... | [21][22][29][33] [45][50][53][64] [65][66] |
| Inadequate management of organizational change | [14][22][39] |
| Poor data conversion, under-estimation of data-migration risk | [10][61] |
| Ineffective communications | [14][41] |
| Lack of expertise of the integrator with processes | [22] |
| Poor quality of testing | [21] |
| Issues related to maintenance of ERP | [22] |
| Organizational complexity and level of geographic dispersion (multi-site issues) | [22][66] |
| Lack of experience and expertise of the organization in the management of contracts | [38][67] |
| Dependence on 'key' users | [68] |
| Insufficient resources | [24][25][26][27][28][30][32][33][36] [37][53][63][64] [65][69][70][71] [72][73][74][75] |
| Intensity of Conflict | [25][32][35][37] [38][53][63][64] [76][77] |
| Level of functional specialization | [78] |
| Magnitude of changes by the system | [24][27][28][33] [35][53][65][77] [78] |
| Process complexity | [32][38][53][64] [67][72] |
| Lack of system flexibility (ability to absorb future changes) | [27][63][64] |
| Number of modules installed | [5] |
| Financial stability of the editor | [27][67][73][77] |
| Lack of experience and expertise of the editor with ERP contracts | [67] |
| Lack of experience and expertise of the editor with processes | [28][38][67][68] [77] |
| Cultural mismatch with the editor | [67][79] |
| Financial stability of the integrator | [67][73] |
| Lack of experience and expertise of the integrator with ERP contracts | [67] |
| Lack of experience and expertise of the editor with processes | [28][38][67][68] |
| Cultural mismatch with the integrator | [67][79] |



2.2 Risk effects

ERP can deliver the expected results (in terms of the implanted system) .but at a much higher than planned cost. Conversely, an ERP may have met the deadlines and budgets prescribed but have not achieved their objectives.

According to [80], there are three main impacts associated with the implementation of ERP :poor quality of the system (reliability, efficiency, portability, profitability, usability, understability, verifiability, and the facility of maintenance), overruns of budgets and schedule .in addition to these effects, [53][80][81] mention that the consequences of poor implementation can up to: Customer Relations ,reputation of information technology service, profitability, competitive position, organizational effectiveness, market share, ability to perform current operations , financial health of the organization, Survival of the organization.

2.3 Classification of ERP Risks

The treatment of all risk factors is a daunting and expensive task for an organization. For this reason, we must classify these factors in order to facilitate their treatment.

From a broad review of the literature on failures the first type of classification can be made depending on the nature of the factor. Another distinction is made between factors [82], this classification can be interpreted in two ways: internal organization and external to the organization, but that influence its success, among these, there are factors related to poor political and economic situation in the country, or factors related to poor organization of the company. The second interpretation leads to distinguish what is related to the business of what is not. According to this view, the factor related to the business organization is internal. By cons, those related to consultants or integrators are external. The authors offer listings that do not include economic or political factors, because it is not possible to act directly on these. [5], class factors in technical factors such as factors related to testing, technical problems, etc. Organizational factors that related to the definition of requirements, etc. [18] categorize the risks in: organization Risks, personal skills risk, risks related to technology, risks associated with users .Finally [39] rank the factors according to seven categories: risks related to the organization, risks related to project management, human resources risks, risks management, risks associated with vendor and

consultants, process risks, and risks related to technology.

3. METHODOLOGY (CASE STUDY)

Case study research is an approach which examines a phenomenon in its natural setting, employing multiple methods of data collection together information from one or a few entities (people, groups, or organizations)’’ [83]. It is also one of the most popular qualitative approaches in the studies of information systems [84]. In this paper, we follow the relevant literature and employ a case study methodology, supplemented by the literature review, to derive insights and propose future research.

To perform our study, we conducted a series of interviews and meeting with the directors of information systems and the staff of ERP implementation. This study was performed in three large structures located in the north region of the Africa, experienced in ERP projects .During this study, we have asked the members about the practices followed in the implementation of ERP, they present the success factors the one hand and the risks and challenges on the other hand.

We briefly present below the organizations studied: (for confidentiality reasons, we define them as X, Y,Z).

Table 2: The Organizations Studied

| X | Y | Z |
|--|---|---|
| Reference operator in the electricity sector :Public establishment of industrial and commercial character .Created in 1963, about 9000 employees and more than 4.5 million customers. Nearly 430 million USD in revenue in 2011. | Establishment of airports management, Created in 1989, more than 2700employees. Nearly 306 million USD in revenue in 2012 | Leader of steel long products for the construction and industry (concrete reinforcing bars & rods). Created in 1974, more than 900 employees, Nearly 530 million USD in revenue in 2012 |

4. RESULTS AND DISCUSSION

The interviews which we conducted give information on practices related to the acquisition and implementation of ERP. We briefly present below the experiences of ERP projects.



Description of ERP implementation experience in X Company

In 1998, the X Company recognizes that its system does not allow meeting the increased flows of information and does not allow effective coordination. So it decided to implement SAP R / 3 system after painstaking care taken in selecting the package that would meet 80% of the needs of the organization through the modules: Financial Management(FI), HR Management(HR), Procurement & stocks(MM), business management, Customer Relationship management, technical Management, Controlling (CO), the decision making(BI).

Among the key success factors of this project, the IS (information system) director emphasizes the importance of: The involvement of top management, involvement of internal expertise more than external, X has allocated its best resources for full-time to create a homogenous team work consisting of (young and experienced employees) .A detailed project management has been established including communication and training activities. In terms of communication, the implementation team has scheduled meetings with all staff throughout the project with stakeholder involvement, X trained over 2000 people to introduce gradual change, good management of (deadlines, budget, quality),clear identification of roles and responsibilities, after project (X has followed the updates perfectly).

The Director of IS showed that this project is very structured because it helps to improve the process and to give visibility on indicators such as turnover in real time, but it must be adapted to the company, it recommended ERP for large organizations. The ERP project was considered highly successful by the organization.

Description of ERP implementation experience in Y Company

It was in 1998 that the Y organization decided to move towards the implementation of ORACLE APPLICATIONS , the choice of ERP and the integrator is followed assistance to the project owner for the integration of the modules: Financial Management(FI), Controlling (CO), Inventory & purchase Management(MM), suppliers management, Fixed Asset Management(AM),

When the decision to implement a new system was taken, top management has given its full trust the committee responsible for the project (Competence

Centre): A technical and functional manager and Leadership modules (accounting, immobilization ...) Who decided to have complete ownership of the solution in-house following the specific area of Y, the competence center has developed modules internally as: customer management, local air control (CLA) also the development of a specific process for OP (payment order adopted by public administrations that does not exist in the standard ORACLE) .For data migration to the new system, Y has organized workshops recovery and proceed with the preparation of CSV files. Among the major issues encountered in the implementation is the lack of experience in the 11.5.9 version of the ERP implemented (the first release it was in 2004 in the region) and the passage of 11.5. 2 to 11.5.9 resulted in a complete overhaul of the setting and increased BD (need for storage space): purchase of a new server.

The Director of Information Systems has focused on the importance of ERP projects in large organizations to help them better decision making.

Description of ERP implementation experience in Z Company

Following the merger between two large groups ,the Z Company changed its JD Edwards software by SAP R / 3 ERP in 2007, The implementation of the package lasted eight months by an experienced integrator for the modules: Financial Management (FI) , Inventory & purchase (MM), sales Management (SD), the decision Support(BI), Customer Relationship management, Maintenance management (PM), Controlling (CO).

Top management was very involved in all stages of the process, it was aware of the importance of the project and the challenges of implementation: multi-site that requires efforts for standardization of important processes. Since the company already had a sizeable experience in the implementation of the JD Edwards software, the migration was successful. Several meetings and visits facilitated knowledge transfer between consultants and the future leaders of the system. A tight project management has been established, included a thorough analysis of the needs for proper configuration of the software, a communication plan, a complete review of processes, and programmed courses which have played a very important role in training on the new environment. ERP (server and database) is relocated to another country for reasons of security and total centralization of information, the only technical problem is the interface between the ERP and

programmable logic controllers which resulted the development of interfaces between them and the ERP for information in real time without operator intervention.

Finally management considered implantation as fully successful and the system is continually updated.

5. PROPOSITION OF CAUSES-EFFECTS MODEL OF ERP RISKS

According to our previous studies [85][86] and the results of the current theoretical and empirical research, we can illustrate the risk factors for implementing an ERP project into four categories: Organizational /managerial Factors, Financial factors, Human Factors, Technological factors.

Table 3: Categorization of risk factors

| Categories of risks | Nº | Risk Factors |
|---------------------------------------|-----|---|
| Organizational and managerial Factors | R1 | Poor top management support |
| | R2 | Organization Culture |
| | R3 | Misestimation and poor planning of current and future needs of the organization |
| | R4 | Unrealistic expectations |
| | R5 | Lack of vision oriented process |
| | R6 | Instability of leadership positions (unstable organizational environment) |
| | R7 | Incompatibility between structure of the organization and ERP system |
| | R8 | Misalignment between ERP / Needs (Incompatibility between IT strategies and business strategies) |
| | R9 | Poor business process reengineering |
| | R10 | Organizational complexity and level of geographic dispersion (multi-site issues) |
| | R11 | Neglecting the managerial aspect and consider the ERP project :purely technical |
| | R12 | Poor management of ERP project (poor estimates of resources and project size) |
| | R13 | Ineffective communication with users (incomprehension requirements) |
| | R14 | Misestimation of workload |
| | R15 | Lack of experience and expertise of the organization in the management of contracts |
| | R16 | Lack of experience and expertise of the integrator in ERP contracts elaboration |
| | R17 | Incorrect Choice of ERP modules |
| | R18 | Rapid turnover of the team of ERP Maintenance |
| | R19 | Frequent changes in qualified end users |
| | R20 | Insufficient employee involvement |
| | R21 | Lack of clarity in defining roles |
| | R22 | Lack of rigor in project monitoring |
| | R23 | Heaviness of legal and administrative procedures |
| | R24 | Lack of control and verification of data entered into the system |
| financial factors | R25 | Poor choice of the integrator and consultants |
| | R26 | The high costs of integration |
| | R27 | The high cost of necessary training |
| | R28 | The high cost of ERP maintaining |
| | R29 | The high costs of updating and license buy |
| | R30 | Change resistance (rejection of the ERP by users) |
| Human Factors | R31 | Social Risk: feeling of control of activities, downsizing. |
| | R32 | Insufficient careful to employee concerns and lack of motivation |
| | R33 | Lack of qualified staff in the processes of the organization |
| | R34 | Lack of qualified staff in computer and databases ... |
| | R35 | Lack of experience and expertise of the integrator with the processes of the organization |
| | R36 | Lack of experience and expertise of the editor with the processes of the organization |
| | R37 | Inadequate project manager |
| | R38 | Inadequate responsible for ERP maintaining |
| | R39 | Inadequate training of ERP users |
| | R40 | Intensity of conflicts, internal conflicts between departments |
| | R41 | Dependence to 'key users' |
| | R42 | Absence of consultants |
| | R43 | Lack of commitment of the project team |
| | R44 | Conflicts between the organization and consultants |
| Technological factors | R45 | Conflicts between the organization and the integrator |
| | R46 | Poor cultural fit with the editor |
| | R47 | Poor cultural fit with the integrator |
| | R48 | Poor choice of ERP |
| | R49 | Complex architecture and high number of modules implemented |
| | R50 | Issues related to the necessary change of hardware (requirement of new hardware) |
| | R51 | Incorrect profiles management and misallocation of access rights (open access to functionalities and sensitive transactions) |
| | R52 | Issues related to the integration and interfaces: number of interfaces with existing systems |
| | R53 | Invalid setting: Errors when setting or configuration can cause coriaceous malfunctions |
| | R54 | The rigidity of ERP (lack of system flexibility and not ability to respond to future changes) the company grows, ERP sometimes can't follow this trend. |
| | R55 | The high rate of system customization (ERP modifications & custom developments) |
| | R56 | Issues related to system installation |
| | R57 | Issues related to data migration |
| | R58 | Issues related to maintenance of ERP |
| | R59 | Lack of appropriate tests |
| | R60 | Poor documentation |

These factors can cause three effects:
 -Overruns of the project deadlines, and / or;
 -Overruns of the project budget, and / or;
 -Poor system quality (lack of features).

The following diagram shows our model:

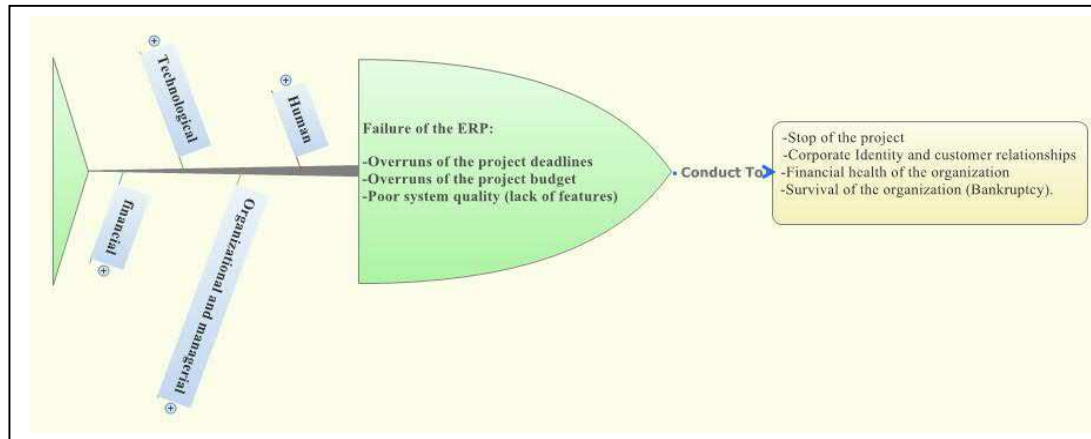


Figure 2: Risks-effects of ERP projects

4. CONCLUSIONS AND FUTURE WORK:

In this article, we introduced a new approach to risk assessment in an ERP project. This study allowed us to model and structures the relationships between risk factors and effects. This is a first attempt to apply the ISHIKAWA model for risks assessment in this class of projects. The ERP is not a magic solution; its benefits are the good preparation and effective implementation with an appropriate use. It is difficult to distinguish the importance of one factor over another. Actually, there is no one single factor of failure; all these of them have their intrinsic importance. The research gives additional benefits such as the categorization of risks. Our research will continue in: classification of risks according to their importance and the proposal of a set of best practices for implementation and use of ERP in organizations.

Despite these merits, the research has its limitations. The main limitation concerns with its exploratory nature. This condition does not allow to attempt any generalization of the results but provides evidence of the applicability of ISHIKAWA technique and its potential in this field.

And these effects can in turn lead to four major effects:

- Stop the project and / or;
- Impact on branding of organization and customer relationships and / or;
- Financial health of the organization and / or;
- Survival of the organization (Bankruptcy).

Another critical factor is Data availability and quality of the value of expert judgments in respect to the project risks. Future research should investigate new ways and means of obtaining data.

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