

A FRAMEWORK FOR EVALUATING DIFFICULTIES IN ERP IMPLEMENTATION

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Abstract: Various sources point out very high percentages of failures to implement ERP systems. In this work, the main difficulties for this task are analyzed and a systematic classification of fundamental reasons is intended. By considering the reasons that lead to failure, a simple and effective mechanism is generated to evaluate in advance complications the project might present. In this way, the tools to be used can be adjusted to the specific characteristics of the project. Somehow, it is intended to solve the problem presented by general methodologies, which are used for any kind of enterprise, without previously considering its conditions and state to face this type of projects.

1 INTRODUCTION

ERP systems support most key processes of an organization by using a common data base that stores all the organization's data (Abdinnour-Helm et al., 2003). These packages expanded rapidly due to their advantages over the rest of the legacy systems: high integration level, operation on the organization's business processes, reduction of operative costs, etc. All these advantages are not easy to achieve. Implementing an ERP is extremely complex and implies a great challenge for the enterprise (Davenport, 1998).

This has led to important failure rates in implementations. One source of problems resides in the difference of interests between customer organizations who search for a unique business solution and ERP sellers who prefer a generic solution to be adjusted to a wide market (Hong and Kim, 2002). In their efforts to have "their business solution", enterprises invest a lot of money in customizing ERPs, which then brings about many problems in the system updating.

This work presents a systematic classification of sources of failures to identify their origins and to foresee solutions to overcome them. A framework is generated to allow for a priori evaluating the main difficulties of the project so as to focus resources towards the appropriate direction. In general terms, implementation methodologies tend to be general and do not previously take into account the difficulties they will have to face. In this case, the complexity of the project is intended to be estimated.

2 ERP IMPLEMENTATION

In the last years, many enterprises acquired ERPs to replace their legacy systems, attaining better integration of their functional areas. Unlike legacy systems, ERPs are not made to meet the organization's requirements but they have to be parameterized according to the business processes of the organization. It is not an easy task since it brings about a great change in the organization. There are various methodologies to implement an ERP, many

of which are developed by suppliers themselves (Al-Mashari and Zairi, 2000; Rebstock and Hildebrand, 1999; Bancroft et al., 1997). They include technical, operative, and organizational issues.

Making the ERP system operative poses a series of important challenges for the enterprise. In many cases, the definition that considers when the system is implemented is an issue to be discussed (Gottschalk, 1999). It is also a discussion topic when all the value the ERP system can provide for the enterprise was reached (Davenport, 1998).

3 SOURCES OF FAILURES

We can evaluate the different sources of failures by studying the factors that make an implementation successful. These factors can be divided into three big groups: human/organizational, economic and technical factors. Within these three groups, there are various elements that allow for identifying possible sources of failures. This section is intended to make a systematic classification of those elements that are considered as source of failures in the ERP implementation taking into account previous works in this area (Gefen, 2002; Bajaj and Nidumolu, 1998; Hong and Kim, 2002; Jianga and Kleinb, 1999; Kuruppuarachichi et al., 2002; Krumbholz and Maiden, 2001; Mabert et al., 2003a, 2003b; Somers and Nelson, 2003; Mandal and Gunasekaran, 2003; Westerveld, 2003; Soffer, 2003; Stensrud, 2001). The following classification has been obtained:

Human/Organizational factors: They become more important when the level of change of the business processes is more significant. They include:

- Leadership: It arises from the sponsor group of the project. It selects and directs functional leaders, supports them in decision-making and provides them capacity for deciding on the main implementation aspects. Lack of leadership inevitably leads to failure (Sarker and Lee, 2003).

- Communication: Everyone in the enterprise must be informed of changes that have been already made or are to be introduced. Communication must be open and honest in order to minimize employees' resistance against change.

- Organizational culture: Implementing an ERP system implies a change in the organization's business processes that can be radical in most cases. It is convenient to have a culture that enables this kind of changes. The employees' attitude towards a change of this kind is vital for a project of these characteristics to be successful.

- Implementation team: It must be balanced; i.e. it should include people from every area of the

enterprise and it should be 100% committed to the project.

- Organizational adjustment: The way in which an ERP system is adjusted to the organization's processes is crucial and it is an important criterion to select an ERP (Lozinsky, 1998). Suppliers strongly recommend implementing the system following the processes contained in the ERP, "the best practices", because they have been extracted from successful examples, and reducing customization. On the other hand, there are organizations whose business processes cannot be adjusted to the ERP procedures. Mainly, strategic information systems are difficult to customize since they correspond to distinct practices from which the enterprise gets competitive advantages. When implementing an ERP system, its adjustment degree to the organization must be well defined because otherwise implementation could be too long and expensive and could not meet the company's requirements.

- Company size: Organizations have different reasons for implementing an ERP, depending on their size. Big organizations are motivated by strategic needs, and the smallest ones are motivated by operative considerations. The number of implemented modules, plans, and the expected results are different. Big companies report great benefits in the financial area, whereas small ones report them in manufacture and logistics.

- Lack of experience to work on this kind of projects: The required effort is quite big and usually there is no experience of working with similar previous projects. There are great risks for the project to be out of budget and time. A careful administration of all resources is required.

- Lack of a methodology: Most suppliers of ERP systems have their own general implementation methodology, which is not always compatible with the organization it will be applied to. Many times, people in charge of this task try to make the organization adjust itself to the methodology requirements, without knowing if they are the most convenient ones according to the company's culture.

- Satisfaction and use of the system by users: A great effort for implementation is useless if the final user is not satisfied by the system and does not want to use it. It is essential to early integrate users so that they can become involved in the project and to take their requirements into account (Gelderman, 1998).

- Understanding of the organization strategic objectives: To attain a successful implementation, a clear definition of the project objectives is required. Key managers must determine the foundations over that the business processes have to operate to satisfy users, company goals, employees' needs, etc.

Economic Factors: If the needed funds are not available, it is impossible and unfeasible for a project to be continued. Some factors are:

- **Economic plan:** It is important to control costs coming from different sources, mainly licences, technical resources, and human resources. The last one is the most significant one and includes consulting, the firm staff expenses, incorporation of specialized technical staff, etc.
- **Budget adjustment:** If the organization does not respect the settled budget for the project, it will inevitably fail. It should be taken into account that in this kind of projects there are hidden costs that should be considered, for example customization.

Technical Factors: the organization's technical capacity for implementing this type of systems must be considered. The most important factors to be taken into account are:

- **Customization and software testing:** Highly trained staff is required to keep the ERP system operating in future updatings. An adequate testing is important to avoid errors at further stages.
- **Staff with technical knowledge:** It is necessary to count on people that have an adequate technical profile to manage the technological change, minimize the impact this might cause, and reduce implementation time.
- **IT resources:** The bigger the amount of technology to be incorporated, the more expensive and complicated the project. This technology must be ready and available before the project starts.

4 FRAMEWORK TO ANALYZE AN ERP IMPLEMENTATION

Frameworks are useful because they allow us to organize and integrate the elements of a problem in a simple and consistent way, assuring the attainment of the pursued outcomes. In addition, they allow holding a common work discipline. The benefits of counting on this kind of tools exceed the reached objectives. The framework development process and the associated discussion among participants provide fundamental contribution to the project (Boyer et al., 2002; Heeks, 2003; etc.).

Before starting a project, it is convenient to bear in mind which are the main difficulties to be overcome and their effect over the project. For this purpose, a framework is presented that allows estimating the degree of difficulty and failure probability so as to prepare suitable measures to overcome problems. It should be taken into account that not all projects are alike, neither should the

same methodologies be used. The tools to be used must be adjusted to each project's needs.

This framework is based on two states: "Where we are now" that measures the organization's current reality, and "Where we want to arrive" that estimates the desired situation when the project ends. Failure probability or project difficulty can be estimated through the gap existing between both states. The greater the gap, the greater the implementation project difficulty. It is intended to see the enterprise's position to face the project.

For the case of a small gap, the framework would indicate that it is probable for the project to be successfully finished. It also indicates that the change level is low, which leads to questions such as: In the face of a low level of change, is it worthy to undertake an ERP project? Do legacy systems with some modifications satisfy our expectancies? Do the project objectives adequately take advantage of ERP system capacities?

By using the previously considered factors, we assume that an ERP implementation can be analyzed through seven key dimensions, which we consider necessary and enough to analyze the existing gap between the current situation and the designed one:

- **Information:** It considers the information the enterprise counts on for making decisions related to the project.
- **Technology:** A very expensive technology is needed. This dimension can be expanded to consider hardware, data base, connectivity, etc.
- **Business Processes:** It deals with a quite wide dimension. It is intended to measure the existing distance between current and redesigned processes to be used in the company.
- **Organizational Culture:** It is necessary to count on an adequate culture, i.e. the right people having a good predisposition to changes and creative and optimistic personality. It also considers inner resistance. Communication policy, previous projects in the company, etc. must be taken into account.
- **Adjustment to the ERP:** Correspondence between the organization's redesigned business processes with the best practices incorporated into the ERP system must be considered. The greater the adjustment, the easier and more economical the implementation.
- **Employees' Skills:** Training of the people involved in the project is analyzed. It requires people having experience in similar projects so as to make implementation faster.
- **Work with Methodologies:** We analyze if the organization is used to working with methodologies, and if some kind of similar experience has been developed.

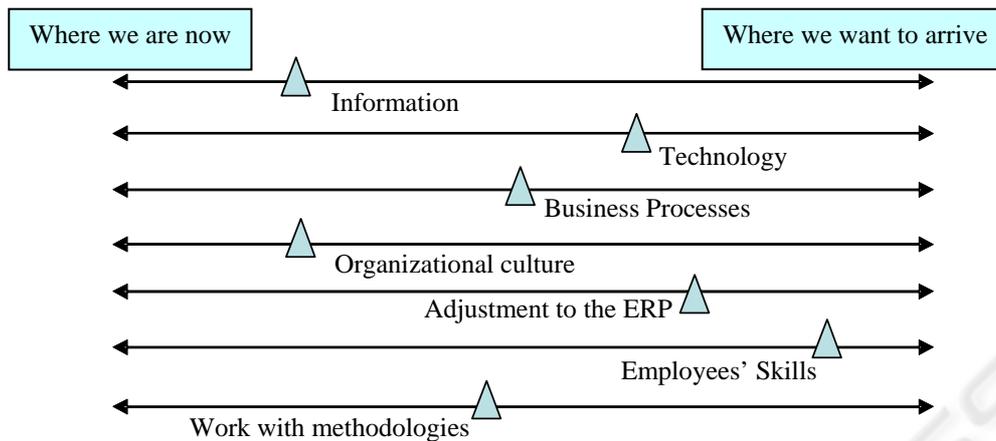


Figure 1: Model for Evaluating the Project Gap.

Figure 1 presents a model for evaluating an organization as regards the specified dimensions. In each dimension, triangles slide horizontally from “Where we are now” to “What we want to arrive”, determining the organization’s position to face the project and defining the dimension’s rating. For example, if the triangle is near “What we want to arrive”, it means that in that dimension the organization is near the pursued goals (the required level of change is low). On the other hand, if the triangle is nearer “Where we are now”, it means that great reforms are needed in that dimension so as to carry out the project. Particular dimensions can be added, depending on the kind of organization.

If the gaps between reality and planning could be reduced, we could also reduce the risk of failing in the implementation. Anyway, it is not generally possible to reduce these gaps since they correspond to conditions related to the enterprise and to the project. These gaps allow for predicting or estimating the difficulties to be faced. In this way, it is easier to determine and use the appropriate resources and to foresee the project length.

5 METHODOLOGY

We present the general steps to follow for using the presented framework.

5.1 Evaluation of gaps

For each dimension, an analysis is made to evaluate the existing gap between the current situation of the organization and the desired situation expected after implementing the ERP system. Numerical values are assigned to consider distance between both

situations. For this purpose, a 0 to 100 scale has been taken for each dimension. For the purpose of guidance, we provide meanings for some values, but any value can be assigned in this range:

- 0 Value: It indicates that there is no difference between the current and the redesigned situation.
- 50 Value: It indicates that there is a degree of mean difference between the current and the redesigned situation.
- 100 Value: It indicates that the current situation is completely different from the solution proposed with the ERP system.

A particular dimension can be divided in several subdimensions with a weight according to their relative importance in the main dimension. For example, we can take Technology dimension and subdivide it into four elements: Data Base, Operative System, Hardware and Connectivity.

Once all proposed dimensions have been assigned, a global indicator, or *general gap*, is generated, which estimates the degree of success the ERP implementation project may have. It is obtained from the sum of the gaps of the proposed dimensions in the model. Here weights for each dimension can be considered.

The table shows how to interpret simply results obtained for the General Gap:

General Gap	Interpretation
501-700	The project is highly risky and many precautions must be taken before starting in order to do so successfully.
301-500	The project has a considerable risk if the appropriate measures are not taken. Precautions should be taken on the most affected dimensions.

101-300	The project does not have too many risks. There might be problems if we do not work on dimensions with significant gaps.
0-100	The project will surely be successful, without significant risks. Te settled goals must be analyzed since the change and the impact on the business are low and thus the ERP acquisition might not be justified.

5.2 Analysis of the general gap in relation to available resources

Available resources cannot be analyzed in the same way that previous dimensions but the general gap must be related to three key resources (Budget, Availability of Human Resources, Time Assigned to the Project) to determine the probability of the project success. Figure 2 shows four quadrants to indicate possible locations of the organization relating both elements, whose meanings are:

- Quadrant I: It encompasses organizations with a low general gap that do not count on enough resources to undertake the project. The organization is not in optimal conditions to start implementation but with some adjustments it can go further towards a successful project.
- Quadrant II: The general gap is high and the organization does not count on the resources needed to face implementation. There are great probabilities of failure. The effort to be made in order to achieve a successful project is very significant and risky.
- Quadrant III: Organizations with greater possibilities of success. They have a low general gap and count on enough resources assigned to the project. Taking into account the value of the general gap, available resources should be assigned to analyze the project goals so as to know if it is really necessary to implement an ERP system since the level of change is too low, or if the project objectives have not been well planned according to the ERP potentialities.
- Quadrant IV: Organizations that have

resources for the project but as the general gap is high, there are many difficulties for the project. A great effort is required. However, having available resources may constitute an incentive to try to overcome the existing problems and constraints using a suitable methodology.

Appropriate scales should be defined over each axis. The previous analysis has been made taking all resources into consideration simultaneously. It can be very useful to unfold the graph in Figure 2 for each separated resource in the y-axis. Also, the different levels of the resources and the general gap must be considered in a detailed analysis.

5.3 Determining actions to be taken

In most cases, the studied organizations will be located over 100 points, for which actions should be taken so as to minimize project risks. One option is to try to reduce gaps. In many cases this is not feasible, because it attacks project quality and leads to less ambitious goals. In some cases a revision of the gaps of certain dimensions may be necessary. For example, in Technology we can consider questions such as: Is it necessary to buy a new data base? In Business Processes, we can analyze whether the redesign proposal has been too ambitious. Therefore, in many cases the first step consists of iterating over previous stages and evaluating other alternatives.

The most important action is to adjust the implementation project steps according to the obtained results; i.e., we must set a period of realistic time for the project, define stages, and make a good distribution of resources. This implies considering each of the standard stages in the methodology and revises them according to the available elements. In many cases, this forces the project to have longer stages with a greater level of detail and more sophisticated tools so as to assure the project's success.

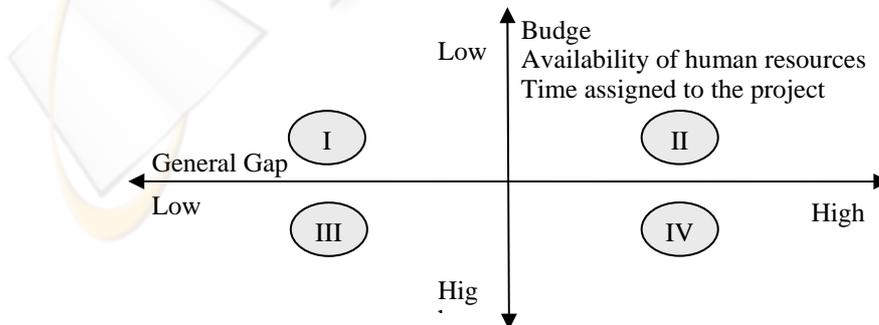


Figure 2: Analysis Model (General Gap of Project vs Resources)

6 CONCLUSIONS

ERP implementation presents a low rate of success. Usually suppliers and firms that implement them count on general methodologies for this task. One source of the aforementioned problems may arise from the fact that methodologies are general and cannot be adjusted to the project's elements.

This adjustment between methodology and the project must be done a priori, before starting. Going back in the project execution, reassigning resources, etc. are mechanisms that probably lead to failure if they are applied during the project development. Therefore, before starting to work, the main problems to be solved should be clearly identified.

We present a framework that allows estimating the difficulties of an ERP implementation project. A series of dimensions is analyzed that are considered as basic for the success of this kind of projects and have been derived from a bibliographic review of works on this area and from the authors' personal experiences. By analyzing the difference between the enterprise's current situation and the one planned with the ERP, the difficulties in the implementation can be estimated. Then, the values obtained for this gap are matched to the available resources to undertake the project.

Regardless of the obtained results, the need of carrying out the posed steps, evaluating the elements, and revising relationships between detected gaps and available resources allows those groups that face such problems to exactly measure the constraints they will have to overcome.

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