The needed adaptability for ERP systems

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Abstract: The new market trends are forcing companies for constantly business process' reorganizations in order to react quickly to the new economical challenges. Not always, enterprise information systems provide an appropriate response to these situations by several reasons, like technology failure, lack of adaptable configuration tools or even by the financial investment required, making it unaffordable to companies. This article presents a functional model for ERP systems (called FME) that would guarantee a baseline structure to build solutions which would provide a complete configuration, and therefore, a timely reaction for market fluctuations. This model has been developed also resuming some of the most used functionalities of the ERP systems available.

Keywords: ERP, adaptability, customize, functional, model.

1. Introduction

The last decades have been characterized by constantly market fluctuations in the global economy stability, leading companies to be faced with an applicant need for amending their strategic business processes. These changes demand, usually, tactical decisions for quick and accurate responses over companies working processes, heading for short-term adaptation actions to face the new market needs. However, this constant (and ill) adaptation, it is often considered a veritable Babel Tower, since its maintenance is performed without a completely "thought and organized" process. A simple change in a process may lead to organizational restructuring and, therefore, demand for changes and new configurations on the existing information systems.

This new trend requires the enterprise information systems to be provided with tools for rapid customization (and management) to enable an effective and timely response to these needs. In this context, there are several Enterprise Resource Planning (ERP) systems in the market capable of answering to these requirements, such as SAP, Microsoft Dynamics, JD Edwards, Priority, PHC Software, Manufactor, Primavera Software, etc. However, they present different solutions and framework concepts for the same functions, and none of them presents a complete solution.

It is in this work, it is presented an "adaptive" functional model that could be assumed as the "baseline" for ERPs systems. This model has, as its primary aim, to provide the necessary conceptual architecture to build software solutions which provide a complete parameterization and configuration, that guarantee an effective response to organization's needs.

2. Major problems founded

Implementing and managing ERP systems might become a complex process due to several causes, like human inadaptability, for instance. According to Lin (2002), about half of ERP implementations fail to meet expectations. Most of them suffered from over-budget, over-time, user dissatisfaction, threatened lawsuit, failed to introduce all planned modules, or the big and horizontal ERP systems pulling back into beta testing.

The following topics resume some of the most common in this business, according to the experience of the author.

2.1. Awareness from market

Software companies develop ERP systems regarding roadmap's interests due to time and cost restrictions, somewhat "forgetting" to study the actual needs of the market. According to Davenport (1998), software houses try to structure the systems to reflect best practices (series of assumptions about the way companies operate in general), but it is the vendor, not the customer, that is defining what "best" means. In many cases, the system will enable a company to operate more efficiently than it did before. In some cases, though, the system's assumptions will run counter to a company's best interests.

Most of the time, software companies are aware of the companies' major difficulties when regarding their policies of distributing software (leaving the responsibility of consulting and analyzing the market to smaller companies, named partners; which, sometimes, aren't prepared for such a difficult task). According to Bingi (1999), because the ERP market has grown so big so fast, there has been a shortage of competent consultants. Finding the right people and keeping them through the implementation is a major challenge, since ERP implementation demands multiple skills -- functional, technical, and interpersonal skills. Although this strategy (high number of partners) might increase software house's sales it, indeed, positioning them away from the companies' "real need" analysis.

(Mandal, 2003) has defended that software vendors should apply for an "iterative evolutionary method" for developing enterprise-wide information systems, since would enable system developers and their customers to communicate effectively with each other to evolve the system towards some defined objective. Such a strategy would help them to analyze the impact of the software implementation on the organization. Unfortunately, such kind of strategies (although, sometimes promised) were never take "really" in consideration.

2.2. Factors preventing decision-making

According to Holland (1999), a new ERP platform forms a critical infrastructure in any company for, at least, the next decade. This sentence enhances the importance of a consistent choosing decision of an ERP system for an organization.

But, an ERP system's implementation is often a complex process, requiring the internal restructuring, both in terms of work procedures and human resources. The growth of Project Management, such as science, proves the importance and complexity of these processes, in order to guarantee a complete control of tasks, resources and associated costs. Even at a stage of "cruising speed" (in which, finally, the company begins to truly enjoy the usage of an integrated

system), any change is considered (by companies' managers) as a cost for the organization; even when ranked as essential to answer to new market adversity. According to Oliveira (2004), the impact that Information Systems and Technologies have in organizations lifecycle is such, that a simple study on her information systems approach is enough to classify her (as innovative) in the market.

These "pessimistic" thoughts have been growing since managers felt that invest continuously (and highly) on technical and human factors for an ERP system that responds, only partially, to the expectations that have been set. According to Davenport (1998), the growing number of horror stories about failed or out-of-control projects certainly gives managers pause. Nowadays, any change becomes subject of a "deeply" financial analysis and hardly consideration by managers.

The following topics resume some of the factors influencing the decision of managers, concerning the changing or customization of an ERP system in their organization:

- **Organizational changes (Human)**
  As already mentioned, an ERP system can obly to organization's structure, and therefore, user's adaption to new functions and work procedures According to Davenport (1998), an enterprise system imposes its own logic on a company's strategy, culture and organization. (Umble, 2003) described that even the most flexible ERP system imposes its own logic on a company's strategy, organization, and culture. Thus, implementing an ERP system may force the reengineering of key business processes and/or developing new business processes to support the organization's goal. Such an approach might result on some workers' refuse to change to the new system!

  Another author enhances the human factor (Courtois, 2006), defending that the success of a system depends of peoples' motivation for the implementation project, needing to know exactly their expectations and follow organization's interests.

  Besides that, it also should be considered the period which two applications run "in parallel", to ensure a continuous and "untailored" process. Although this scenario seems to be the most secure, in fact, promote fatigue on users. (Yusuf, 2004) has identified some risks related to human concerns when implementing ERP systems, like: resistance of change to new process methods by management and supervision; possible failure to cut over to the new system through an inability to load data; possible failure to cut over to the new system through the inappropriate systems testing of volume, stress and data conversion.

- **Implementation costs (Finance)**
  According to Bingi (1999), the total cost of implementation could be three to five times the purchase price of the ERP system. The implementation costs increase as the degree of customization increases. The cost of hiring consultants and all that goes with it can consume up to 30 percent of the overall budget for the implementation, making this stage as one of the most expensive. Besides that, it's one of the stages most "affected" when a reengineering decision is applied or when a wrong analysis is made, since it gathered the business rules definition and customization procedures.

- **Supplier dependency**

When an organization buy an ERP system become, in a certain way, dependent of their software supplier/partner, to configure and parameterize the system. After the implementation stage, it might be required high-cost maintenance contracts to ensure the ERP system evolution to organization's needs. These types of scenarios are, normally, predicted by managers and might become a constraint when deciding for an ERP system. This "dependency" can be reduced if internal teams follow, constantly, all stages of the implementation stage and ask for a high degree of participation. This will give some autonomy to companies manage their maintenance costs.

2.3. Implementation times

According to Bingi (1999), the problem with ERP packages is that they are very general and need to be configured to a specific type of business which takes a long time, depending on the specific requirements of the business. For example, SAP is so complex and general that there are nearly 8000 switches that need to be set properly to make it handle the business processes in a way a company needs. The extent of customization determines the length of the implementation. The more customization needed, the longer it will take to roll the software out and the more it will cost to keep it up-to-date.

(Tchokohué, 2003) referred a study made by the Standish Group, which found that 90% of ERP implementations end up late or over budget. And, in some cases, the implementation time is extended indefinitely, which has negative consequences for both the companies and the morale of their employees.

An additional factor can be added if the implementation process is carried out by less competent partners/implementers, which will increase implementation times, risks and costs.

2.4. Upgrade process (new versions)

Other handicap detected on these kinds of systems (even the "most advanced" ERP systems which include many configuration features) is that they become a "nightmare" when an upgrade is needed; since it became very hard to maintain the same performance, when a new release is available to market. Besides these problems, it also can be pointed a technological restriction: some of the ERPs systems are developed based on two layers (Presentation and Data layers), which turn the upgrade operations a difficult task. This type of architecture does not provide the desired scalability for such a complex and multi-department system.

These scenarios also "spread" the feeling of not buying the first ERP versions to avoid the first errors; so called the Beta versions. It became a usually procedure, on software markets, customers prefer to wait for "mature" versions to reduce implementation's problems.

As a first conclusion, it can be assumed that all these indicators are considered by companies' managers, to analyze the impact on their organization. Companies' deal, daily, with alternative scenarios evaluation to support the decision process, comparing all the benefits and weaknesses of each option (internally, regarding processes' modification; externally, the market's reaction that can be provided).

3. "State-of-art" of ERP systems

The actual ERP systems already include solutions for quick customizations. However, all of them, present some advantages and disadvantages among each other, becoming difficult to find a "standard meaning". This chapter presents the traditional functional structure of these kinds of systems.

Figure 1 presents a scheme, which represents the existent functional structure for ERP systems, divided in 3 parameterization levels. It can be defined a first level for ERP internal business development, which includes all the business rules developed by the software house as standard operation routines. The second level is defined as the Business Process customization level, which concerns the entire advanced configuration promoted by consultants and implementers, in order to guarantee system's adaptation to companies' requirements. Finally, the third level is dedicated to Low level customization, which includes the entire parameterization available for ERP's users.

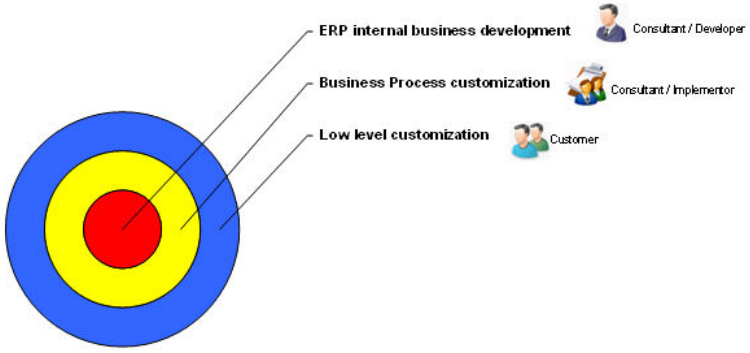

Figure 1 – Parameterization' levels of ERP systems

1st Level: ERP internal business development
This level includes all the standard routines developed by the software house for the ERP system. On an implementation process, this level is never applied, unless a "software bug" is detected or the customer argue for a specific need, that even the "Business Process implementation" level cannot handle.

This level is assumed as the "heart" of an ERP! Built in a complex structure (data and programming code); it's the responsible for guaranteeing the perfect integration between processes and data, for a complete coherent information kept. Changes to this level are always avoided by the software houses, to prevent major problems. Normally, it's only changed when mandatory developments are required, for instance, like changing of financial/government legislations.

2nd Level: Business Process Customizations
This level includes all the available configuration tools to be used by consultants. Since the major ERP systems work on a three-tier development application scheme, it might include several changes to ERP's business rules, regarding advanced customizations requested by customers.
Since the most part of the processes is already standardized (like financial and commercial, for instance), this level assumes a high importance since it reveals the major differences between the

ERP systems. This means that the major difference on buying/choosing an ERP is the ability of customization/parameterization of this second level.

3rd Level: Low level customizations
This level includes the entire "local" customizations available for users, to allow single tasks like choosing colours, configuring columns orders, sending e-mails by a condition, etc. Although not assuming a major importance like the previous level, in fact, it promotes some flexibility on internal processes, giving some ability to users (easily) enhance their daily procedures.

The ERP systems existing on the market have different approaches to answer to these three levels. Some of them present better solutions for the 3rd level, forgetting that (to answer effectively to companies' requirements) need to dedicate a high attention for the 2nd level. The ideal scenario would be an ERP system that could promote a user-friendly configuration tool (but highly advanced concerning the parameterization ability) to "explore" conveniently all capacities of the 2nd level.

4. (desired) Functional model for ERP systems

It is extremely important that ERP systems provide an internal reactive model, regarding the availability of configuration and parameterization tools, to promote user's interaction with the software. The next image (Figure 2) presents a functional model (called FME) that could be applied for designing a complete innovative and integrated system, with a high level of adaptability and interactivity.

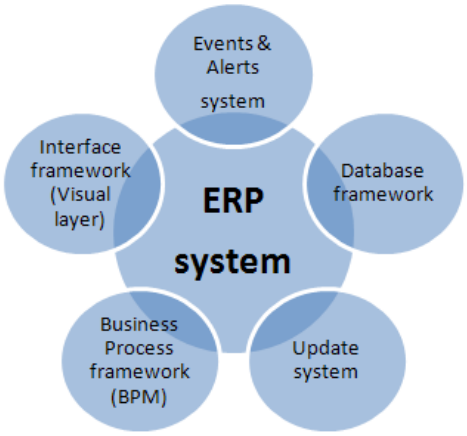

Figure 2 – FME – Functional model for ERP systems

The presented model includes an internal **Event and alert sub-system**, user-friendly, to be used by the "common" user (without the need of technical knowledge). Some examples of this kind of sub-system is the parameterization to include validations and alerts messages to ensure the fill up of mandatory fields presented on screen; another example is configuring the system to send e-mails after a certain action or condition detected. This sub-system enhances the "local" flexibility to customers, betting on user's motivation by solving simple needs; also promotes highly attention of consultants/implementers on the second level (presented on the previous topic).

Regarding the principle that “ERP systems must be adapted to companies and not the opposite”; surely systems’ interfaces must be changed to add or hide data required by users. For this concern, the FME model presents a sub-system called **Interface framework**, which allows the complete design of interfaces (forms) of the ERP system to answer customers’ needs. This sub-system allows functionalities like add new or hide existing fields, and even control their appearance by user’s privileges. A typical example is hiding monetary fields for users, which do not belong to the financial user’s group.

Looking to an ERP system as a living creature, certainly, his blood would be data! ERP systems need to "grow" to follow organizations lifecycle, keeping safely information and providing the desired scability. This sub-system is named **Database framework**, and includes the advanced management of information systems database. For instance, adding user fields to standard tables, creating new tables, creating triggers and indexes, procedures, etc. These type of functionalities should only be performed by specialized teams (consulting/implementers) since the wrong use may affect the global performance of all application. On the other hand, a “well know use” can provide a higher performance on the global system.

As already mentioned, an ERP system must ensure scalability to the company. It must guarantee that its updates or new versions do not affect negatively the existent data, reducing impacts to the system. Usually, software houses apply these kinds of operations updating single DLLs or Web-Services, to ensure the global appliance on the system and reducing the need of client's software update. The sub-system responsible for these procedures is named the **Update system**.

The business rules parameterization approach completes the FME model! At this sub-system (called **Business Process framework**), it is included all the configuration tools which allow processes adaptation to ensure a continuous and accurate information flow in all company.
Although dedicated to consultant/implementers, this sub-system should provide a graphical tool for business process representation, for a better visualization and configuration.

The next image (Figure 3) presents an example of an advanced BPM application for process’ parameterization, available on ERP Priority. This tool provides an easy interface to create document’s status, manage their approval and provide e-mail messages for a complete knowledge and control. This example (Purchasing Process) presents a user-friendly configuration tool, with a high impact on system’s usage.

At a high complex stage, FME model would also recommend allowing the editing of the programming code on processes' rules for a complete customization (but always controlling the correct execution and their dependences with other sub-systems).

The FME model would support any ERP system to achieve integrated functionalities, totally dedicated to organizations' needs. However, like any model, asks for an additional requirement: documentation! When an ERP system’s implementation presents highly levels of customization, it demands that his stages to be reported, to share information for future projects. Although not represented on Figure 2, it is assumed as an essential topic at any of the sub-systems presented.

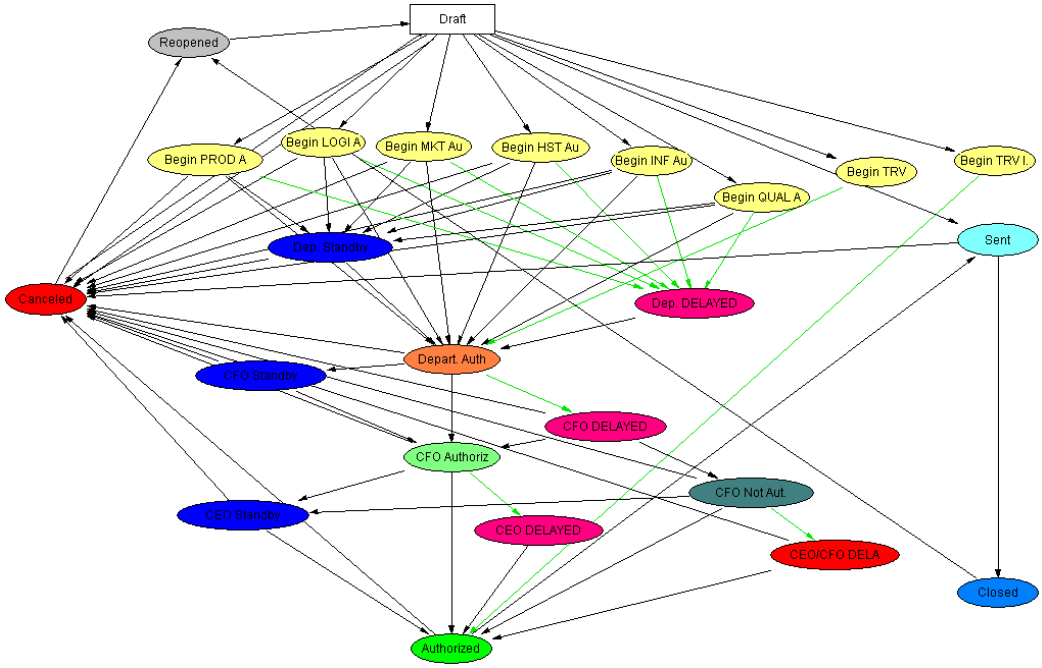

Figure 3 – Example of BPM configuration on ERP Priority

The FME model is, easily, "inserted" on the actual parameterization levels of ERP systems, which enhances the idea of a practice appliance, for a future work. The next image (Figure 4) presents the relation of the FME model's sub-systems with the parameterization levels mentioned on the last topic. The sub-system Event and alert has been, basically, classified on the "Low level customization", ensuring an easily use for the common users; but, it also has been included on the "Business Process" level, to considerer the needed advanced parameterizations made by implementers.

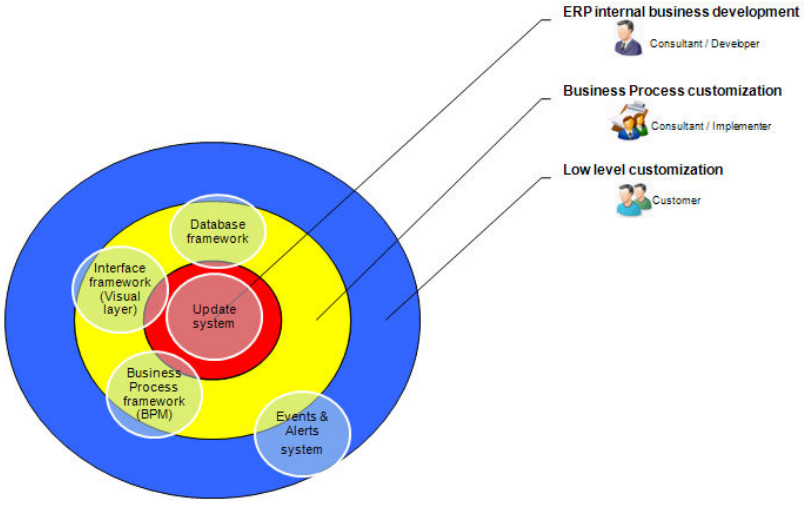

Figure 4 – FME model and their parameterization levels

5. Conclusions

According to Davenport (1999), if a company doesn't take careful, it might face the dream of information integration run into a nightmare. This enhances the importance of an ERP system on a company and, therefore, the responsibility a manager has when choosing a system.

This paper resumed some of the main restrictions founded by companies when configuring ERP systems, guaranteeing constantly adaptations, for an accurate answer for their market. For several times, financial and time restrictions block the decision for changing an ERP system; on other occasions, the systems do not provide the needed "reaction capacity" to face this reality.

To achieve a complete solution, a new functional model (called FME) has been designed to be applied to any ERP system. Using brief descriptions and simple diagrams, this complex model has been resumed in five sub-systems that would ensure a dynamic lifecycle for these kinds of enterprise systems. It promotes and searches for a highly process' integration, flexibility on the local user and reducing errors when updating versions. The major aim is customer's satisfaction by using an ERP system that follows (and answers) his needs, for longer periods.

For future works, the major challenge is to design an architectural model (developing issues and restrictions) to support such a model on an ERP system.

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