Influence Factors of Business Intelligence in the Context of ERP Projects

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Abstract—Business Intelligence projects are very dynamic and during their development they encounter many environment, technology and personnel changes. All these changes determine the need for a progressive planning and an iterative development approach, involving several application releases.

This article presents the development of a real industry business intelligence project, in a company that used an ERP system, Oracle Applications. It focuses on the main factors that influenced and affected the project development and it analyses the system evolution from technical point of view, the solutions found to fulfill the changing requirements, but also the impact of the company reorganization on the project.

The description of this particular experience can be of use to all those who are involved in building business intelligence solutions to reveal some of success factors, to prevent or to solve some of the inherent problems related to this type of projects.

Keywords—Business Intelligence, ERP, organization changes, critical success factors

I. INTRODUCTION

We live in the Information Age, when having proper information means being competitive. Enterprise Resource Planning (ERP) systems meant a huge step in providing an integrated business environment, as they put together all the data, the applications and the people of a company. The central element of an ERP system is its unique database, which stores very big volumes of data, organized in thousands of tables. The ERP's database complex schema is

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not adequate for data analysis and reporting. Of course, there is hidden a lot of useful information, but it requires the use of "intelligent" tools for extracting it. Business Intelligence seems to be the answer to that problem and in the last five years or so, most companies applied business intelligence tools to mine for information from their ERP.

A short definition tells us that: "Business Intelligence is the process of getting enough of the right information in a timely manner and usable form and analyzing it so that it can have a positive impact on business strategy, tactics or operations" [1].

BI Systems must have the ability to allow managers to view data in different perspective, to drill-down and roll-up to aggregate levels, to navigate and on-line query data sets in order to discover new factors that affect business process and also to anticipate and forecast changes inside and outside the organization.

The development of a BI system on an ERP database is not an uncommon experience, bringing on some important advantages:

- homogenous data source systems;
- easier data acquisition and data quality assurance methods;
- possibility of data consolidation at company level, where the company has more branches.

The specific aspects may come from the way of implementing the BI project. In our case, the BI project was implemented by the same developer that implemented the ERP system, and it was strongly related to the ERP project implementation, which continued to be extended in parallel with our BI project.

II. PROBLEM FORMULATION

A purported 60%-70% of business intelligence (BI) applications fail. The root causes for these failures are not related only to the technology but to organizational, cultural, and infrastructure issues [4].

This paper will present a real experience of developing a large business intelligence project, and analysis the difficulties and the problems met as the project was developed, and finally formulates some lessons learned of use for future implementations.

A. The context: an Oracle Application ERP implementation

This paper will describe a BI project experience developed

in the context of implementing Oracle ERP solution to a big company activating in Romanian oil industry services, with a complex organizational structure, having over 15000 employees.

In the beginning of the project, the company structure looked like showed in Fig.1.

The ERP project apparently started on a solid ground, with Oracle Financial (FI) module implementation at the central unit. The ERP project then continued by implementing Oracle FI in all company branches, sectors and working points.
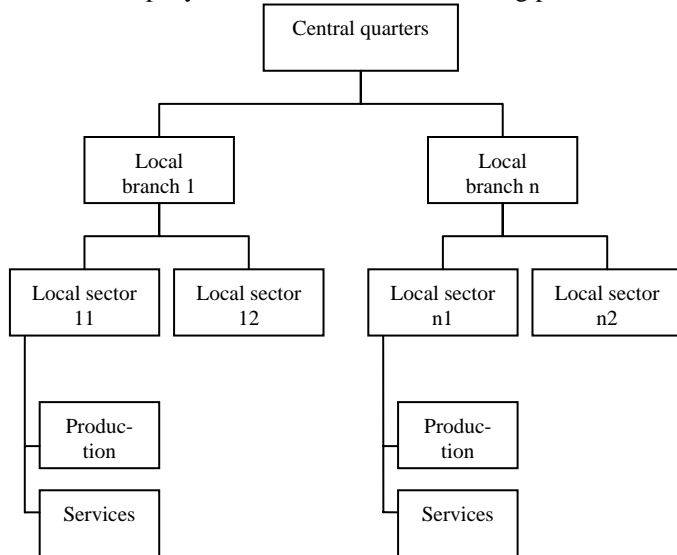
Fig.1 The company structure at the beginning of the project

As usual, the implementation generated the need for processes reengineering and revealed important flaws of the company structure and management. As a result, the company decided to hire an experienced international consultancy company to manage the entire process of organizational change.

Changes affected company structure, business information and material flows and the way they were registered by accountability, management and reporting hierarchy. New sub organizations were created, others were joined or eliminated, and there were planned modernization and technological changes measures.

After operating the changes, the organizational structure looked as shown in Fig. 2.

There were some obvious advantages brought by this new view of business:

- Better transparency;
- Better cost control over cost centers;
- Better resource management;
- Higher efficiency;
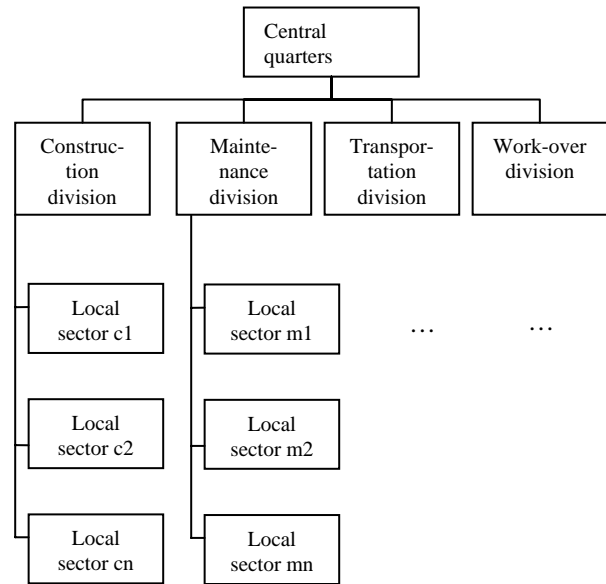- Cost reduction (as a result of personnel reduction or relocation).

Fig.2 Present company structure

The next project phase was the implementation of the Logistics modules and Work over modules.

B. The BI project

The BI project started when the financial module had already been implemented at the central quarters, so there were available data to fulfill the reporting needs of the management and to analyze the major economic parameters.

In the beginning, the project seemed to be a classical one, and we followed the classical phases [2]:

1. **Planning**: enterprise infrastructure evaluation; project planning – that was performed in the same time with the analysis for the ERP project.

2. **Business analysis** – project requirements definition; data analysis; application prototyping and metadata repository analysis.

3. **Design** – database design; ETL design; metadata repository design.

4. **Construction** – ETL development; application development; data mining; metadata repository development

5. **Deployment** – implementation; release evaluation.

These phases of the project were completed almost entirely twice: first for the initial company structure and second for the modified company structure.

BI team faced three important types of problems:

• **Technical problems** – the initially allocated resources were reduced, as the initial estimations of the data volume were overcome as soon as the BI module was implemented in the entire company. It was estimated that a virtual data warehouse would be sufficient, but the reporting and analysis needs were higher, so the performances of the initial solution had to be somehow improved.

• **Communication problems** – there was a lack of availability from the company personnel, as they were already

overwhelmed by tasks related to the ERP implementation and by activities related to the consultancy company cooperation, all that added to their day by day activities.

• **Organization changes problems** – the BI project was from the very beginning under the sign of change. Beside the changes due to the technical aspects, the drastic structure changes in the company negatively influenced the relevance of the initial business analysis, and often made some of the developed reports irrelevant or inapplicable.

The work was performed with gaps, as there was always some top management decision to make that would have affected the BI project. The initial plan was revised over and over, so it somehow lost its power as management tool. The entire structure of incomes and outcomes categories and their corresponding accounts were changed in the middle of the project.

We will focus on the technical and organizational structure aspects, as the communication problem is more like a project management problem, and is not in our area of interest for the moment.

III. THE TECHNICAL SOLUTION

The system described in this article is built over stages and sub-stages proposed in [3] and the solution include the following technologies: data warehouse realized with aggregate data and virtual model, OLAP technology, data mining facilities, analytic SQL functions. The interface is based on a Business Intelligence Portal that integrates all these technologies and offer direct access to the system from anywhere, anytime.

First Phase

The cost factor was decisive when deciding which of the two options to adopt:

- a separate data warehouse, involving an extended data volume, both elementary and aggregated. This option involved high performance hardware support and high implementation time and cost.

- a virtual data warehouse, which worked directly with data from the ERP database, much easier to implement. It requires significant processing power and might affect the processing capabilities of the servers involved in operational activities.

In the beginning, we simply used Oracle Discoverer ver. 10.1.2.1, which works on a virtual data warehouse build over the database. Multi-dimension structures like dimensions and fact tables are automatically transformed from relational sources. We started with low data volumes, generated by the use of the FI module at the central quarters. Oracle Discoverer Desktop was installed on the computers of the main decision makers that were going to use it.

We developed reports for analyzing Cash Flows, Budgets, Costs, Expenses and Incomes only for the central head quarters. The number of rows involved in these reports was in

average 100000/month, so we did not need a large amount of resources.

Second Phase

When the FI module was installed in the entire company, we faced the problem of having to go to each of the sectors to install the product and instruct the managers how to use it and some other IT persons how to ensure the maintenance and future development. So, we integrated Oracle Discoverer with Oracle Application Server Portal 10g Release 2, and the solution became available on-line, allowing everybody to access information according to their established privileges. But, this decision had a negative impact on the performances: the working speed decreased as the required memory space increased from 32 GB server shared as Discoverer needed, to 64 GB server shared as Oracle Portal needed.
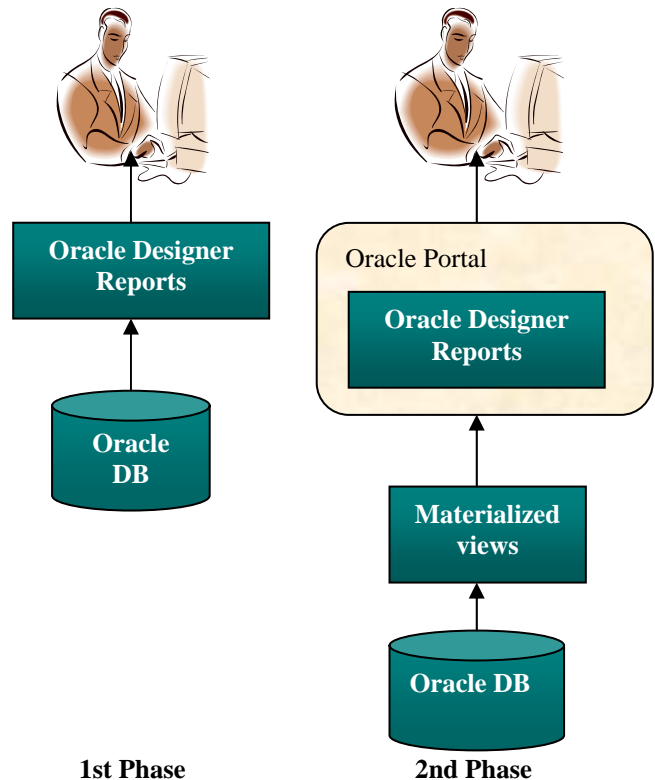

Fig.3(a) Evolution of technical solution – initial phases

We didn't manage to obtain a dedicated server for Oracle Application Server because of very high hardware resource cost. In this phase, we had to develop reports for analyzing Cash Flows, Budgets, Costs, Expenses and Incomes for the central head quarters and ten sectors with different area of production. So, the number of rows involved in these reports was over 1, 5 million/month. Under the circumstances, with low allocated resources and a large amount of data per month we needed to find another solution to increase the speed and reduce the loading time for reports.

Third Phase

When the other ERP modules started to be implemented, we were facing serious problems. We decided to construct an

enterprise data warehouse so we also integrated Oracle Data Warehouse Builder and Oracle Data Mining into Oracle Portal. Unlike Oracle Discoverer, in Warehouse Builder data is physically stored into a special repository, build on the database. The role of Oracle Data Mining was to supply additional analysis power.

This solution was a success because data is aggregated in the central data warehouse, the ETL (Extract, Transform and Load) process is built separately, off-line so it doesn't affect the reporting analytical time. We built new types of reports related to production (costs and allocated resources), work over, purchasing orders, transactions per account from all functional modules, etc. We succeed in extracting data from all modules and aggregating them in one central data warehouse with sub-data marts from financial, production, purchasing orders and order entry modules. The final solution is described in the next figure:
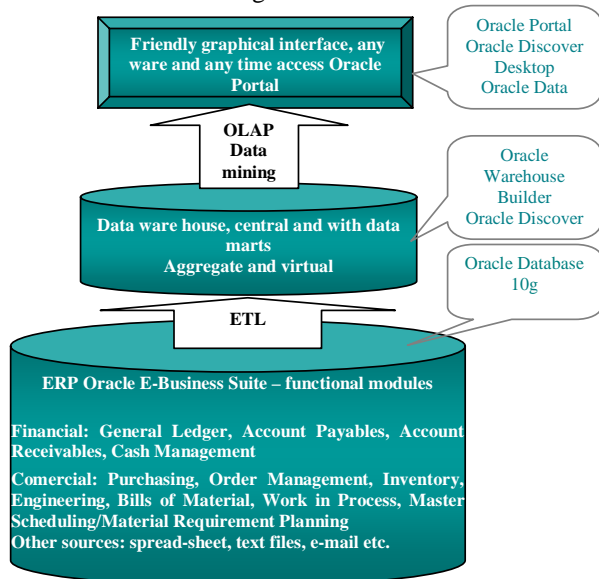

Fig.3(b) Evolution of technical solution – final phase

The number of rows involved was now over 3 millions/month, and the performances were finally satisfying.

IV. ORGANIZATION CHANGE IMPACT

Major business reorganization is one reason BI project typically get hosed [5]. As we illustrated in Fig. 1 and Fig. 2 we faced such an important business restructuring. More, the initial scope estimation proved to be inexact, and it had to be reevaluated in the second phase of the project, so the project gained new dimensions.

As a result, most of the analysis results had to be reevaluated, and database design and repository design had to be revised and seriously extended, having an important impact over technical and human resource requirements. The BI team had to be enlarged and it was itself a problem, as there were no other BI specialists available, and other two new persons had to be employed and integrated.

Many of the reports that were developed in the first part were inapplicable. All these generated important time loss and inefficiency; it often happened that after getting complete specifications, data gathering, and completing of the report design, during the validation meeting we were communicated the whole perspective was changed. This had impact not only directly upon efficiency, but our team members got to be confused or demoralized.

But, there was a bright side in all those changes. As the consultancy company progressed in elaborating the new business view, they inevitably brought out the reporting needs. At some point, it was raised the question of a BI solution necessity.

Our team was invited for discussions, and we had the chance of proving the great advantages of BI over the existing reports (Microsoft Excel reports or native Oracle Applications reports):

- Flexibility, scalability and responsiveness to changes;
- Integrated data across platforms and data sources;
- User friendly, dynamic, web-enabled tools for analysis;
- Management reports with real-time and worldwide access;
- Reduced IT support requirements;
- High degree of control over data security.

A demonstration based on the customized reports developed in the first phase had a relevant impact.

Another positive aspect at this point was the change in the attitude of end-users. If they were previously reluctant to changing their old tools (Microsoft Excel and other Office applications) and learning how to use a new one, they were now eager and motivated to do it as the old reports were no longer valid. And the truth is that they come to love it in very short time, as the new reports were very flexible and easy to use and they interfaced directly with the ERP application and other data sources.

The end-user involvement is very important to developing functional BI solutions, as project requirement and scope are set by users, they know exactly the data they need and they will test and use the result of the project. There are voices claiming there were a shift of authority and ownership in BI projects, from IT to business side [3], although none of the sides involved is comfortable with it.

V. CONCLUSION

Developing Business Intelligence systems involves time, high-costs and human resources efforts and it involves many risks like: system design, data quality, and technology obsolescence.

- System design risks stem from poor conceptualization of an enterprise's true business needs before the technology is deployed.

• Data quality risks relate primarily to whether or not data has been properly cleansed.

• Technology obsolescence refers to the failure on the part of the vendor to anticipate new technologies.

A solution for covering these risks is Business Intelligence Portals integrating data from data warehouses and making the content of other business intelligence tools available online.

One important conclusion of this real project experience is that, more than technical reasons, organizational and infrastructure dysfunction endanger the success of the project.

We could see on our own expense that when there are no supporting business decisions, the BI project is paralyzed. So, the main factor in conducting such a project is business rather than IT. Following this direction, after our project implementation was ready, the maintenance and further development of BI reports were entrusted to two selected end-users, specially trained, but not to the IT department.

Simply combining data warehouse and data mining engines on the top of an Enterprise Resource Planning system will never provide a viable response to the changing management needs. A competitive advantage can be obtained only by adding business-oriented personalization so that the information provided can fulfill the particular needs of end-users and empower dynamic analysis and decisions.

A business intelligence project is like a battle, but the result is worthwhile fighting for, considering the important benefits. Enterprise wide BI is becoming nowadays a necessity for providing widely and easily available information throughout the organization.

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