# ERP Project Implementation: Evidence from the Oil and Gas Sector

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*Abstract. Enterprise Resource Planning (ERP) systems provide integration and optimization of various business processes, which can lead to improved planning and decision quality, and a smoother coordination between business units, resulting in higher efficiency and a quicker response time to customer demands and inquiries. This paper reports the challenges and opportunities and the outcome of an ERP implementation process in the Oil & Gas exploration sector. This study will facilitate the understanding of the transition, constraints, and implementation process of ERP in this sector and will also provide guidelines from lessons learned in this regard.*

*Keywords: case study; ERP; implementation; oil and gas exploration; SAP*

## 1 Introduction

ERP implementation poses major challenges to organizations, as many of them fail in their early stages or substantially exceed the project cost [1]. ERP systems differ qualitatively from prior large scale Information Technology (IT) implementations in three ways [2]: 1) ERP impacts the whole organization, 2) employees may be learning new business processes in addition to new software, and 3) ERP is often a business led initiative, rather than IT led. ERP is an integrated set of subsystems that integrates all facets of the business, including planning, manufacturing, logistics, sales and marketing. ERP systems originated to serve the information needs of manufacturing companies. Over time though, they have grown to serve other industries, including financial services, consumer goods sector, supply chain management and the human resources sector. These systems provide integration and optimization of various business processes and this was what the companies looked for [3] along with tangible and intangible business benefits to organizations [4]. Effective integration is the key because if one of these links fail, the organization's performance may suffer and may not meet the expectations of its customers or the service level of its competitors [5]. It

is not wrong to say that ERP systems gained importance as they arrived at a time when process improvement and accuracy of information became critical strategic issues [6]. With this growth, ERP systems, which first ran on mainframes before migrating to client-server systems, are now migrating to the Web and include numerous applications. ERP is a product that helps automate a company's business process by employing an integrated user interface, an integrated data set, and an integrated code set. Hunter and Lippert [7] forecasted the ERP market to reach USD 1 trillion by 2010. A summer 2005 survey of members of the Society for Information Management showed that ERP is among the top application and technology developments of its members [8]. ERP systems are complex, and implementing one can be challenging, time-consuming and an expensive project for any company [9]. Motwani et al. [10] emphasized that ERP adoption involves initiating appropriate business process changes as well as information technology changes to significantly enhance performance, quality, costs, flexibility, and responsiveness. ERP systems are widely adopted in a diverse range of organizations and define the business model on which they operate [11]. An ERP implementation can take many years to complete and costs tens of millions of dollars for a moderate size firm and more than $100 million for large organizations [12]. Implementing an ERP system is a major undertaking. It is well known that the implementation of an ERP system is a very expensive and complex task and implementation tasks include consulting, process design, data conversion, training, integration and testing [13]. About 90% of ERP system implementations are late or over budget [14] and the success rate of ERP systems implementation is only about 33% [15] [16]. The relative invisibility of the ERP implementation process is also identified as a major cause of ERP implementation failures [17]. Such invisibility is attributed to the unpredictably complex social interaction of IT and organization [18]. Volkoff [19] suggested that the critical challenge of ERP implementation is believed to be the mutual adaptation between IT and user environment. The inclusion of today's strategic choices into the enterprise systems may significantly constrain future action. By the time the implementation of an ERP system is completed, the strategic context of the firm may have changed [11]. Nicolaou [20] reports that ERP implementation success often results from a number of factors, such as user participation and involvement in software development, the assessment of business needs, the processes during the analysis phase of the project and the level of data integration designed into the systems. ERP changes these processes, from designing a custom system to accommodate the existing business processes of a firm to selecting a business application system that best meets the firm's needs. Mabert et al. [3] suggested that case studies and interviews facilitate to obtain reliable and detailed information on the current status of ERP practice and ERP implementations. They further argued that most implementation projects are unique in many ways, in spite of many common underlying issues, activities and strategies. To meet time deadlines alongside budget targets, ERP projects must be planned very carefully and managed very efficiently [3]. Moreover, a lack of understanding and time and budget pressures

budget pressures make it difficult for system and maintenance personnel to identify and remove unused modifications during a release change [21].

In the context of ERP project implementation, challenges represent major pitfalls which, if not addressed, may cause the failure of a project. Therefore, it is important to understand the real-life implementations, problems and related scenarios in detail.

Furthermore, to the best of our knowledge, very few real-life ERP implementations in the oil and gas sector are documented in the literature. Therefore, this paper will facilitate the understanding of the constraints, problems, success and pitfalls of implementation in this sector.

This paper is organized as follows: First, the relevant ERP implementation literature is reviewed. The next section follows a real-life ERP implementation as a case study, followed by discussions. Section 5 summarizes the conclusions.

# 2 Literature Review

ERP systems, similar to other management information systems, are often perceived as very complex and difficult to implement [22], [23]. System implementation success depends on many factors: the ERP system evaluation, vendor selection, the ERP consultant, the implementation plan and execution are all critical to the success of implementing an ERP system [24]. The inability of some firms to successfully implement and utilize enterprise systems to increase organizational outcomes has been a source of concern for both practitioners and academia [25]. The evidence of enterprise implementation failures go back to the late 1990s [26], [27], [9]. For many organizations, ERP systems are the largest systems they have worked with in terms of the financial resources invested, the number of people involved and the scale of implementation [24]. Several cases of ERP system implementation have experienced considerable difficulties [28], [29], [30], [23]. The failure rate of ERP implementation is very high [31]. Numerous examples of failed and abandoned implementation projects are cited in the literature, such as Fox-Meyer Drug, Mobile Europe, Dell and Applied Materials [9]. Wah [30] cites failures at Whirlpool, Hershey, Waste Management, Inc. and W.L. Gore & Associates. The University of Massachusetts-Amhrest [32] and Indiana University [33], have also experienced revenue loss, wasted time, cost overruns and delays in ERP implementation projects. The Chaos Chronicles mentioned that only 34% of IT projects undertaken by Fortune 500 companies are successfully completed [34]. Nike's ERP implementation is included in a listing of "infamous failures in IT project management" because of a major inventory problem which resulted in a profit drop of USD 100 million in the 3$^{rd}$ quarter of 2000 [35].

Muscatello and Parente [36] cite ERP failure rates to be as high as 50%. Among other obstacles, technical problems and people obstacles have been cited as the major barriers [37], [29]. The types of problems and issues that arise from the implementation of ERP systems range from specific issues and problems that can come up during the installation of an ERP to behavioural, procedural, political and organisational changes, among others, that manifest themselves once the system is installed. In the case of ERP, successful implementation is imperative, since the costs and risks of these technology investments rival their potential pay-offs [38]. The failure of ERP system implementation projects may lead to bankruptcy [9], [39], [40], [41]. A study of 100 projects by Sirkin and Dikel [42] found that their sponsors considered them successful in only one-third of the cases, and that tangible financial impact was achieved in only 37% of cases. Markus et al. [43] suggest that ERP systems are inherently flexible, which means that stakeholders have many opportunities to influence the form of technology during the initial decision-making, development, implementation and also the use of the system. They further argued that many problems related to ERP-implementation are related to a mismatch of the system to characteristics of the organization. This is supported by Davenport [9], that "ERP tends to impose its own logic on a company's strategy, culture, and organization which may or may not fit with existing organizational arrangements". Although ERP systems are functionally rich, standardizing organizational processes with these systems is often difficult [44]. It is found that many firms that have experienced success with ERP have comprehensively reengineered their organizational processes and structures as a method for enterprise–wide transformation [45]. In the case of implementing an ERP system we should put more effort in customizing ERP modules to comply with the existing workflow, report formats and data needs [24]. Involving users as early as possible in system implementation is generally a good strategy [46]. As an enterprise system, the success of ERP implementation requires close cross-functional cooperation [10]. Further evidence from literature shows that, although many organizations are using some modules of an ERP system, they do not see themselves as equipped with ERP [47], [48], [49].

In particular, IT integrators that specialize in energy are seeing more opportunities in what is termed as the "upstream" segment of the oil and gas sector. Upstream includes oil and gas exploration and the drilling and operation of wells. Drilling companies deal with large assets and work crews that move about a country or different ocean sites. Such companies use ERP to make sure their resources are deployed effectively. ERP solutions also help companies track equipment maintenance and keep tabs on employee certification and training. Drilling personnel may need certification to operate certain types of equipment [50]. Mergers and acquisitions are common in the upstream space, and integrators find opportunity in consolidation. This trend got underway a few years ago and continues apace. Consolidation begets complexity and generates interest in ERP. Defining a reasonable (i.e., smaller) system scope by phasing in software functionality over a series of sequential implementation phases is an important

means of decreasing complexity [51]. Moore [50] further suggests that, as the oil and gas sector companies absorb others, operations may span several countries, each with its own statutory reporting requirements. Companies crossing international boundaries also need to deal with multiple currencies. Overall, combined organizations face rationalizing financial and accounting systems which require ERP implementation.

Case study research is "an empirical inquiry that investigates a contemporary phenomenon within its real-life context" [52]. Since research is more interested in the process aspects of ERP implementation, a case study has the potential of providing an in-depth investigation of these issues in a real-life context (Yin, 2003). Generally, the case study method is a preferred strategy when "how" and "why" questions are being posed and the researcher has little control over events [52]. The case study method, a qualitative and descriptive research method, looks intensely at an individual or small number of participants, drawing conclusions only about the participants or group and only in the specific context [52]. The case study method is an ideal methodology when a holistic, in-depth investigation is required [53]. The case study method has been proven a useful tool in investigating the problems of ERP implementation [54], [55], [56], [10].

# 3 Case Study

## 3.1 Background of the Company

The company was established in the early 1970s to handle the drilling operations required for exploration and field development as well as undertaking work-over and maintenance operations in both onshore and offshore areas. It has successfully carried out all the requirements of drilling operations and played an important role in the discovery of oil and gas. The main functions of the company are:

- Operations: This function includes two main divisions: Onshore and Offshore – each handles drilling operations. A logistics division is also included under this function and is responsible for providing logistics support in terms of transportation and civil equipment.
- Technical: This is mainly responsible for providing technical support to the operations function. The key divisions under this function are commercial (procurement, inventory, tendering, warehouse, etc), engineering & projects, maintenance, business support and a newly established division under the name of new services. The field support services, two warehouses and two workshops, are under commercial and maintenance divisions respectively.

- Administration: The role of this function is to provide administrative support including human resources (HR), finance, IT and general services. All of these divisions are located in the head office.

## 3.2 Information Technology Infrastructure Setup

The Information Systems & Technology (IS&T) department was formally established in the early 1990s with the mandate of providing computer and networking services to employees at the head office. At that time, the company was running Novell Netware and desktop computers were primarily used by finance and payroll services. The structure of the IS&T consisted of a networking unit and applications unit. The total number of IT staff, including network engineers, programmers and customer support staff was under 20. The following in-house data-based applications were being used:

- **Financial Applications:** General Ledger, Accounts Payable, Accounts Receivable, Payroll
- **Material Management:** Inventory Management, Fixed Assets
- **Miscellaneous:** Employee Database, Maintenance Work Order, Historical Database

Most of the above applications were developed by third parties and later on supported, maintained and enhanced by the internal development team of IS&T. Each application was dedicated to a particular group (department or process) and the data exchange among these applications was very limited. The standard management reports were incorporated in the applications and were printed and distributed to the management or the concerned staff on a periodic or on-request basis. Management had to rely on the availability of the existing data and most of the decision making required a lot of manual information from various resources.

Initially the computers were only available to financial analysts, data entry operators and managers. During the mid 90s, PC-based computing became popular and gradually all employees were provided with PC workstations with a Windows operating system using word processing tools and other office applications. After all of the PCs were networked, the company decided to centralize the electronic files and hence the storage system (merely a dedicated file server) was added to the data centre.

## 3.3 Weaknesses of IT Applications

The following problems were faced in the old IT setup [57]:

- Only a few functions / processes were automated using database applications.

- All the applications were working in silos without any exchange or integration among them.
- The maintenance of these applications was very difficult due to the lack of documentation of source code, process information among the development team, etc.
- Most business areas were not automated – hardly any decision-making was fully supported by the existing applications.
- Most of the company's processes were cross-functional, e.g. Material Requirement Planning, Procurement, Inventory, Maintenance, Invoices and Payments, Operations Planning, etc. However, the existing applications only supported a small portion of the cross-functional process, so the value generated by these applications was offset by the subsequent manual flow of the information.
- The architecture of the applications itself was weak. The system controls were inappropriate, allowing human error during data entry. As a result, the management had little confidence in the reports generated from the system, resulting in a forced parallel-run of the manual registers and files for reconciliation and validation purposes.
- The core business areas were handled by manual processes. For example, more than 80% of staff were working in operations (onshore and offshore), 10% were based in the Head office and the remaining 10% were deployed in field support services (workshops, warehouses, base camps, etc) – none of these areas had IT systems to support their processes.
- Long-employed staff with built-up tacit knowledge of the company became the only source of information. Lack of process documentation aggravated the problem and a few key positions held most of the process knowledge, creating critical organizational risk.

## 3.4 ERP Implementation

### 3.4.1 Objectives Setting

In order to define clear goals and a set of expectations, the taskforce arranged a workshop with the management team to obtain their viewpoint. Participants agreed on the following points:

Timeframe – the implementation should not take a long time to complete.

Cost – learning from industry experience, it was a general concern that any such implementation typically took 3 times the initially estimated cost; the taskforce was asked to focus on the cost variance of the project.

### 3.4.2 ERP Selection

The first task was to finalize the selection of a particular ERP system. The task force had the following options to evaluate:

i) Single ERP (System Application Product - SAP or Oracle) or

ii) Best of breed (selecting the best module for each of its functional area)

Option (ii) was discarded quickly as it required more cost, time and skills to implement. In addition, it required building a comprehensive skill set for a variety of applications, which was extremely difficult at the time. Therefore, the option to go for a single ERP was selected. The next question was to choose between SAP and Oracle as these two ERP packages were amongst the most popular choices in that region and industry sector (i.e. Oil & Gas). Again the taskforce had the following options to consider:

i) Conducting a self-study and choose between SAP and Oracle or

ii) Hiring a consultant to study the company's requirements and propose a particular ERP system.

After evaluating both options, the taskforce dismissed the second option as it required extra time (the tendering process itself could take many weeks) and cost. Therefore, it was decided to arrange meetings with other sister companies who had already implemented an ERP to obtain their view point and lessons learned. It was also decided to arrange volunteers from each functional area to study the high-level features of a particular module of both ERPs. After conducting the self-study and meetings with other operating companies, the task force agreed to proceed with SAP. The recommendation was presented to management and it was accepted.

The task force then conducted market research to find out the range of costs and timeframe. The initial data collected was not very encouraging as the minimum cost identified was USD 8 million (software license, hardware and implementation cost). The average implementation time ranged from 18 months to 3 years; which was beyond the initial estimations, as the company was aiming to complete the transition in 12 months.

### 3.4.3 Scoping and Approach Definition

The taskforce then moved to the Scoping and Planning phase in which a team of focal points (from each of the functional areas) was created to jointly develop a business requirements document for the ERP implementation. The focal points were selected based on their experience and knowledge of functional areas of the company. These focal points were required to allocate 80% of their business hours to work on this task as the deadline was in four weeks. Since most of the focal points were new to this type of work, they started working on their individual

areas in their own style – the consolidated set of requirements produced by the team were clearly lacking in quality and consistency, as the requirements were either too high-level/generic or too detailed. The team took another two weeks to refine those requirements further. An organization's strategic decision on ERP customization or business process adaptation during planning can have a profound impact on the practices used to support the system during maintenance and support [9]. Here it is also important to note that IT management may poorly define goals, have an overly simplistic project plan, use unrealistic deadlines and budgets, and fail to set and manage the expectations on the product (the software being developed) and the project (the development process) to gain support from users, developers, and functional managers [58].

It was planned to implement the following SAP modules in the first round of implementation:

Table 1
Implemented SAP Modules

| **Financial Accounting** | **Controlling** | **Asset Management** | **Human Resources** | **Plant Maintenance** | **Material Management** |
|---|---|---|---|---|---|
| General Ledger | Cost Elements | Purchase | Employment History | Labour | Requisitions |
| Accounts Receivable | Cost Centres | Sale | Payroll | Material | Purchase Orders |
| Accounts Payable | Activity Based Costing (ABS) | Depreciation | Succession Planning | Downtime and Outages | Goods Receipt |
| Book Close | Profit Centres | Tracking | Career Management | | Inventory Management |
| Consolidation | *Interface development with Oil and Gas applications | *Oil and Gas Control report system | | | Bill of Material |

** Specific to Oil and Gas sector requirements*

The taskforce had to address some of the strategic options:

**Big-Bang vs. Phased Approach:** One of the questions was to finalize the implementation approach – whether to implement all modules in parallel or use a phased approach where each module would be implemented in a sequential manner. The later approach seemed to take a longer time than big-bang, and therefore the team proposed to adopt a big-bang approach.

**Third Party vs. In-house Implementation:** Where the first question mainly addressed the timeframe, this question concerned cost as well. The taskforce evaluated various options and the most suitable appeared to be the hiring of SAP consultants on a contract (as short-term employees), along with an experienced SAP project manager whose core responsibility would be to

manage the SAP contract staff to deliver in the agreed time frame. Most of the SAP consultants were recruited from a body-shop (Indian resource costing maximum 20% of any SAP implementation consultancy firm). For ERP implementations in particular, in-house expertise is often lacking, and companies often turn to external consultants in implementing the system [59] but the outsourcing of jobs does not transfer the ultimate management responsibility for their successful completion [60]. They further argued that poor management of outsourcing responsibilities can increase risks and create integration problems across products and processes.

During this phase, the new SAP project manager was recruited and a team of 10 SAP consultants was hired as contract employees. These included six functional resources specialized in different SAP modules, two SAP Advanced Business Application Programming (ABAP) developers as technical resources, one SAP GUI and security administrator and one database administrator. At that time, SAP 4.6C version was bought. The license agreement included all SAP modules along with 200 initial user licenses.

### 3.4.4 Business Blueprints

The newly recruited project manager formed a functional team including the focal points from each of the business areas and the SAP functional consultants. The team was given the task of preparing the detailed business blueprints which were mainly detailed definitions of the company's processes and their mapping with the best practice-based processes existing, defined in SAP. In most areas, the company agreed to adopt the built-in processes of SAP as it gave an opportunity to implement the best practices simultaneously. The HR and payroll modules, however, required some customization, as certain local personnel policies were governed by government regulations and changing them was out of the question.

The task took eight weeks. With some known and unknown weaknesses in the blueprint document, the team decided to move to the next phase.

### 3.4.5 Design and Development

In IT projects, design and implementation decisions made at an early stage can have an impact on activities undertaken at a later stage [60]. During the design phase, the complete definition of SAP GUI screens, transaction details, input/output layout and reporting formats were prepared. As most of the existing processes were manual, the major part of the design phase was actually aiming towards a vanilla implementation of SAP. The design phase started in the $13^{th}$ week of the project (measured from the Scoping and Approach Definition Phase), and it took nearly eight weeks to complete. As time elapsed, the team was feeling a sense of urgency to complete the tasks-in-hand. As a result, some of the areas such as detailed reporting of requirements, test criteria, test cases and others did

not get the attention they required. Nonetheless, the team produced a detailed design document at the end of the design phase. The role of the focal points was merely to review and sign-off the design document.

During the design phase, the technical team had completed the hardware sizing and specification. The platform choices were left open for the company and, based on the long-term relations with the existing hardware vendors, a combination of Compaq and Dell servers were acquired. The backend database server was also kept open for the company to choose from and the existing relationships with Microsoft business partners were leveraged to cut the deal for a Microsoft SQL Server as the backend database server. Clearly the company's platform choice was Windows, as all the PCs were equipped with Windows O/S, Microsoft Office, and Windows NT/2000 as network operating systems. The company-wide email was supported by Microsoft Exchange server.

Towards the end of the design phase, the project team moved to the development phase. During this phase, the following activities were carried out:

a) Hardware set up

b) MS SQL Server installation and configuration on the database server

c) Installation and configuration of development and testing environment on separate servers

d) Preparation for the test user machines

e) Configuration of the SAP applications

f) Data migration and conversion for the existing applications

At the end of this phase, the project was completed in 32 weeks and the overall management was satisfied with the progress.

### 3.4.6 Specific ERP Implementation Issues with Oil and Gas Sector

An oil and gas control report system was installed, whose purpose was to maintain records to assess product quantities. A production scheduling component (software) for this sector must have the capability to record the movement of raw materials and intermediate products from one unit to the other. Most of the ERPs do not provide the features to capture such specific information particular to this sector. The organization developed their in-house systems for oil and gas control report system, operations management and production scheduling. During ERP implementations, if these specific information requirements are not correctly captured during the requirements analysis stage, it results in ERP implementation failure because the new ERP is not in a position to satisfy the information requirements of all stake holders [61]. Further, the development of interfaces and their testing requires more resources, effort and time, and problems in poorly-designed interfaces result in the failure of the entire project [61].

### 3.4.7 Implementation

Once the configuration of the SAP interfaces was completed, the initial user acceptance testing was conducted. As suggested by its name, stakeholders, IT managers and users play main roles in this stage [62]. The same team of focal points was used with a few added divisional users. Not much time was given for this testing as it was assumed that unchanged processes in SAP were already tested and confirmed. A list of target users was prepared for the system training in their respective areas. The project team struggled during this phase as the availability of the users was only 50% in all of the training sessions, despite management instructions to give full time to these sessions. The project adopted a 'train-the-trainers' approach where it was assumed that the selected users would train the rest of the staff in their divisions.

The system finally rolled-out in the 40$^{th}$ week. The whole SAP team's contract was extended for another year to provide continuous technical and functional support until the system matured. The company had great expectations for SAP and was aiming to collect immediate benefits after the implementation.

# 4 Discussions

The overall project achieved both of the primary goals – timeline and cost. However, post-implementation progress did not occur as the company expected. Many areas remained 'out of SAP', data residing in SAP was questionable in its accuracy, certain controls were still missing in SAP, and transactions were taking more time to complete in SAP, compared to the previous applications or manual processes.

When these issues were realized at top-management level, an SAP review committee was formed to conduct an assessment of the current situation and to develop an action plan. The team started working on the task and after assessing the situation and meeting with key staff, the following was presented to the management:

- The overall project lacked appropriate change management during its implementation. The SAP was definitely a transformational project for the company where its scope involved the company-wide processes and almost all the head office based employees were expected to use the system. Since ERP is a major investment of an organization and the implementation may involve substantial organizational changes, top management support was found to be a key success factor of success; but more importantly, top management needs to develop a shared vision and to communicate it to the employees so that expectations are clear [24], [46], [63]. A case study of 12

manufacturers found that a common characteristic of ERP projects which finished on time and on/under budget was the involvement of senior executives who also established clear priorities [3]. Laughlin [64] posits top management support as the first order of business for ERP; but what degree of involvement is appropriate? Jarvenpaa and Ives [65] found that "executive involvement" (a psychological state) is more strongly associated with the firm's progressive use of IT than executive participation (actual behaviour) in IT activities. In a survey of SAP users, Bradford and Florin [66] found that top management support was directly related to perceived organizational performance and user satisfaction. Thus, the expectation of both peers and top management may influence the behaviour of the ERP users [24]. However, in this case, very little effort was spent in planning the transition from its legacy/manual processes to a sophisticated ERP arena. The project's core focus remained on the timely completion of the project within the budget, rather than achieving the results. Mabert et al. [3] also found in their case study that because of the investment required for an ERP project, both in terms of resources and the resulting organizational changes, companies are very sensitive about implementation times and budgets.

- Another factor which was not considered was the employees' perception of SAP. The rumour had already been spread in the company that after SAP, the warehouse staff would be truncated to just 20% of the original staff. Similarly, the support staff in other areas like Finance, HR, and Material Management had a similar impression. Focal points that were a part of the project team were aware of the uncertain climate and may not have proactively quelled fears and rumours. As a result, the design phase remained weak and certain controls in SAP remained open. This caused the system to accept inaccurate data in some of the transactions, which created doubts about the integrity of the system. Compatibility between the new system and the existing business procedures and data format are the major issues reported by companies [67], [68]. Reimers [69] also observed that implementing an ERP system implies that master data are maintained in one department but are actually used by other departments; smooth master data maintenance involves a high degree of cross-functional collaboration and also understanding, which might be lacking in state-owned enterprises. Since ERP contains various modules that are intricately linked with each other, data should be managed properly to ensure their accuracy [70]. Here it is important to note that implementing an ERP will bring changes in the way people work within the organization, processes will change and there may be job cuts and rationalization of responsibilities within departments [71].
- The third very important factor was the reduced training time for the end users. Umble et al. [72] supported education/training as the most widely recognized critical success factor. A change management consultant observes that while shortening planned training may be the "fastest and least

expensive way" it may be "counter-productive in the long run" [30]. Here the project team wanted to complete the implementation phase and made an unfairly optimistic assumption about the 'train the trainers' approach. In order to provide a smooth access to ERP systems, a large number of elements must work closely together. These elements include support in hardware, software, training and information provision [24]. Reimers [69] also identified training as one of the critical success factors in ERP implementation. Bradford and Florin [66] surveyed SAP users and found a relationship between training, perceived organizational performance and user satisfaction. Bradley and Lee [73] found a positive relationship between user satisfaction with ERP training and user satisfaction with the installed ERP system at a university. A Gartner Group study indicates that 25% of the ERP budget should be dedicated to training users [74]. Yet, a study by Benchmarking Partners found that training averaged 8% of total project cost, but varied from 1% to 30% [75]. Somers and Nelson [76] found user training ranked 14 on the list of Critical Success Factors (CSFs) developed from a survey of senior IS executives involved in both on-going and completed implementations. It is a significant measure of successful ERP implementation to provide training to most employees to understand and use end-to-end business processes using the enterprise systems [25]. Incorrect mapping of business processes with application features may result in complete ERP failure because the system will not be able to capture all business processes according to company requirements. Management faces a dilemma between reducing the use of costly consultants and the lack of internal skills and knowledge to implement ERP [77].

- There was a need for developing many interfaces and their testing required more resources, effort and time. Legacy systems do not work in an integrated ERP environment. Due to lack of capabilities to record the oil and gas control specific information during implementation, it becomes difficult to fill all the required fields of new systems, due to which the data conversion stage faced a lot of dilemmas.
- The company had a mix of many nationalities and cultures, and not all employees had influence over others to train or convince them in their respective areas. Moreover, some of the trained employees viewed their new status as one of increased power within the company, and were reluctant to pass their new-found knowledge to their colleagues.

## Conclusions

This study provides valuable insights into understanding ERP implementations and significant factors influencing their success. Various case studies provide different findings which are unique to ERP implementations because of the integrative characteristics of ERP systems. Alignment of the standard ERP processes with the company's business process has been considered as an

important step in the ERP implementation process [37]. After almost a year of implementation, the company has mixed results in this case. Certain areas have seen great improvements after the implementation of SAP (e.g. Procurement, Maintenance, Financial) where as certain areas remain weak (e.g. Employee Records, Contract Administration, Integrated Planning). From this implementation experience, it can be seen that it is not a particular technology platform or software application that can transform a company. Instead, it is the way the company implements the technology that makes it successful.

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