A Case Study in Chinese Failure in ERP Implementation

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ABSTRACT---- ***This article is a single-case study on ERP implementation processes at a Chinese enterprise. The enterprise, Ω, implemented the second generation of ERP system supplied by SAP R3 to supersede its earlier own custom-designed first generation ERP system. We selected five Key Critical Success Factors (KCSFs) of; top management support, business process re-engineering (BPR), change management, project management, and company context for analysis of second generation ERP SAP R3 implementation at Ω. The primary reason for change over from first generation to second generation ERP SAP R3 was business expansion and modernization. Ω failed to customize SAP R3 to its business processes. There were variety of reasons for this failure with amongst others, users' resistance, company culture, complex business processes, error in input to database, lack of understanding of business processes by SAP consultants and understanding of SAP functions by key users.***

Keywords--- Change management, Project Management, Business Process Re-engineering (BPR), Culture.

1. INTRODUCTION

Ω is one of China's largest microscope enterprises, claiming to be the fifth most popular brand in the world. The enterprise was established in 1983 in Xiamen, and now it has six subsidiary companies all over the world: Hong Kong, U.S., Canada, Germany, Spain, and U.K., with over 2500 employees. Ω at China, Xiamen is the production HQ and the manufacturing center and technology development centers. Chengdu, Guiyang, and Sanming Production Plants produce different components of the microscope. Since most of its sales are for overseas, Hong Kong is the international marketing and sale center. Ω Enterprise was founded by acquisition of Xiamen Optical Instrument Factory, a state-owned company, and taking over all its employees. Ω has built international reputation from its Hong Kong based investments, international business and its state-owned legacy. Due to its state-owned background, government has influence on Ω business affairs.

Ω specializes in manufacturing of both conventional microscope and digital microscopes. The main product, i.e. digital microscope, is used for education, lab research, industry measurement, and medical application. On this perspective, Ω is also a high-tech company. It possesses a Research & Development center, which integrates sub-divisions of optics, mechanics, chemical, industry design, electronic, software, and it has over 100 professional engineers and technicians. The Ω technology high-tech know-how is a key success factor in ERP implementation efforts.

2. THE ERP IMPLEMENTATION AT Ω

2.1. Motivation behind ERP Implementation at Ω

In begin 1999, **Ω** planned to implement ERP in a period when most Chinese firms were eager to change from business expansion to modern high-tech business. Ω aimed at developing technology, innovation and expansion in its both domestic and global market share. As a result of firm expansion, firm encountered with a number of new problems. In order to handle these problems, Ω searched for an effective and advanced management tool to support its business processes, and to resolve the problems arising from expansions:

- Since the headquarters for; the marketing and sale center, manufacturing center, and technology and development center are at different locations and fair distance from each other, the real-time and reliable communication and cooperation were among the most urgent issues.
- The product serial numbers outdated and malfunctioned because of rapid new development and products' updates. For instance, the same type of digital microscope, customized for different companies, and ordered through different serial numbers, triggered the problems in resource management.
- One complete set of digital microscope comprise of hardware and software, composing of several components. Different departments had their own ways to mark these components, i.e. the same part of the product had more than one

component tag number. This was the cause of some of communication issues.

- The information flow was phase-by-phase and slowly.
- The database for daily activity had reached its functional limitation because of the vast expansion in data.
- In addition to State publicity, the trend of ERP implementation had influenced the Ω top management decision in selection of ERP implementation as a management response tool to upcoming issues.

In addition to these problems in Ω prior to ERP SAP R3 implementation, top management had its own reasoning for ERP adoption.

2.2. The first generation own custom-designed ERP implementation

In this section, the analysis of the first generation of ERP system is based on the process model developed by Ross (1998). In an ERP implementation model, Ross (1998) suggests the link between the process stages to organizational performance. The following section presents how the custom-designed ERP system was developed and performed at Ω.

- Design Stage

According to Ross (1998), the decisions timeline has to be determined; including changing business processes or ERP customization period, and period for determination of process standardization domain must be specified.

Ω chose to design and implement the ERP system internally, and for this purpose, it hired some experienced programmers to learn how to design the ERP system. While the custom-designed ERP system focused in solving the most urgent problems and critical to firm operation, the software programmers involved in the design of ERP system were not ERP experts with limited knowledge in ERP functions.

- Implementation Stage

At this stage, firm starts with ERP implementation, and some problems emerge because of the new system. It will take time to take the problems and then, the effects come out (Ross, 1998). In this case, the ERP system was designed to solve the existing problems and Ω was less flexible towards application of ERP system. Initially, the ERP system was a small module, aiming to solve the serial number for different products with limited number of users and departments involved. The system was implemented smoothly because of 1. Training, 2. Phase by phase implementation, and 3. Users' Acceptance.

The firm custom designed ERP system was based on the following three modules: 1) Planning: Planning included MRP (Material Resource Planning) simulation, purchase orders application, short resource checking. It was primarily to provide the general resource schedule for the next manufacturing set. 2) Manufacturing: This involved receiving orders from Hong Kong, and arranging the manufacturing orders to sub-manufacturer. In this function, ERP acted as a link among the headquarters (Xiamen), the sale center (Hong Kong) and sub-manufacturing company (Chengdu, Guiyang, Sangming), and 3) Resource management: Resource management included tracking of purchase orders, and adjusting the resource order in case of any priority order.

- Stabilization Stage

Firms take benefits from the ERP system, if it performs its functional expectations in implementation stage (Ross, 1998). Ω entered stabilization stage at the end of 2000 at which some of the above mentioned problems were resolved. For instance, the disorderly product serial numbers were organized, and this enabled the product parts to have unified identification codes.

The basic access to the resource database allowed the subsidiaries to have a real time input and output for all resources. In general, the improvement in communication, coordination and cooperation based on the three modules (planning, manufacture, and resource management) formed an effective supply chain in Ω processes; and overall Ω performed better than before.

- Continuous Improvement Stage

After the stabilization stage, the change in business environment must force companies to roll out change management throughout the organization. The ERP system also has to be improved according to these changes, with the development

of new functions (Ross, 1998). Since 2002, Ω launched its focus on the digital microscope instead of the conventional microscope. The transfer of the products led to the ERP updates, which increased the requirement for an increase in database capacity for recording more microscope categories and components parts. This included different types and parts of hardware and different versions of software. However, problems were that the new products (digital microscopes) developed more problems, especially after integration of hardware and software. This required more efficient information exchange throughout the entire value chain. ERP system played a critical role in information collection and information sharing. With the ERP support, Ω aimed to develop more businesses at domestic and global markets.

- Transformation Stage

At this stage, firms use ERP system to perform process re-engineering and to increase their business margin; however, firms have seldom reached this stage (Ross, 1998).

The firm growth brought exponential changes to both organizational structure and business activities. There were more demands to the customer specific requirements. The firm had to put more product attributes for custom-designed product. In a Digital Lab, Japanese prefer monitoring the students' microscope, while the western focus is on the real time communication between teacher and students. ERP had to reflect broad customers' requirements, and assign tasks to each department to fulfill these requirements. The custom-designed ERP failed to support these complex process requirements, and the system appeared to regenerate gradually more problems. Considering all the factors, the reasons for ERP change over can be described as follows:

The function and module of the first generation ERP system was difficult to develop and expand to other and more advanced functions.

The ERP system was designed and developed by in-house Ω programmers. They had no or limited knowledge of ERP systems and limited competencies to forecast the changes in business processes, and to understand marketing focus, and management structure. The design of the system was all based on the situation at that time, and there was less flexibility for further development. In addition, at technical level, there were unexpected bugs in the first ERP generation, and Ω had no experience how to trouble shoot the bugs.

Ω had grown with exponential changes in organizational structure, management model and manufacturing processes. First of all, ERP generation no longer fit to the firm organizational business processes. Secondly, the system was neither a suitable system for the enterprise and neither was it robust to modernization.

The system had fatal limitations, which slowed down the parallel development of ERP system with organizational changes. Finally, the gap between the ERP system and real-time business processes of the firm became a barrier to Ω further business development in the market.

Despite all, the first generation of ERP system was successful in achieving its objectives for the lifetime of product. It improved the resource management at Ω, and it synchronized the flow of resources among different business units. The large boost in Ω revenue owed to this ERP application. However, considering the ERP shortcomings and opportunity costs, Ω decided to supersede the first ERP generation system by a professional ERP system.

2.3. The second generation off-the-shelf ERP SAP R3 implementation

Ω chose SAP R3 for their new business processes. Since 2005, the ERP experts worked at Ω on ERP implementation project. The ERP SAP R3 implementation process took the following implementation phases;

- Chartering Phase

In 2004, the CEO decided to replace the out of date inhouse ERP with a new ERP SAP R3 system. Ω made a comparison among different ERP vendors, such as Yongyou, Oracle, and finally he chose SAP R3. SAP was recognized as the most advanced and flexible ERP system for Ω application. After the final decision on SAP R3 implementation, SAP consultant started with their business process study at Ω. At this phase, Ω held several meetings to introduce the business processes and firm database to SAP consultants

- Project Phase

  Ω outsourced ERP SAP R3 implementation project to SAP. In order to provide the critical process operations of different department, Ω built a SAP team consisting of the key users in each department. SAP held several trainings for these users involved in the ERP SAP R3 system.

  In begin 2007, the ERP SAP was pilot tested for about two months at Ω. The basic results were in accordance to the expectations, and SAP rolled out SAP R3 implementation in entire organization.

- Shakedown Phase

  At this phase, Ω worked on the adaptation to ERP SAP R3 system, and it adjusted the ERP SAP R3 system to its live business processes. There are temporary problems like 'reduced productivity' and 'business disruption' in the beginning of this phase (Markus & Tanis, 2000). Ω faced the same situation with unpredicted problems emerging and causing business disruptions. There were some system bugs, which were not discovered during the test stage. For instance, since the design of the system omitted the function 'software serial number management', this function was realized manually, or by the old ERP system. For this reason, the new ERP SAP R3 system operated in parallel with its predecessor.

- Onward and Upward Phase

  At this phase, ERP SAP R3 system had to be stable and profitable. Ω did not reach this phase, and ERP SAP implementation required a great deal of improvements.

  The implementation of SAP R3 moved to its third phase. The lessons learnt from the first generation had been considered in the design of the new ERP system. There were more modules in the new system to fit the more complex business operations. Ω emphasized on upgrade of ERP system to meet the requirements for a dynamic business environment. However, more difficulties became more visible, and the new ERP system seemed difficult to adapt to, and some of the functions were not flexible enough. There was a gap between the new ERP system business processes and the live business processes at Ω. Ω became a little bit anxious since the system did not function to users' expectations, and the problems were hard to overcome.

3. ERP SAP R3 IMPLEMENTATION CRITICAL SUCCESS FACTORS MODEL

Ω encountered many problems in ERP SAP R3 implementation process. We analyzed the ERP implementation process on the basis of five KCSFs at Ω.

- Top Management Support

  The implementation of ERP system involves the entire firm involvement, and it can't be successful without the top management understanding, support and participation (Davenport, 1998; Holland, 1999; Esteves & Pastor, 1999; Z.X. Chen, 2001; Yang W. S. & Yan H. H., 2001). The support from the top management is significant for the success of ERP implementation.

  In details, the executive support could be *involvement* and *participation* (Jarvernppa & Ives, 1990): Involvement is a subjective and psychological concept, reflecting the cognition and attitude towards the information system. Low involvement illustrates that the executive considers the information system as a common technical project. As Davenport (1998) argues, only the top management possesses the capability to solve the conflicts between the business activities and technology.

  The participation is the concept of activity, which refers to the investment on the projects, including time, money, concentration and so on (Jarvenppa & Ives, 1991). The executive support should be at strategic level, not only considering the budget, but also organizational innovation, management and culture, aiming to remove the resistance to ERP system.

  At Ω, the executive had highly involved and participated in the ERP implementation. Initially, Ω budgeted 10 million (Chinese) Yuan available to ERP SAP R3 implementation project required capital. Secondly, Ω required its staff to cooperate with ERP implementation SAP team, which assured the supports from "soft" factor. Thirdly, the executive

played an important role in selection of the ERP supplier, the build-up of ERP project team, and negotiations with ERP consultants.

It was obvious that top management gave importance to the ERP SAP R3 implementation project. However, the problem was the top management sometimes took over the project management role, making decisions for the ERP implementation process. Some of these decisions pushed the ERP system into predicament.

- Business Process Reengineering (BPR) versus Customization of ERP System

As for information system, ERP is a tool, which supports the firm to conduct change management; as for management method, ERP is a change management strategy (Esteves (2002). It is generally considered that BPR is essential for the success of ERP implementation (Davenport, 1998; Holland et al., 1999; Zhang et al, 2002; Guo & Tang, 2001). The *best practices* that ERP system advocates may misfit the organizational structure, operational procedures, management model, and infrastructure of the legacy system (Soh et al., 2000; Shang & Seddon, 2000). Therefore, firms have to minimize these misfits by balancing the BPR and ERP customization. According to Soh et al. (2000), the greater the organization changes, the better for ERP implementation is anticipated.

In ERP implementation process, the customization of ERP software is common for the enterprise. According to organization configuration; it is impossible to adjust ERP system completely to the previous organizational and business operation characteristics. On one hand, refining the ERP software is not an easy job, and it can trouble the maintenance in future; On the other hand, ERP is an advanced management concept, which the *best practices* has already been designed embodied in the ERP software (Soh et al., 2000). Adjustments on the system will be difficult to realize the potential benefits from ERP (Al-Mudimigh et al., 2001).

ERP is considered to be the new technology which can bring fundamental innovation on organizational and change management. Chen & Ye (2002) even regards ERP itself as a kind of BPR.

Similarly to Soh et al.'s (2000) point of view, Shang & Seddon (2000) created a matrix with four strategies to achieve fit in an ERP according to two dimensions: 'preparedness to change the enterprise application software' and preparedness to change organizational processes.
Shang & Seddon considers that system exploration create most value for the company among these four strategies; next are software modification & enhancement and process modification & enhancement.

Prior to ERP implementation, Ω business process was complex and inefficient. Because of widespread office locations in HK, Chengdu, Guiyang and Sanming, the communications between these centers were an issue. Ω expected that ERP SAP R3 system could resolve these problems.

Ω implemented the first ERP generation based on the strategy of *software modification & enhancement*, because there was no change in organizational business processes prior to the implementation. The system design and implementation were all aiming to solve the existing problems. The problems did not completely settle down by ERP implementation since the SAP R3 system could not improve the business processes. The failure to improve the Ω business processes was the main reason for the ERP failure.

SAP provided the second generation of ERP for Ω with the design concept based on the western business and management model. The Chinese enterprises have strong characteristics of their own, especially with the Chinese culture and state-owned background. The traditional management model and organization structure of Chinese enterprise differed from that of in West. in addition, Ω had its own company culture different from other Chinese enterprises.

A review of Ω business processes showed that customization was a complex process at Ω. The external SAP ERP implementation team did not understand the chaotic business processes and a mass of data from different subsidiaries. This led to some obvious bugs. One of the bugs was that the ERP system did not contain the price module for Digital Lab products (one of the most saleable products), so, Hong Kong could not check the price through ERP system. They requested the price from colleagues in Xiamen. This was a small error and easy to refine at the design stage. It decreased the efficiency of the whole supply chain and added trouble to entire business operations. That was the reason for manual operation of second generation ERP SAP R3 system.
Ω learnt that ERP system was not a tool for to settle with all the management problems or to solve the organizational process problems automatically.

Ω did not create the business process work responsibility for each department clearly, and it did not unify materials serial numbers and standards prior to ERP implementation. As a result, ERP SAP R3 system did not manage to support the materials efficiently. The serial number for each product part was not assigned in a systematic order. The initial input data to ERP SAP R3 system had no uniform or consistent system. This caused the ERP SAP R3 system to lose its key and basic function in resource management.

4. CHANGE MANAGEMENT

Change management focus is on how to deal with users' resistance. One of the important reasons for ERP failure is change management, since many problems in the ERP implementation arise from users' resistance (Kelly et al. (1999) and Sumner (1999)). Any resistance from individuals or functional groups can endanger the success of ERP implementation. Change management, with in particular, the management of users' resistance has been a real challenge to ERP implementation process.

The emotion for changes amongst the key users was the key critical failure factor in implementation of second generation of ERP SAP R3 at Ω. The reason was because some of the users had participated in the design and implementation of the first generation ERP system; while the second generation ERP system was all designed and implemented by SAP. The emotional resistance was to the extent that key users were reluctant to contribute to the ERP SAP R3 team and ERP R3 implementation process.

This was despite their familiarity with Ω's ERP environment and their potential critical roles in success of SAP implementation.

The new ERP SAP R3 system was more complete. It contained more functional modules than the previous Ω own custom-designed ERP system. However, users were used to the simple operation of the old system. Users found the new system hard to operate. The reasons for users' inadequacy were inadequate training and narrow focus on certain ERP areas.

With implementation of new ERP SAP R3 system, there were more changes in the business processes at Ω. This demanded new relationships, interface and situations in enterprise. The work responsibility became ambiguous, especially for cooperation between teams and individuals. Users felt unstable because of the technical and management changes they encountered. Ω did not invest enough on smoothening of the changes during the ERP implementation.

- Project Management

ERP implementation is a considerable investment. It is a lengthy information-based project, involving the overall operations within an enterprise.

An ERP project has to draw up detailed requirements, target planning, and formal implementation schedule (Somers & Nelson, 2001; Chen & Ye, 2002). ERP is viewed as a process oriented IT tool, which the specific target or business vision has to transfer into the measurable mission or tasks (Al-Mashari et al., 2003). Without the definite business target, the ERP implementation may become a software installation project, and the implementation team would lose their direction, finally the system would be useless. It is essential that the project manager possesses experienced IT background, familiarity of the business process and organizational environment, as well as excellent communication skills.
Moreover, most important thing is that the manager has to be empowered (Scott & Vesssey (2002) and Somers (2001)).

At Ω, the first generation ERP implementation team was familiar with business processes and organization infrastructure. Though, they lacked formal ERP implementation requirements, target analysis, and step-by-step implantation plan. The project was more like problem solving rather than a management tool. Consequently, the first generation ERP system developed many limitations over the years, and it no longer fit the business processes at Ω.

The implementation team for second generation of ERP also encountered a great deal of problems understanding complicated business processes and organizational structure. Ω held extensive meetings and brainstorming sessions for SAP implementation team to understand the firm business structure and business processes.

Despite all efforts, the post ERP implementation system still developed a big bug. Overall, there was a huge gap in understanding Ω business processes and operation of the ERP SAP R3 at Ω.

- Company Context

Ω is a middle size company with several subsidiaries at different locations. Ω devoted a large budget to ERP SAP R3 implementation process.
The Chinese culture had an impact on ERP SAP R3 implementation process, especially at Ω, which had a state-owned background. The management at Ω was heavily hierarchical, and seldom empowered by middle or low level management. ERP systems which derive from western culture require empowerment and information sharing (Davison, 2002). At Ω, CEO made all the decisions, ranging from the business strategy to authorization of daily expenses at Ω. Every decision in the ERP system had to go through authorization of the CEO. Chinese culture follows 'rule of man', and the decision making is based on the experiences rather than the information system.

ERP system requires each activity to follow the designed practice, which means the business process activities rely on the regulations. Identification of regulation and unification of the standards in each department were significant processes to ERP SAP R3 implementation at Ω.

As a state-owned enterprise, Ω was influenced by politics (Liusong, 2001). Many Chinese firms adopted ERP system because the ERP system was considered to advance their management and technology tools. To catch up with high technology and modern management, Ω decided to implement ERP SAP R3 system without careful business analysis and acknowledgement of detailed requirements for implementation.

A typical Chinese characteristic advocates that the organization should be stable and harmonized. The users may reject the information system, which breaks the previous internal relationships within the organization. They work hard and efficiently; but they are indifferent, and they avoid troubles, by shifting the responsibility to keep their job secure. For this reason, change management could have played a critical role in success of ERP implementation process at Ω.

Prior and post implementation of ERP process was with a lot of changes and staff brain drain, with software department in particular. Ω invested to a great deal in training the new users.

Due to complex business processes and databases, critical users at each department experienced how the businesses worked in their domains. These critical users were not always the managers. The ERP SAP R3 implementation most of all needed the support of these critical users. With departure of these critical users, the difficulties with ERP SAP R3 implementation and post implementation process enhanced to the failure of implementation objectives.

5. CONCLUSION

The strong support from top management had positive impact on ERP implementation process, whereas weak BPR, resistance by key users, hierarchical autocratic culture, and SAP R/3 misfit were among the reasons for partial ERP customization, and implementation failure at Ω. In this paper, we aimed to identify the KCSFs for two ERP implementation processes in a Chinese enterprise. In case analysis, we selected five KCSFs: top management support, BPR, change management, project management, and company context.

We drew up the following conclusions on the five KCSFs of ERP implementation:
Top management support had positive impacts in ERP implementation. However, the traditional Chinese management concept with hierarchical management, led the top management support to an autocratic control.

BPR was one of the most important factors in ERP implementation at Ω. We learnt that the balance between BPR and customization of ERP software would have to be carefully considered prior to ERP implementation and in the course of ERP adoption.
Change management was the most important KCSF in ERP implementation at Ω. In China, the level of enterprise IT integration has been relatively lower in comparison to IT integration in Western countries. The level of user resistance has been higher towards both IT integration and ERP adoption.

The project management role was undermined at Ω because of the strong power of top management. The ERP project was hardly empowered by middle and low level management. As a result, this factor lowered the motivation for participation and ERP application.

Company context influenced ERP implementation process at different levels. The Chinese culture with a hierarchical management model and with characteristics of Chinese users had negative impacts on an ERP project at Ω.

On the basis of ERP implementation KCSFs analysis, we concluded that Ω had to facilitate the information flow throughout the supply chain across Ω to improve the resource management and order management. The ERP implementation had to focus on solving the issues of resource management and order management. The implementation process had to be well planned, considering all facets of the firm actual business processes.

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