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# Critical success factors for implementing ERP: the case of a Chinese electronics manufacturer

Critical success factors

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## Abstract

**Purpose** – The purpose of this paper is to examine the enterprise resource planning (ERP) implementation experiences of a leading Chinese enterprise. The objective is to provide Chinese enterprises implementing ERP with knowledge about ERP implementation critical success factors.

**Design/methodology/approach** – Construction of a case study of the company using semi-structured interviews of the principals involved in the ERP implementation process as well as examination of company documentation supported by literature.

**Findings** – The major findings of this paper are that the critical success factors for the case company for implementing ERP is similar to its Western counterparts, with the addition of an underpinning theme – cultural characteristics. This study found that when an attempt is made to adapt the implementation to the Chinese culture, management and style of the company, implementation is successful.

**Originality/value** – The value of this paper is that it presents companies wishing to implement ERP as well as vendors and consultants with a set of critical success factors that is applicable in China. Understanding the critical success factors would lead to a smoother implementation path. Although as a single case study the ability to generalise the findings is limited, support from literature and the experiences of the company before and after making changes to their ERP implementation add to the knowledge of ERP in China.

**Keywords** Manufacturing resource planning, Critical success factors, Electronics industry, China

**Paper type** Research paper

## Introduction

Enterprise resource planning (ERP) systems is one of the most popular organisation wide software packages to emerge in recent years. Davenport (1998) suggests that ERP is the most important development in the corporate use of information technology (IT) in the 1990s. An ERP system is an integrated software solution that spans the range of business processes that enables companies to gain a holistic view of the business enterprise (Ehie and Madsen, 2005). ERP allows the integration of functions, divisions of businesses in terms of information exchange and flow, and the integration of business functions as diverse as accounting, finance, human resources, operations, sales, marketing, customer information and even the supply chain (Koh and Saad, 2006; Motwani *et al.*, 2005; Tarn *et al.*, 2002; Kumar and van Hillegersberg, 2000; Palaniswamy and Frank, 2000).

The potential benefits of successfully implementing an ERP system is large, and even, according to Markus *et al.* (2000), critical to organisational performance and survival. ERP systems can potentially allow a company to manage its business better with potential benefits of improved process flow, better data analysis, higher quality



data for decision-making, reduced inventories, improved coordination throughout the supply chain, and better customer service (Gattiker and Goodhue, 2005; Lengnick-Hall *et al.*, 2004; Gupta, 2000; Fan *et al.*, 2000). Zheng *et al.* (2000) meanwhile suggest that ERP systems improve the efficiency of management decisions and plans and increase the flexibility with adjustments of functionality to react to business needs while Huang and Palvia (2001) suggest that ERP helps a manufacturer or a service business manage the important parts of its business. All of this point to improved profit margins (Fan *et al.*, 2000).

Businesses have been quick to embrace ERP. Willis and Willis-Brown (2002) observe that the ERP market is one of the fastest growing markets in the software industry and Yen *et al.* (2002) and Adam and O'Doherty (2000) suggest that ERP will continue to be one of the fastest growing and influential players in the application software industry through to the next decade. This is despite the high numbers, approximately 50 per cent, of ERP projects failing to achieve anticipated benefits (Appleton, 1997). Scott and Vessey (2002) observe that 90 per cent of SAP R/3 projects run late. In extreme cases, companies have even had to close because of vast ERP investments that did not go live, an example being the FoxMeyer Drug Company that went into bankruptcy (Scott and Vessey, 2002). The cost associated with ERP implementations can be very high (Hayes *et al.*, 2001). Cooke and Peterson (1998) observe that up until 1998, 6,000 companies had implemented ERP packages at an average cost of US\$20 million, while Mabert *et al.* (2001) put the total implementation cost at "tens of millions" of dollars for a medium-sized company and US\$300-500 million for large international corporations. All of this leads to a heavy and potentially very large financial burden that companies must bear (Brakely, 1999; Kumar and van Hillegersberg, 2000). This financial burden is not restricted to the direct cost of the ERP system, but can lead to lost sales as experienced by Hershey Foods' ERP implementation problems that led the company to lose US\$150 million in lost sales (Burritt, 2000; Reuters, 1999). Nonetheless, businesses continue to implement ERP systems as the potential benefits far outweighs the risks.

Chinese businesses started to look towards IT as part of a wider business modernisation programme involving their processes and management models, partly in response to increased internal competition, and partly to increased foreign competition, that accession to the World Trade Organisation (WTO) would bring. Huang and Palvia (2001) observe that China is investing heavily in IT projects in both private and public sectors, but in 2001, there were only a handful of ERP systems. However, enterprises in China are increasingly looking to ERP in the hope that these will change their management model and modernise their businesses.

One of the reasons for the high failure rate for ERP implementation is because of the complicated integration of organisational and technical levels (Huang *et al.*, 2004). If there are many cases of ERP implementation failure in western countries that have high IT maturity and good IT infrastructure, good ERP experience (Huang and Palvia, 2001), then ERP implementation in China will also encounter similar numbers, if not more cases of failures, not least because the majority of ERP systems are Western designed systems for Western businesses. As Huang and Palvia (2001) suggest countries with inadequate IT infrastructure and governmental policies, lack of IT/ERP experience and low IT maturity will experience ERP implementation problems. In addition, as Martinsons and Hempel (1998) suggest, the process of innovation,

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including ERP implementation, is limited in China because of the Chinese management style, informal planning, highly dependent social and organisational relationships and attitudes towards organisational change.

This research examines the ERP implementation efforts of a major Chinese electronics manufacturer. This manufacturer implemented an ERP system that also transcended its supply chain, affecting its suppliers and customers but not without encountering major problems. The paper focuses on the key obstacles and problems experienced by the company in implementing ERP, how the company overcome these and offer a set of critical success factors for enterprises considering implementing ERP in China.

### Methodology

This research is a case study of a growing enterprise in China and seeks to explore the enterprise's ERP implementation experiences. Although there is a growing body of knowledge on ERP, there is little on the experiences of ERP implementation in Chinese enterprises. Yin (1994) suggests that case studies are suitable to explore new areas and issues where little theory is available or, as Benbasat *et al.* (1987) suggest, in areas where research and theory are at their earliest stages. Data collection involved semi-structured interviews of key staff in a position to discuss the ERP experience backed up by follow-up phone calls when necessary and documents related to the ERP implementation efforts.

The semi-structured interviews, using open-ended questions, centred on the problems experienced by the company and the actions the company took to overcome these problems. This study interviewed members of the company including top management, members of the implementation project team, consultants and employees expected to use the ERP systems to determine the difficulties experienced and what they thought were the critical success factors that led to an eventual successful implementation. Concerning any bias responses, this paper does not seek to prove or disprove any prior theory on ERP implementation in China but to examine the actual experiences of those involved in managing, implementing and using ERP in the company.

### Background of the case study company

Founded in the mid 1980s, this company operates in a very competitive sector, the electronics-manufacturing sector in China. The competitiveness of the sector led the company to request that this paper withhold its name and to refer to the company as ElectronicCo. ElectronicCo manufactures components and parts for the computer industry, as well as electronic items sold via retailers to the end-users and have an annual turnover in excess of US\$100 million in 2004. Its complex supply chain comprise of over 25 subsidiaries scattered throughout China, nearly 100 suppliers with three quarters from outside China, 25 warehouses, and almost 300 retailers, supported by a legacy system. Implementation of this system was uncoordinated and on an "as-need" basis in a 15-year period up to 2001. The result is a system strained by the company's fast growth, uncoordinated and significantly customised systems in both the company's different functions such as the financial, operations, and human resource functions, and its subsidiaries, suppliers and retailers. ElectronicCo is also

part of a larger group based in Hong Kong, but has a high degree of autonomy and its legacy system did not extend to the parent group.

As the company grew, incorporating more subsidiaries, suppliers and retailers, the legacy system caused increasing delays, made increasing number of errors and did not allow managers access to information needed to work effectively with its enlarging network. The legacy system was in effect becoming obsolete, did not provide the company with the functionality of an effective business IT system, and the company found it an increasing burden to maintain the hardware and the software of the system. ElectronicCo identified ERP as the technology that will enable it to integrate its resource and information requirements along its supply chain and at the same time replace obsolete hardware. As Vosburg and Kumar (2001) suggest, ERP can replace a number independent legacy systems in an organisation and as Laughlin (1999) suggests, ERP systems manage an enterprise's value chain in an integrated manner, handling its inventory, logistics, orders, billing, shipping, sales, and customer service. ERP systems seem to meet the needs of the company. ElectronicCo had no control over the choice of the ERP system and consultants as the parent group made these decisions.

There were other reasons that also contributed to the decision to implement ERP. Competition is intensifying not only from Chinese-based enterprises but also from foreign enterprises as well. The company believed that foreign enterprises would take advantage of WTO regulations and setup factories in China, as WTO regulations point to the opening up of opportunities for foreign enterprises to start-up in China. Entry into the WTO also presented the company with increased export opportunities, and the existing legacy system would not be able to support these opportunities.

### **ERP implementation at ElectronicCo**

The project had failed to meet a 12-month deadline set by the company, based on the recommendations from the consultants and the project team. Senior management accepted this deadline because they were anxious to see the benefits of their ERP investment. ERP implementation typically takes anything from 12 months for small simple enterprises to 36 months or longer for large complex multi-divisional enterprises. A total of 12 months was to prove to be an unrealistic deadline. The project eventually experienced a further three months delay before the company decided to alter its ERP implementation strategy by firstly appointing a new consulting firm. ElectronicCo called this their "turnaround point". This consulting firm took three months to analyse the situation that has happened and to draw up a series of actions. It was a further 15 months before implementation completed and the system was launched. ElectronicCo appointed this consulting firm based on recommendations from the ERP vendor, with potential firms having to demonstrate their experience in implementing ERP systems as well as the ability to work with Chinese enterprises.

The critical success factors for implementing ERP experienced by ElectronicCo are as below. The ERP implementation experiences of the company presented a good opportunity to examine the critical success factors because of the initial difficulties faced (prior to the "turnaround point") and the actions the company took to remedy the difficulties (the "turnaround point").

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### Top management

The decision to implement ERP came from top management levels at both the company and the parent group. However, their involvement stopped as soon as they allocated the resources, formed the project team, appointed the consultants and purchased the ERP system. The project team had an almost free hand to implement the ERP system, and the only requirement from top management was for the project to complete within 12 months. The result is an absence of visible top management support and many in the company did not see the implementation project as a priority.

This is a common situation in China as most Chinese enterprises regard ERP implementation as an IT project, and therefore, regard qualified IT staff to be best suited to complete the project. Davenport (1998) suggests that it should be the opposite, that top management should not push the responsibility of ERP implementation to their technological departments, because, as Walsham and Waema (1994) also suggest, implementation of ERP is more than a technological challenge. Kim *et al.* (2005), Umble *et al.* (2003), Nah *et al.* (2001), Bingi *et al.* (1999), Buckhout *et al.* (1999), Laughlin (1999), Davenport (1998) and Walsham and Waema (1994) are amongst those who suggest that top management need to make sustained involvement and commitment in order to make the ERP implementation a success. In essence, the company's top management was not in charge of the project, was not responsible for communicating with the employees, there was a lack of direction and vision, and the project lacked a champion.

### *Turnaround point*

At the turnaround point, the new consultants designed a programme of activities for top management's involvement including making ElectronicCo's top management more visible in the company and taking a more active role in the implementation process, appearing in the company's newsletters, and spending more time with the company's employees, suppliers and retailers. Top management were also required to produce their visions for the ERP system and a set of performance goals that they expected from the project team. There were regular meetings with middle-level managers and employees in all the subsidiaries. Top management were at last, taking on what Pfeffer (1981) describes as symbolic management, providing explanations and rationales for the company's change activities, and what Spender and Grinyer (1995) suggest as creating an energising context for change.

The consultants also worked with the company to appoint a highly respected senior manager to champion the project. The project champion needs to be able to influence and gain support from more senior managers and peers, be able to lead and motivate the project team and other employees, listen to concerns, counselling unsettled people, develop teams and individuals to assist the change process (Gilgeous, 1997). Rogers (1995) suggests that for costly, visible, or radical projects the champion needs to be a person in a position of power and high office. ERP projects exhibit the traits of being costly and radical.

### Project team

Having the right composition of the ERP implementation project team is very important (Umble *et al.*, 2003; Nah *et al.*, 2001; Bingi *et al.*, 1999; Buckhout *et al.*, 1999; Laughlin, 1999; Ross, 1999) but may be difficult to have. Team members should be technologically competent, understand the company and its business and come from



the departments affected by the new system. This team should contain the best people in the organisation (Bingi *et al.*, 1999, Buckhout *et al.*, 1999), and be cross-functional (Nah *et al.*, 2003) to reflect the cross-functional nature of ERP systems.

ElectronicCo however, did not assign the right people to the project team as top management failed to understand the importance of having an appropriately composed project team. Top management thought that the IT department should run the implementation of an IT-based project, and therefore, the company's ERP project team consisted of mainly IT specialists. These specialists are technical professionals skilled in computer languages, workings of the network and the internet, and familiar with the technological aspects of the ERP system, and many have degrees in management information systems but they were not familiar with the various aspects of the company's business operations.

With regards to the consultants used, although the consulting firm had a good international reputation in ERP implementation, it had little experience working with Chinese companies and had little understanding of Chinese business and management practices. The consultants often cited from experiences of implementing ERP in other countries and tried to impose and adopt similar practices for the company without understanding the different working practices and culture. The consultants did not understand that, as Martinsons and Hempel (1998) suggest, Chinese management style, informal planning and process modelling, interdependent social and organisational relationships, and attitudes towards organisational change all limit process innovation efforts. They did not integrate with the implementation team and many of the consultants could not speak the same language as the team, and could not build up trust with the company.

#### *Turnaround point*

The new consultants worked with the company's senior management to form a cross-departmental and cross-functional project team. Members of the IT department were still involved but in smaller numbers. The company also integrated the consultants into the project team. Consultants play an important role in ERP implementation as the right consultants have experience and knowledge in the ERP system and in the implementation procedures. This role is especially important in China because ERP is still new to Chinese enterprises and these will need guidance from the consultants. The consultants may be able to offer effective suggestion to enterprise, guide the employees, develop proper in-time strategies, and even conduct employee training.

#### **Project management**

Project management is an important requirement in implementing ERP. Umble *et al.* (2003), Nah *et al.* (2001, 2003) and Laughlin (1999) suggest that successful ERP implementation requires excellent project management which includes a clear definition of objectives, development of both a work plan and a resource plan and careful tracking of project progress. The project team should be capable of, and entrusted with, making critical decisions (Laughlin, 1999; Minahan, 1998) and that a competent project manager is one of the most important factors in implementation of information systems, such as ERP.

When the company's top management formed a project team comprising mainly of IT specialists, they also appointed and delegated responsibility for successful completion of the project to a senior member of staff, the IT development manager to lead the project. This manager, and most of the project team, although knowledgeable with information systems, has no experience in leading a major implementation project. The result was a team that had unrealistic schedules and budgets within an unrealistic deadline of 12 months for completing the project.

#### *Turnaround point*

On the advice of the new consultants, the company dispatched the new implementation team to a two-week "crash-course" in project management. The consultants worked with the implementation team to set a more realistic deadline that now include schedules, budgets, control procedures and milestones. A realistic deadline is especially important for the company, as it has no experience of any major change initiatives similar to implementing ERP. In addition, a realistic deadline will allow the company to ease employees into a new idea preparing them for the change that is to come, and put less pressure on employees, especially the project team to implement the change.

#### **Process change**

Most companies that implement ERP are unlikely to have processes and structures compatible with the structure, tools, and types of information provided by ERP systems (Umble *et al.*, 2003). For this reason, it is likely that companies implementing ERP will need to reengineer, at a minimum, their key processes to support the requirements of the ERP system. Yusuf *et al.* (2004), Mandal and Gunasekaran (2002) and Bingi *et al.* (1999) suggest that to take full advantage of the ERP software, business process reengineering is a prerequisite. However, as Martinsons and Hempel (2001) suggest, because Chinese culture view radical change associated with BPR differently to Western culture as Chinese culture is more past oriented, reactive and reluctant to change established social relationships, the Chinese are reluctant to engage in major change efforts.

The company's top management did not help, as they viewed ERP as simply a technological challenge rather than one that affects the entire company, hence the high number of IT staff involvement. This view is not restricted to Chinese enterprises though, as Umble *et al.* (2003) observe that many chief executives in the west view ERP as simply a software system and the implementation of ERP as primarily a technological challenge.

#### *Turnaround point*

The initial consultants did recognise the need to redesign the company's key processes to fit in with the ERP requirements, and had mapped out the changes needed, drew up detailed redesigning plans and started changing many of the key processes. However, without top management similarly recognising this and providing support, redesigning key processes were to prove difficult. The new consultants had to convince top management that ERP is not simply a software system and that to gain full benefit it is likely that implementation will involve redesigning business processes, and that they will have to support the process changes.



**Education and training**

Training users to use ERP is important because ERP is not easy to use even for highly educated managers with good IT skills. Umble *et al.* (2003), Nah *et al.* (2001, 2003) and Gupta (2000) suggest that adequate training can help increase success for ERP systems. Vosburg and Kumar (2001) meanwhile observe that lack of proper training can frustrate ERP users and suggest on-going training as a way to ensure success in implementing ERP. This is especially important with the company, both internally and for those externally affected by ERP, because it is important to gain user acceptance and training can help employees and other users adjust to the change, and helps build positive attitudes toward the new system. Furthermore, as Russo and Kremer (1999) observe, hands-on training is an important driver of new system implementation success.

The company's employee training programme was ineffective and insufficient. Although the initial consultants recommended training courses lasting for periods of between two and three months, some managers thought that this was taking too much time away from normal business activities and did not allow their employees to attend the courses. In order to fit in time and to reduce training cost, ElectronicCo required the training provider to deliver the training in compressed format. The training was delivered by a Western-based training consultancy using materials designed for a Western audience. The company's human resource department, responsible for organising and funding employee training, quickly found that they had an insufficient budget for this. As a result, only senior managers, departmental managers and key employees received training. Most of the end-users did not receive any formal training. This is common in China as many Chinese enterprises commonly consider training as low priority, an expense that they can reduce or eliminate in difficult times. The company had hoped that those who received training would cascade their knowledge and experience down to other colleagues. This also did not materialise. The managers were not active learners during the course, and were not enthusiastic to share their experience with other colleagues after the course. Most of these staff commented that the training materials were too difficult and beyond their understanding, and they only attended the course because they received instructions to do so and some even commented that they did not know why they had to attend the course at all. As a result, employee training was not as effective as the company expected or needed. The company's subsidiaries, key suppliers and key retailers experienced the same situation.

*Turnaround point*

Many Chinese enterprises have to outsource training because there are not many good and qualified internal trainers who can deliver suitably designed and pitched courses for the employees. The company thus developed training partnership with one of China's top universities because this was cheaper than working with foreign universities or with specialists training consultants, and the courses would use material designed for the Chinese audience. The courses were to provide awareness, knowledge and skills in IT, ERP, communication and new working methods. Employees received five hours of training in one week. The partnership also provided distance-learning material for those employees in the various subsidiaries. The consultants put in place a formal cascading programme for training whereby those

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employees, especially senior managers who have received training are required to train or at least mentor those working beneath them.

Critical success factors

### Communication

Kraemmerand *et al.* (2003) suggest that communication is essential for creating approval and widespread understanding and acceptance of ERP. Spike and Lesser (1995) suggest that in implementation of change, communication is a tool for announcing, explaining or preparing people for change while Lippitt (1997) suggests that communication can increase commitment to change as well as reducing confusion and resistance to change. According to Bancroft *et al.* (1998), communication should start early, be consistent and continuous, and include an overview of the system, the reasons for implementing it, and a vision on how the business will change and how the system will support these.

However, the company's top management did not inform all their employees of their ERP plans and of the benefits that ERP will bring to the company. Further, neither the consultants nor the project team was concerned about communicating progress to the employees. Without effective communication, there is no structured manner for employees to find out what was happening in the company. Employees, suppliers and customers frequently complained that they did not know what was going on with the company's ERP implementation activities. Internally, the company's employees did not understand the purpose and benefits of implementing ERP many were concerned about their benefits and position in the company and how ERP would affect them.

### *Turnaround point*

Working with the new consultants, the company's senior management conducted a series of management briefings to their employees, suppliers and retailers. They also initiated regular communications with the key managers who in turn conducted weekly briefing meetings with members of their own teams, and set up newsletters. Employees, suppliers and retailers can also access the company's intranet to view updates on the ERP implementation progress.

### Conclusion

This paper provides valuable insights towards understanding ERP implementation in China. In particular, it examined the ERP implementation experiences of a major Chinese enterprise, from the initial implementation problems to actions undertaken to ensure implementation success. Through interviews and examination of company documentations, this study provides a set of critical success factors for this company. These CSFs are:

- *Top management.* Strong, committed, and visible top management to promote ERP and to support the implementation process.
- *Project team.* A cross-functional and qualified team that also consist of suitable consultants.
- *Project management.* Led by a good project manager with plans, schedules, control procedures and milestones.
- *Process change.* To structure the company's organisation to work with the requirements of the ERP system.

- *Education and training.* Needed to suit the employees' needs, as well as meeting the needs of the company.
- *Communication.* Structured, regular and accessible.

The CSFs for ElectronicCo are similar to those experienced by many Western businesses when implementing ERP. The problems that can lead to implementation failure are also similar to those experienced by Western businesses that have been unsuccessful with ERP implementation. Implementing ERP in any organisation is difficult and this paper shows the additional difficulties of implementing ERP in China, due to cultural differences. Every CSF identified for ElectronicCo has elements of Chinese cultural characteristics, business and management style and practice. This paper thus shows that the approach used to implement ERP in the West is applicable to China if consideration is given to cultural differences, and the implementation approach suitably modified. The CSF for this company will be beneficial to future enterprises wishing to implement ERP in China.

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