Reopening The Centralization-Decentralization Debate: A Comparative Case Study Of ERP Implementation In Two Chinese Petroleum Companies

Julien Malaurent
Department of Economics, Finance, Control, EMLYON Business School, Ecully Cedex, France, malaurent@em-lyon.com

Li Yan
Information Systems and Decision Sciences Department, ESSEC Business School, Cergy-Pontoise Cedex, France, liyan@essec.fr

David Avison
Information Systems and Decision Sciences Department, ESSEC Business School, Cergy-Pontoise Cedex, avison@essec.fr

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REOPENING THE CENTRALIZATION-DECENTRALIZATION DEBATE: A COMPARATIVE CASE STUDY OF ERP IMPLEMENTATION IN TWO CHINESE PETROLEUM COMPANIES

Julien Malaurent, Department of Economics, Finance, Control, EMLYON Business School, Ecullly Cedex, France, malaurent@em-lyon.com
Li Yan, Information Systems and Decision Sciences Department, ESSEC Business School, Cergy-Pontoise Cedex, France, liyan@essec.fr
David Avison, Information Systems and Decision Sciences Department, ESSEC Business School, Cergy-Pontoise Cedex, avison@essec.fr

Abstract

In this comparative case study research, we reflect on two enterprise resource planning (ERP) implementation stories at two large petrochemical companies in China. These companies implemented the same ERP system in a similar time span (though not at the same time). They are two very large Chinese State-Owned Enterprises (SOEs) and in this paper we highlight the centralization versus decentralization debate relating to IS-IT as this issue is proved particularly important in this specific context of Chinese SOEs. The first company went from a decentralized strategy towards a centralized one. Conversely, the second company went from a centralized strategy towards a decentralized one. Despite these differences, both companies successfully completed the projects with dissimilar mixed strategies.

Keywords: Centralization, Decentralization, ERP, Chinese context.
1 INTRODUCTION

The centralization versus decentralization debate has been with us since early computing, but it became a particularly important issue from the 1980s. Before that time, computer systems tended to be very expensive and large mainframe systems, and therefore organizations expected only to have one centralized system. But since, with the spread of powerful and yet cheaper and smaller minicomputers, microcomputers, PCs, workstations and so on, distributed computing became an option. However as Olson and Chervany (1980) have argued, it is not so much the choice between computer systems that is vital in this debate but “what degree of control over the information systems services function should be exercised by its users, and how much control should be retained in a centralized department?” It is this issue that we are trying to address in this paper with regard to the new political and economic environment of Chinese organizations. Specifically, we look at these aspects with respect to the different approaches of ERP implementation in two large state-owned oil companies in China.

King (1983) agreed that the centralization/decentralization issue is about control, and more to do with political and organizational factors than economic ones. “Centralization versus decentralization of control concerns the locus of decision-making activity in the organization. Centralization implies the concentration of decision-making power in a single person or a small group; decentralization implies that decisions are made at various levels in the organizational hierarchy.” Organizations with centralized control structure, more generally, are likely to have centralized control over computing services also. However arguments favouring decentralization were emerging based on the potential for improved computing services for users. The debate was sometimes reduced to one of efficiency (of centralized control) versus effectiveness (of decentralized control where users know their areas of concern). But this was somewhat superficial and King (1983) provided a thorough overview of potential costs and benefits (defined broadly, not only in the financial sense) of both approaches. He also suggested that the debate was more about a continuum between the two extremes rather than one or the other and he also opened up a discussion on the potential of a mixed strategy which proved relevant in our own study.

With the change in Chinese politics, previously centralized organizations had the potential to choose decentralization just as many Western organizations chose decentralization in the early 1980s and the years following, hence our paper is entitled ‘re-opening the centralization-decentralization debate’. George and King (1991) gave four propositions about the relationship between centralization and decentralization. First that computerization can cause centralization; second that computerization can cause decentralization; third that there is no relationship between the two and finally that computerization reflects centralization. They were writing before the widespread use of ERP systems in the West and these systems, as we shall see, are so important and ubiquitous that they add a particular distortion to the debate.

Our paper belatedly responds to the call of George and King (1991) for further empirical research to investigate this debate and we choose to look at ERP implementations in particular, and in two large state-owned organizations in China, because ERP systems open up the potential for even further grounding of centralized control, which was not what the Chinese reforms were ostensibly about (though in reality there is difficulty in giving up the power provided by centralized control). ERP systems are first and foremost about control (and its linked association with power), as some researchers (Bloomfield and Coombs 1992; Robey 1981) have pointed out, and this is central to the debate.

In essence, our research supports the view that the relationship between computerization and centralization or decentralization is not a simple causal one and can reflect any of the four positions of George and King (1991) including a mix of them. Having reached that conclusion, suggesting that the debate is much more complex than a simple centralization or decentralization decision, discussion of the topic seems less prominent in the journals, though
it has been sometimes raised – at least by implication - in the context of business alignment research (see the excellent review article of Chan and Reich (2007).

Zrimsek and Prior (2003) looked at the issue in our particular context of ERP systems and they were in favour of centralized ERP deployments. They argued that from a total cost perspective, decentralized solutions have higher initial implementation and on-going ownership costs. They were also concerned about a loss of standardization and control of the ERP solutions if the deployment was decentralized. On the other hand, they did suggest that greater centralization means architectural complexity (relating to, for example, business recovery issues) although they argued that these complexities could be overcome by “careful design”. More specifically, researches on ERP implementation (Avison and Malautre 2007; Yusuf et al. 2006) have discussed the particular difficulties and potential failure of implementing ERP systems in the Chinese context. We therefore turn to the specific context of our case study.

2 CONTEXT

2.1 Chinese state-owned enterprises

The organizational structure of the two companies under study is critical in this discussion. Both companies are state-owned enterprises (SOEs) in the petroleum and petrochemical industry. An SOE is a company legally owned by the government, directly or indirectly. This can be at provincial, regional or national level. In China, SOEs are at the core of China's modern economic structure, functioning with a degree of state-led capitalism. The efficiency or otherwise of these formerly centralized bureaucratic structures has been discussed by researchers (e.g. Dong and Putterman 2000; Jefferson et al. 2000; Komiya 1987; Naughton 1992).

Following the economic reforms of the 1980’s launched by Deng Xiaoping, an important process of change has been taken by most of the Chinese SOEs in order to improve their efficiency and increase their competitiveness in the global market. The most important Chinese SOEs are now publicly listed in the Hong Kong stock exchange. These listed companies in mainland China which are incorporated internationally are commonly referred to as ‘red chip’ companies. This dramatic change to corporatization was designed to improve the managerial incentives of these companies. It aimed to define a structure of rights and responsibilities to delimitate the role of managers and shareholders, to setup incentives for both parties and to enable their monitoring.

Recent Chinese economic history presents key insights for understanding the specificities of the research discussed in this paper. The last twenty-five years represent a major change for the Chinese economy and industry. During this period of time, China has gone through a gradual path of reforms which have transformed local industry from a centralized and planned economy (based on the Soviet model) to a market-oriented economy (a hybrid solution based on Western capitalism and Chinese traditions). At the organizational level, it had a number of major repercussions as it implied a complete restructuring of SOEs.

At the outset of the reforms, SOEs functioned as “passive agents” of the state economic bureaucracy (Komiya 1987). Managers of SOEs had little autonomy over research and development, product innovation, investment planning, marketing, nor even some control over routine operations such as production scheduling, material purchases, wage structures, and employment levels. Ten years of reform brought dramatic changes in the allocation of industrial products, the procurement of inputs, the character of incentives, and the degree of competition. By the end of the 1980s, enterprise managers had already gained control of most business decisions. New forms of contracting gradually supplanted annual target plans and this applied even to the largest firms.
The overall impact of these reforms on the structural environment surrounding SOE operations can be summarized under three headings: autonomy, incentives and competition.

2.1.1 Autonomy

As the scope of mandatory planning diminished, the managers of SOEs acquired increasing autonomy over decisions about the quantity and variety of outputs, production methods, selling prices and marketing strategies.

2.1.2 Incentives

New incentive mechanisms reconfigured the relationship between effort, financial outcomes, individual reward, and enterprise control over resources. From around 1980, SOEs were allowed to retain part of their profits. Consequently, the compensation scheme for SOE managers has also been modified in order to better motivate them.

2.1.3 Competition

Reforms have meant an expansion not only of markets, but also of competition. (Naughton 1992) observed sharp reductions in both the level of SOEs’ profits and the dispersion of profitability across branches of Chinese industry after the launch of the economic reforms. He attributes the decline and convergence of profit rates to the erosion of barriers that had formerly protected SOEs against competition from collective firms and from imported products.

Additionally, the last twenty-five years have also seen a great expansion of non-state-owned enterprises which has forced SOEs into a more market-oriented type of management in order to remain competitive. In line with this trend, major business process reengineering (BPR) projects were launched within SOEs in order to adapt their internal processes.

It was within this context that the two companies under study had been created. Company 1 was created in 1998 as a result of a government decision to strategically restructure the petroleum and petrochemical industry. It was publically listed since 2000. Company 2 was established in 1982 following Deng Xiaoping’s reforms. Several of its subsidiaries are also publically listed. The two companies have implemented the SAP systems with the aim of leveraging the best practices of ERP systems in the industry (proposed through standard business processes) in order to enhance the effectiveness and efficiency of their organizations. Both companies expected the ERP system to be a reengineering tool that will force the company into the best structure for the new political and economic environment.

2.2 ERP systems used for business process reengineering operations

Researchers have demonstrated how companies have implemented ERP systems to streamline their business processes, and thereby improve their overall effectiveness (Martinsons and Hempel 1998; Rajapakse and Seddon 2005; Zrimsek 2001). The two case study companies worked with a top international technology consulting firm to benefit from its experience with other international petroleum companies which have implemented ERP systems and in this way enable them to adopt international standards and benefit from the best practices in their industry. The role of the consulting firm was to assist the two Chinese SOEs by:

- Identifying business improvement opportunities and formulating business strategy.
- Redesigning organizational structure to support business strategy and its transformation.
- Designing and implementing the financial and performance reporting architecture.
- Implementing a company-wide common ERP system.
- Training the employees for the new system.
2.3 Petrochemical industry and Information Systems

We now look at the petrochemical industry processes and the logistical constraints from an information systems perspective. The two companies under study fulfil the whole chain of petrochemical activities starting from oil and gas exploration to selling petrochemical products. Company 1’s business includes:

- Oil and gas exploration and extract.
- Oil Refining.
- Storage and transportation (including pipeline transportation) of crude oil, refined oil and natural gas.
- Production and sales of petrochemicals, chemical fibers, chemical fertilizers, and other chemical products.
- Import, export and import/export agency business of crude oil, natural gas, refined oil products, petrochemicals, and other chemicals.

Company 2 has a similar set of activities ranging from the exploration and development of oil and gas to the production and selling of chemicals and fertilizers.

This large scope of activities constitutes a challenging mission for the information systems divisions. It requires the set-up of a well-integrated information technology (IT) architecture to connect real-time process information systems (such as supervisory control and data acquisition (SCADA) systems) installed in petrochemical plants spread all over China with logistics and management software such as ERP systems, other supply chain management (SCM) software and customer relationship management (CRM) software installed within refineries and headquarters. In this research, we focus only on the set-up of ERP systems, but it remains important to understand the complete picture of information systems in the petrochemical industry.

Our research focus relates to the set-up and impact of ERP implementation in relation to the centralization vs. decentralization debate in large Chinese SOEs. We now turn to our research method to investigate the two cases and discuss our findings.

3 CASE STUDY COMPARISON

3.1 Research approach

We carried out a posteriori investigations of these two companies through interviews and documentation. We focused on the implementation strategies used by the two companies in the ERP work. We had access to these data only through external consultants. We were able to interview a consultant project director who was in charge of the ERP implementation projects at both companies and a less senior ERP consultant who was actively involved in both projects. Documentation included some key facts and detailed processes on both projects. However, as we highlight in the concluding section, we had difficulties obtaining all the documentation on the two companies and the two ERP projects that we would have liked to analyse. Further, we were not able to meet or interview any employee from the two petroleum firms.

We are conscious of the limitations of this investigation in terms of data interpretation as the consultants interviewed provided us with their own perspective and interpretation of the two ERP implementation stories and we did not obtain a real company perspective. Nevertheless, we argue that the collection of factual data through the external consultants was a sufficient and reliable source of information for this investigation aimed at analysing and discussing the ERP implementation strategies enacted. And we exercised extreme caution in basing our
discussion only on factual data from the consultants, not their subjective opinions. But clearly there are limitations in our research approach due to limited data access.

3.2 Two Chinese petroleum leaders

Table 1 summarizes data collected from the two companies concerning their technical architecture.

<table>
<thead>
<tr>
<th>Features</th>
<th>Company 1</th>
<th>Company 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of licenses</td>
<td>20,000-30,000</td>
<td>3,000-4,000</td>
</tr>
<tr>
<td>ERP version</td>
<td>SAP R/4</td>
<td>SAP ECC 5.0</td>
</tr>
<tr>
<td>Modules implemented</td>
<td>FI/CO, SD, MM, PM, PP, PS</td>
<td>FI/CO, HR, SD, MM, PM, PP, PS</td>
</tr>
<tr>
<td>Use of parallel legacy systems</td>
<td>Some industry-specific systems such as: 1. a retail system for gas station management, 2. a manufacturing execution system for production management, 3. a distribution control system for production control</td>
<td>Lotus Notes (workflow management), IBM Maximus, Integration bus for communication with external applications</td>
</tr>
</tbody>
</table>

Table 1: Technical architecture of the two case study companies

The first company under study (called here Company 1) is considered as one of the most important public Chinese petroleum companies and is listed in different markets. In terms of location and size and business activities, it has its headquarters in Beijing, capital of People's Republic of China, with branches and subsidiary companies in many provinces across China, employs around half a million people and has different subsidiaries involved in every aspect of oil and gas exploration, development, refining, production of petrochemical products, marketing, logistics, retail and wholesale. Selling mainly to mainland China, the company also exports products to South-East Asia.

The second company (called here Company 2) is also a Chinese SOE. Its main business focuses on the exploitation of oil and gas resources in offshore China in cooperation with foreign partners. A great majority of the shares are owned by the Government of the People's Republic of China. It also has its headquarters in Beijing, branches in different provinces all over China, and employs around 50,000 employees.

In 2011, both companies were ranked in Fortune Global 500.

3.2.1 Company 1 ERP project: From a decentralized to a centralized approach

Company 1 was formed in 1998 from a collection of smaller companies, each of which had built its own IT infrastructure. It seems that even within these small companies themselves, each division was using different information systems from different suppliers. Using a wide variety of IT suppliers made the software licensing process both complicated and costly. It also led to a number of compatibility issues. Moreover, many of the subsidiary companies were developing their own IT solutions, often with long development lifecycles – and at considerable total cost.

Within this context, Company 1 built its own IT infrastructure in 2002, with an effort to consolidate different IT systems from different subsidiaries. Before the SAP software implementation, Company 1 had a mixed hardware infrastructure, consisting of a large number of servers from IBM, Sun and HP. For the new environment, the project team decided to use the IBM System p5 595 and 570 platforms to support the infrastructure.

Concerning ERP strategy, Company 1 initiated the deployment of SAP systems in a decentralized way (bottom-up), which was considered to be suitable for its unique corporate
IT system with diverse infrastructure configurations. It was the first Chinese petroleum company to implement an ERP system. With no previous case for reference, they set the initial strategy to adopt a trial-and-error approach in the first phase by selecting several subsidiaries as the test beds. Based on the lessons learnt from these subsidiaries, they designed a complete blueprint (a set of formalized business processes and scenario for each function of the future system), which would be rolled out at the remaining subsidiaries in the whole corporate during a second phase.

In 2002, four subsidiary sites were selected to implement SAP systems with adequate autonomy. Each of them decided for themselves the server configuration, data storage, module customization to be achieved according to the business specificities of each site. The initial sites covered the business functions of refining, chemical industry, and sales activities.

According to the interviewees of the external consultant firm, this initial trial-and-error ERP implementation in these four sites was considered successful. Therefore, in 2003, three more subsidiaries were implemented for further trial-and-error experiments, which also turned out to be a success. The sites selected for this second stage of trial-and-error presented a wider functional scope including key functions such as oil field production.

Following the seven successful implementation cases during 2002 and 2003, the ERP team composed of internal and external consultants designed a first version of the ERP implementation blueprint to provide guidelines for further implementation of larger scope across the corporation. In 2004, sixteen more subsidiaries were chosen to implement SAP; in 2005, twenty-seven more; in 2006, seventeen more, which means that between 2002 and 2006, Company 1 implemented sixty-seven ERP systems throughout their plants and units.

The decentralized approach in implementing SAP, with the flexibility it provided, proved to be effective in the initial stage of promoting SAP in the corporation. However, according to the external consultants, the blueprint designed after the successful SAP implementation at first seven sites was not detailed enough (e.g. not adequately anticipating the specific issues at other subsidiaries) to be applied strictly to other subsidiaries in such a short period of time. Therefore, some difficulties arose at headquarters during the consolidation process. The following problems were identified in the second phase when the SAP system was deployed at a larger scale in the corporation:

- There was a lack of a general agreement on the data format in the systems of each subsidiary: for example, there was no unique identifier code for customers, suppliers, and raw material, which caused a lot of discrepancies in information among different subsidiaries and made it extremely difficult for the headquarters to control and analyze their information.
- Localization in SAP implementation at different subsidiaries has severely affected the standardization of the corporate IT system. In various cases, the local configuration of the SAP systems could not completely follow the blueprint due to their own unique infrastructure configuration and there was no way the central headquarters could interfere.
- There was a lack of uniform regulation to control administrative rights and system access at different subsidiaries. The decentralized way of system control had posed severe threats to IT security.
- Duplication in setting up servers and difficulty in leveraging economies of scale in server maintenance had significantly increased the capital expenditure as well as operational expenditure in implementing SAP throughout the corporation.

In 2006, based on the reflection of all these issues, Company 1 decided to move towards a more centralized implementation approach in order to better cultivate the system integration capacity of the SAP system. The major change in this approach was that the headquarters will centrally control the server configuration and system access rights, based on different business functions. For example, the oil refinement and sales functions will be respectively managed centrally, across different subsidiaries. The detailed practices included improving
communications between the different sites and headquarters, and normalization of the data format of documents, which included information about customers, suppliers, raw materials, inventory, production, finance, and so on.

The new IT infrastructure used fifty IBM p5 servers (both 595 and 570), two eServer 670s for testing and development, and a global storage system. In 2006 and 2007, Company 1 had further rolled out SAP systems in another twenty-four sites successfully following a much more centralized ERP project architecture.

3.2.2 Company 2 ERP project: From a centralized to a decentralized strategy

Ever since it was founded in 1982, Company 2 has put strong emphasis on the usage of information technology in managing its business. In 2006, the IT department passed ISO 20000 certification, the first among large Chinese SOEs to obtain this. It marked its achievements in IT services within the organization. Compared with Company 1, Company 2 was more mature in managing IT to support their business. In their history of corporate IT development, they had followed a basic principle “Uniform Plan, Uniform Construction, Uniform Management” of IT systems. This reflected the organizational structural characteristics of traditional Chinese SOEs in emphasizing centralized control (Company 2 was founded 16 years earlier than Company 1).

For Company 2, the first steps of the ERP project started in 2004. As they hired the same IT consulting company as Company 1 for the deployment of their ERP systems and they also chose to adopt SAP, Company 2 could benefit from the experience of Company 1’s ‘trial-and-error’ approach in SAP implementation. Based on the feedback on Company 1’s ERP projects, they did not adopt a similar approach. Consequently, following the advice from the external consulting firm, they decided to adopt a centralized management approach to implement SAP in their corporate directly. A global template was designed in 2005.

Their centralized ERP plan included a four-step implementation approach:

- Initialization: determine the ERP implementation strategy and decide on the architecture for the system (both hardware and software).
- Blueprint Planning: design the global template and implement it in selected pilot sites. With feedback from the pilot project, make adjustments to the global template and finalize it.
- Implementation and Diffusion: based on the global template, implement ERP in key second-tier enterprises (apart from those which were included in the pilot projects).
- Maintenance and Support: Keep on rolling out the ERP project in third-tier enterprises, keep on maintaining and improving the ERP systems that have gone live and deepening their application.

The first stage was completed at the end of 2004. The second stage tasks were completed at the end of 2006 whilst they started the third stage in the second half of 2006, which means the second and third stages were run in parallel. The third stage tasks were accomplished at the beginning of 2009. The fourth stage went parallel with the second and the third stages also with many of the enterprises completing ERP implementation and starting second-phase development.

As mentioned above, the project was centralized and controlled by the headquarters’ IT team. Everything went smoothly until one subsidiary reported severe difficulty in following the centrally developed global template which took into consideration the requirements of majority of subsidiaries while this specific subsidiary had very different needs. These different needs were caused by both internal and external reasons.

Internally, this is a unique upstream subsidiary which is specialized in offshore extraction of oil and gas and its business is production centric. Due to the complexity of the offshore oil production system and the subsequent difficulty and high cost in adjusting production
quantity, the sales activities need to be adapted to the production activities. This special requirement is exactly the opposite of the situation faced by most of the downstream subsidiaries where business is marketing and sales-centric and production quantity is driven by the market demand. This unique business process requirement was not reflected in the global ERP template.

Externally, this subsidiary was publically listed in the United States and thus needed to comply with the Sarbanes–Oxley Act which enhanced the responsibilities in corporate governance, internal control assessment and financial information disclosure of publically listed companies. Therefore, this subsidiary had designed more complex standardization for internal control and processes and required the ERP system to be aligned with it. Again, this requirement on system design in compliance with external legal rules could not be met by following the global template of ERP implementation which was designed by the corporate headquarter.

In order to solve the problems encountered by this subsidiary, and potentially other subsidiaries, Company 2 decided to move towards a more decentralized approach in ERP deployment from its initial centralized strategy. By tightly controlling the key steps in the ERP implementation process and giving autonomy for local customization to subsidiaries with unique requirements, Company 2 maximized the system standardization while satisfying specific needs of those subsidiaries.

4 CENTRALIZATION VS DECENTRALIZATION

As described above, the two companies initially used two different strategies for their ERP implementations since the context was different. Company 1 was the first local petroleum company to implement such a large enterprise information system in China. With no existing references in the same industry for them to consider, it seemed advisable for them to start with a decentralized approach in which trial-and-error projects were carried out at pilot sites before the implementation was rolled out at the corporate level.

Compared with Company 1, Company 2 was founded much earlier and it was a more traditional Chinese SOE with an organizational structure emphasizing centralized control. Company 2 also had a much longer history of IT adoption and corporate IT system development that was aligned with the characteristics of organizational structure. This partially explained why Company 2 started the ERP implementation with a centralized approach and confirmed our discussion in the introduction that the choice between centralization and decentralization of an IT system has more to do with political and organizational factors. Organizations with centralized control structure are also more likely to have centralized control over computing services. Another important reason for Company 2's adoption of this approach was that Company 2 benefitted from the feedback and experiences of Company 1 which implemented their ERP systems several years earlier. The external IT consultant company also played a major role since it implemented the ERP system within both firms and consequently helped the communication of feedback and best practice from Company 1 to Company 2.

Despite the fact that the two companies used different implementation strategies, they both came up with a mixed solution composed of process standardization and process diversity. The centralization approach has been largely discussed as a relevant method for the spread of general guidelines (such as business processes), the control of implementation costs, the visibility of headquarters over their subsidiaries, and the maintenance and upgrade of the network and hardware infrastructure, etc. On the other hand it also seems to be a synonym for rigidity and a lack of specific guidelines. The administration and authorization processes can also slow down the reactivity of the overall information systems.

However the decentralization strategy has proved risky as it might give too much freedom to the subsidiaries in terms of governance. It could then become difficult for the central policies
and the financial consolidation processes to develop and maintain as the subsidiaries may design their own data format and local databases. In terms of security and communications, it also raises a number of serious concerns. On the other hand, the decentralization strategy allows better adaptability and flexibility to the local environment and markets which can develop local capabilities, sustain competitive advantage through real flexibility, and also reduce the administration and communication costs between headquarters and remote sites.

Table 2 summarizes the differences between the centralized and decentralized approaches in ERP implementation along major system indicators based on the analysis of the two companies’ cases. Caution need to be exercised in interpreting the evaluation in this table: they are all relative statements.

<table>
<thead>
<tr>
<th>System Indicator</th>
<th>Centralized Approach</th>
<th>Decentralized Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of implementation</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Cost of maintenance</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>System security</td>
<td>Easy to enhance</td>
<td>Difficulty to enhance</td>
</tr>
<tr>
<td>Standardization in system maintenance</td>
<td>Easy to enhance</td>
<td>Difficulty to enhance</td>
</tr>
<tr>
<td>Standardization in business process</td>
<td>Easy to enhance</td>
<td>Difficulty to enhance</td>
</tr>
<tr>
<td>Difficulty in satisfying customization requirements of different business functions</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Difficulty in corporate information integration</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Difficulty in system upgrading</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Difficulty in second-time development</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Workload in second-time development</td>
<td>Small</td>
<td>Big</td>
</tr>
</tbody>
</table>

Table 2: Comparison of centralized and decentralized approaches in ERP Implementation along major system indicators

Through this comparative case study analysis, we posit that the two strategies may not contradict each other. Instead, they may co-exist harmoniously. The two different ERP stories have demonstrated that:

1. A centralized ERP implementation approach may not be incompatible with a high degree of process diversity among subsidiaries in a big corporation if autonomy is given to subsidiaries to customize the non-critical parts of the system;
2. A company initially using a decentralized strategy for ERP implementation may progressively turn towards process standardization according to the emergence of a set of best practices gained from the trial-and-error implementation projects at pilot sites.

Martinsons and Westwood (1997) have discussed the management of information systems in Chinese business culture to underline some important economic and cultural specificities in China that were poorly understood. For example, the authors emphasized the importance of the power structure and the management of information in Chinese organizations. Unlike modern Western companies and the basic tenets of ERP systems, power is maintained by controlling key information outside the formal information systems in Chinese organizations. We found that most of the critical management information remains as tacit knowledge in the mind of the managers and is only communicated verbally. Key ideas and knowledge are selectively transmitted to chosen individuals. Consequently, until recently there has been little use of information systems to support or formalize the most strategic and sensitive areas of communication of management information.

Based on this political perspective, the recent move towards the use of ERP systems could be justified by a desire to maintain centralized power and control through different subsidiaries, units and plants of the SOEs that spread all over the country. As a result of the high power
distance in Chinese culture, Chinese organizations make IT investments that help them monitor their expanding business operations.

From the data collected, we have observed that the two companies have adopted different ERP implementation strategies given different contexts. Nevertheless, once the ERP systems were setup, the two companies eventually came up with mixed solutions composed of process standardization and process diversity according to the specificities of each unit. However in both cases, the purposes of the ERP systems were aligned with a similar objective, that is, to be used as a management control tool to maintain the power of the headquarters over their subsidiaries.

In terms of implication, this comparative case study is among the first few to analyse the ERP implementation projects in Chinese SOEs in the petrochemical industry from a holistic perspective. Practically, it provides support for companies with a similar hierarchical structure, operating in a similar political, cultural and economic environment, in choosing the scientific deployment strategy when they construct large scale corporate IT infrastructure such as ERP system so as to maximize the effectiveness and efficiency of the system. Theoretically, this case study contributes to the debate of centralization and decentralization of IT system implementation by confirming the possibility of a mixed strategy (King 1983) with one approach dynamically evolving towards the other one.

We now turn to the discussion of limitations of the study. We only looked at two companies which made our results not easily generalizable. However, the fine example of Orlikowski (1993) has shown that this is not a limitation in itself in case study research since the two organizations chosen for our study are large Chinese SOEs with extremely important strategic positions in the country and they have shown interesting and insightful comparison over the same topic of ERP implementation. A more problematic limitation concerns the access that we had to the two companies as our only source of information was through external consultants in charge of the two projects. We could not gain access to any member of either company. Access is rarely easy, but can be particularly difficult in the Chinese context for legal as well as cultural reasons. However, we argue that our conclusions are well founded being based only on factual data from the consultants.

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