Empirical Study of Distinct Features and Challenges of Joint Development of Information Systems: The Case of ABC Bank[*]

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Abstract: The internal development and outsourced development of information systems have been studied intensively, but little research has been conducted on the joint development mode. This paper describes the benefits and problems encountered in the joint development of accounting management information systems based on a real case. The case illustrates some distinct advantages, such as full control over the development schedule, the flexibility with resource allocation, and insurance for sustained active participation by the end-users. However, this development mode also involves potential problems, e.g., potential conflicts arising from diverse backgrounds and cultures of the various stakeholders and challenges to manage personnel from outside partners.

Key words: joint systems development; outsourced software development; user participation; project management

Introduction

A major difference between the development of enterprise information systems (IS) and other software projects is that the former usually involves a great deal of complicated and idiosyncratic internal business logic, which demands active participation of the users. Instead of developing their solutions in-house, most businesses resort to outsourcing or purchasing mature off-the-shelf software packages due to the lack of internal competence. However, software packages often do not perfectly meet the internal needs, so outsourcing has become a real option in the portfolio of IT management strategies[1]. Therefore, some enterprises opt to develop their own systems with external partners for their unique expertise, while keeping project management responsibilities internally. This mode of development is referred to as joint information systems development (JISD).

To date, much of the prior research on information systems development (ISD) has been done in the context of internal development and maintenance in the traditional computing paradigm[2]. However, few studies have examined JISD. Therefore, this research investigates the following research questions: How are joint information systems projects developed in China？ What are the unique characteristics of JISD in the Chinese context? How and why are decisions made in the process of developing a major JISD?

A recent empirical study concluded that the current outsourcing practices are relatively unsophisticated compared to the prescriptions from economic theories[3]. According to the agency theory[4], goal inconsistency and information asymmetries are major issues in outsourcing[5]; outsourcing is, thus, not recommended when uncertainty is high and measurability is low. However, incentive schemes and monitoring

mechanisms can be designed to reduce goal incongruence and information asymmetries.

Shore[6] argued strongly for the critical role of project leadership in IS implementation because of the complexity and high failure rate. Leadership in general is defined as "the process of influencing others to take action in accord with an individual's vision toward a shared purpose that takes into consideration the competitive environment, the goals of the organization, and the knowledge, capabilities, and motivation of followers."

It has been demonstrated that inappropriate evaluation before and/or after outsourcing and inadequate contracts are the main reasons for hidden costs and the failure of outsourcing[7]. The importance of proper project management in large ISD has also been highlighted by a recent empirical study[2]. It was found that formal project management practices were more probable for meeting the project schedule, whereas neither project complexity nor project size mattered. In particular, for projects with high complexity, outsourcing and the adoption of project management practices were more likely to lead to on-time systems completion than otherwise. However, this might prove to be extra difficult for ISD in China, because there is little emphasis on the use of formal co-ordination mechanisms and control structure in the Chinese management culture.

1　Research Method

According to Yin[8], case studies are best suited for exploring the how and why. So we used a descriptive case study supplemented with qualitative analysis to investigate the processes (how) and rationales (why) behind ISD and outsourcing management. We conducted interviews with the project manager of a major core business system at the ABC Bank and also requested for other supplementary documents to verify and triangulate our findings. Eventually, data was collected from a variety of sources including minutes of over 40 internal meetings of the project team, newsletters, design documents, and over 15 hours of in-depth interview with one of the project managers. Both of us participated in the face-to-face interviews, which occurred over a period of about six months, and took a large volume of notes. We also had numerous contacts with the informant via e-mail and online chats for clarification and supplementary information and got

detailed answers.

2　Case Description

2.1　Company and project background

The ABC Bank is one of the "big four" state-owned commercial banks, with a national presence in China. The Finance Department of ABC Bank started a full-scale business requirements analysis for the entire bank, with the objective of eventually installing comprehensive management accounting information systems, which would cover each level's transactions and functions in the bank.

A feasibility report was finally completed in March 2004. The project team consisted of only a dozen internal employees. They were mostly domain experts summoned from subsidiary branches due to the headquarters' lack of manpower, with only one IT person in the team. From the end of 2003 to early 2004, the bank held three special meetings to examine the project proposal and initiation, code named AIS.

2.2　Project management structure

The AIS project management structure consisted of a project steering committee, under which there were a technical team and a business support team. The steering committee members were senior executives of the bank, and they played a nominal and ceremonial role only, without any real responsibilities. The *de facto* project management responsibilities fell on three people. Mr. Li (The names of the individuals, project, organizational units involved in the case description are changed to hide their identities.), a senior manager in the Technologies Department of the Bank's Guangdong provincial branch, was appointed the manager of the technical team. Mr. Niu, a younger but very capable manager from the bank headquarters' Software Development Center (SDC), is as the deputy manager. And Mr. Miao, from the Finance Department of the headquarters, was the manager of the business team.

In October 2004, the team gathered in Guangzhou, the capital city of Guangdong Province, to start the development. The team spent the first month on refining requirements and regrouping the subsystems, but was unable to make a decision on the development approach and platform. Subsequently, it was also unable to decide on what documentation tool to use due to

fragmentation in the team, diverse opinions pulling in different directions, and lack of coordination and leadership. The team decided to use the familiar data flow diagrams (DFDs) to model the complex business processes. Another month had passed away by then.

In March 2005, the project team moved to Beijing after five months in Guangzhou, on the recommendation of Niu and Miao leaving behind Mr. Li, because of his weak leadership and lack of commitment due to his other responsibilities. Mr. Niu and Mr. Miao took over all day-to-day management responsibilities. Soon after the return to Beijing, Mr. Miao was promoted to be a division chief and phased out of the project manager role. Having closely worked with Mr. Niu for over half a year and recognized his strong commitment and managerial talent, Mr. Miao transferred all management responsibilities to Mr. Niu. It was from this point that the project team had a single point of management responsibilities.

2.3 Systems architecture and other technical issues

Through earlier research on existing products on the market and demos by international and domestic vendors, the project team had developed a more realistic and thorough understanding of the architecture of modern management accounting systems than the feasibility report. They realized that the client/server architecture proposed in the feasibility study was not ideal. However, most of the developers in the bank were used to the C language and the client/server architecture. It was a challenge to overcome this inertia, and not possible to convince the majority.

When the team refined the requirements and regrouped the subsystems in Guangzhou, it became clear that the JEEE technology based on the browser/server architecture was a better choice for leveraging the Internet technologies, simplifying systems development, promoting data sharing and re-use, and consolidating system functions. Moreover, JEEE technologies were believed to provide richer interfaces with open standards and portability. Most of the sophisticated managements accounting systems were based on such architecture. However, there was an impasse due to the mismatch with the team's technical skills and lack of leadership.

Two months later, as the understanding of the requirements deepened, the project team fully recognized that the traditional development method, technologies, and architecture could not meet the requirements. Meanwhile, through constant discussion, the domain experts and technical members refined the requirements. As a result, the five subsystems previously defined were restructured into seven, and each of them was given redefined modules and functional specifications. The structural enhancement further revealed the incompatibility between the traditional approach and the advanced functional requirements. In December 2004, the project team finally decided to use the JEEE platform.

To help the developers master JEEE in a short time period, the team conducted 10 days' training on JEEE. It was overwhelmed by the challenge to use a new platform to develop a huge complex system, and this was coupled with the recent enlargement of scope and number of subsystems. The Guangdong Branch added four more developers, but even with these 20 developers the task was still too heavy to bear. The team decided to outsource, and the first choice came to their mind was XYZ Software Company.

In early January 2005, over a dozen developers along with a project manager from XYZ joined the project team and ABC was billed for each man-month at a fixed rate. Mr. Niu and Mr. Miao hoped that the involvement of XYZ company could inject into the project team not only technical experience with the JEEE platform but also project management expertise. XYZ company's technical strengths were also expected to alleviate the project team's pressure due to delay. Starting from this point, the project switched to a joint development mode.

In February 2005, the development of the user interfaces was completed by the four development groups. Each group had completed one subsystem's coding for an incomplete prototype. Domain experts on the team conducted their review and evaluation, and then regrouped the functions into 10 subsystems. The contents on the user interfaces also grew to be more realistic. This throw-away prototype was primitive in many ways, and only one version was created; however, as an effective instrument for the domain experts its impact on the understanding of the business requirements and the future design cannot be overstated. Even though the prototype was "thrown away", its accessory

design elements, such as the list of elements on each user interface, data structure, and data models, were retained and supported subsequent work.

2.4　Composition of the project team

The project team members had two types of background from three different sources. The business personnel were subject experts drafted from the headquarters and regional branches, as were some of the developers. The rest of the technical personnel came from external software firms.

The project management responsibilities remained in the ABC bank's team. The external helpers were placed at the middle tier or below, as they provided input to the course of project management when needed. The project managers initially had high hopes for the project manager from XYZ to make a strong contribution to project management. Unfortunately, he was unable to deliver and was not as competent as expected. In response to ABC's request, XYZ sent another expert in project management to the team.

However, to Mr. Niu's surprise, the XYZ developers seemed without a common process and style. Their two leaders were not able to create a homonymous and collaborative group culture, and the group had shown signs of disintegration, which planted the seed for later labor problems. To further complicate the situation, the two leaders from XYZ got into a power struggle, competing against each other. Mr. Niu decided to assign the latecomer to the project supervision group, leaving the first leader in the platform group. The project supervision group's responsibilities included internal quality control, process regulations, design review, and consultation to the project leaders. Since the XYZ developers did not get along with each other well, they were split into different development groups, which was also thought helpful for them to build a collaborative relationship with the domain experts.

When the need for more developers arose, the senior management at the bank picked two other smaller software companies for the development team as outsourcers, and the number of developers in the team's four groups exceeded 70 in the coding stage. This further complicated the development environment. Mr. Niu restructured the team and promoted an elder and well-respected developer, who was from one of the smaller software firms, to be his deputy. After this round of restructure, each group's responsibilities as well as the group leaders', became clearly defined.

2.5　Cultural fit and human resources management

Given the diverse sources of the team members, Mr. Niu had to deal with a whole series of human resources issues with each group with few resources at his disposal. He wondered why the XYZ developers could not work together as a team because he had previously reviewed the developers' resumes. In the resumes, both XYZ developers were supposed to have worked at XYZ for at least one year and they were JEEE experts. But some members' technical skills were short of expectation and most importantly they could not collaborate as a team.

To ABC's internal subject experts, who were outside of the SDC, Mr. Niu had no effective mechanism of influence, as their income and promotion were beyond his influence. To the developers from the regional branches, they thought and acted like a block, which meant that any penalty to any individual would affect their peers' psychology. Without their active participation, it would be hard to make any progress. Without many resources, it was a challenge to motivate the team members. Mr. Niu could only rely upon his personal charisma and use intangible means to motivate the troop. For example, he empathized with the team members from regional branches for being away from home for so long, understood their desire to return their original workplace, accommodated their home visit requests as many as possible, and wrote to their leaders to praise the excellent performers. If all of these still could not retain someone, he would accept the request for leave provided he could arrange qualified replacement. The intent was to keep an amicable relationship with these individuals so that at least they could be pulled in for help in the future when needed.

To the developers borrowed from partner companies, Mr. Niu's principle was to "show respect and mingle with them". When XYZ developers initially worked in their own group, there was a tendency of communication breakdown with the domain experts. After the restructuring, the personnel from the two sides had better communications and improved their attitudes.

To develop a team culture, project managers stressed the need to forget about they-vs-us mentalities, and to

create an environment of mutual learning and collaboration. Any discrimination, verbal or in writing, was strictly banned. Judgment was made without consideration to affiliations. In usual partnerships in China, the client personnel often feel that they are the boss in the position to give orders without any need to do work and treat the vendor personnel as hard labors to do the work. Mr. Niu's effort to eradicate this habit was initially resented by ABC personnel on the team. He had to engage in person-to-person communication to explain his rationale and resolved the resistance via heart-felt exchange of ideas.

2.6 End-to-end user participation

One of the most distinctive features of the AIS project was that it was allocated with domain experts from many provincial branches of the bank, and they were a core part of the team participated in the project from end to end. The adherence to the user-centered design principles proved to be extremely useful[9]. Other than in the coding stage, they were full participants as the source of requirements throughout all other stages of development when they prepared testing cases. They contributed to the entire process of system development, from requirements definition, construction of the system model and architecture, functional point analysis, prototype of user interfaces, preparation of use cases and test cases, to acceptance tests. They have played an important role in insuring the project a success.

Given the tight schedule, the project management for AIS simplified many necessary steps and procedures for efficiency while significantly increasing the project risk. For example, smooth communication between the subject experts and developers and the frequent feedback from subject experts on design sped up the cycle of iteration.

Exactly one year later after the project kickoff, the project team was ready for user acceptance tests. Subsequent kickoff, preparation, and training, data conversion, demos, and installation of the production environment went smoothly. Six weeks later, the system went online in the Guangdong branch and worked smoothly.

3 Case Analysis

3.1 Critical success factors

As illustrated in the case, the joint ISD is necessary as the bank has not enough internal manpower and expertise and the bank was ill-prepared for the task. The project team had done some right things and made mistakes in the process of completing the difficult task with reasonable success. A number of factors had contributed to the outcome.

First of all, the bank was completely in charge of the project management, including major design decisions and resource allocation, which ensured full commitment and unlimited resources to some extent. Since the bank was completely in charge, it took the initiative to assemble a project team drawing resources nationwide and ensured the domain experts remain in the team for end-to-end participation via administrative power. It would have been difficult, if possible at all, had the project been entirely outsourced.

The case is also a good example of user-driven project management[9], and exhibited the associated benefits. It was not clear in this case whether it was by design or coincidence. However, the end-users' earlier access to the system from the design stage was instrumental for the business process redesign, which would benefit future adoption in terms of feasibility and high impact and return. Moreover, as end-users were part of the team, which enabled frequent and constant communication between the technical team and business team, there was no accumulation of conflicts. In a way, a series of micro adjustments prevented any radical change.

Second, the design of human resources practice and relationship maintenance played an important role. For example, whereas domain experts participated in the development process from end-to-end, and shared leadership with technical leader in each group, such structural arrangement really ensured effective participation[10], where user participation often got marginalized by the dominance of technical people.

Third, effective and end-to-end participation of the domain experts was crucial for both requirements analysis and eventual system adoption. Two factors seemed to have made the user participation effective, subject experts being part of the team, and the short

cycle iterations based on prototypes. The throw-away prototype with user interfaces and other elements helped tremendously in later stages.

3.2 Potential pitfalls

There were several pitfalls that seem unique to joint ISD described in the ABC Bank case, and many valuable lessons can be learned from the case. First, one of the preconditions for synergy from a joint ISD project is cultural comparability and sharing. There is a high complexity in managing team members of various knowledge and education backgrounds, work experiences, and interests. This necessarily entails extra effort to manage, which consumes valuable resources and could be a distraction. The project management needs to be skillful in human resources management and mindful of potential cultural conflict.

Second, as in any outsourcing project, the selection of vendor partner is important. The ABC Bank was careful with the vendor selection process and did a good job to monitor the work. The bank went through due diligence check of the potential vendors and the employees were assigned on the project. Unfortunately, this effort was still not enough.

Third, the client must possess contract management experience. Unfortunately, this was not done in this case and a lesson was learned. Furthermore, the client needs the experience to manage outsourcing relationships, e.g., the ability to anticipate and manage potential risks.

Fourth, having the client in full control of project management might limit the motivation and the partners' knowledge and experience sharing, which is part of the reason for outsourcing. Therefore, the responsibilities and the role of the partners need to be defined in advance to fully benefit from a joint ISD, to draw synergy. In this case, the external partners' involvement was reduced to individual contract work. ABC Bank benefited from the technical skills of the individual developers from XYZ and some project management know-how, but did not get much from management consulting and business process redesign.

Finally, with the client driving the project management, there is no hard constraint on budget and schedule as in a contract for a completely outsourced project, and the chance of budget and schedule overruns becomes real. In the AIS case, there was a three- to four-month delay. When the contracted developer was billed at 20 000 RMB per man-month, with 30 developers, this item alone caused millions of RMB over budget. The delivery schedule was internal and not firm for a back-office application.

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