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IT PROJECT RISK IN HONG KONG

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Abstract

This study investigated the project risk in information systems design and development in the context of Hong Kong. While a large majority of the past research studies was conducted using the Delphi method, multiple case study research methodology was employed in this study in order to provide compelling evidence of the phenomenon. Another novel approach was the application of the causal mapping technique to analyse the cases. This technique enabled in-depth analysis of the research results. The findings extend prior models of software project development risk and show some of the subtle relationships among major model components.

Keywords: System Development, Software Project Risk, Hong Kong, Global Information Management

1 INTRODUCTION

Facing triple constraints (scope, cost and schedule), no project is guaranteed success. Regardless of their nature and scope, a large majority of Information Technology (IT) project results in failure (Keil 1995; Keil et al. 1998). “No countries are immune.” (Sauer 1999 p.280). For example, in a survey among IT project managers, only 41% of the 236 respondents considered their projects were a complete success (White and Fortune 2002). Another survey indicated that 18% of the projects studied have failed and 53% are challenged (Standish Group International 2004). All these previous studies show that most IT projects are likely to fail.

Fortunately, these studies also suggest that it is possible to identify and analyse project risk in the development phase to prevent the situation from getting worse. Much effort has been invested to propose methods and tools to project managers to reduce IT project failure opportunity and to raise the success rate. For example, Gotterbarn and Rogerson (2005) proposed a IT project scenario analysis tool, Software Development Impact Statement (SoDIS), to assist project stakeholders identify the risks which possibly may appear in their IT projects. Hartman and Ashrafi (2004) developed the SMART Project Planning framework for effective, holistic, integrated and risk sensitive project planning. Beranek et al. (2005) offered project leaders a set of guidelines in managing virtual project teams.

The purpose of this study is to identify the risks affecting project performance in the development phase. In particular, this study focuses on the situation in Hong Kong, a city characterized by its unique mixture of Asian and Western cultures. Consequently, some of the risks that face practitioners in Hong Kong may be unique to that environment, while others span across IT practitioners universally.

The paper is presented as follows. Section 2 outlines the background of the study while section 3 describes the research methodology and the data analysis procedure. Research findings and discussion are reported in Sections 4 and 5. Finally, we conclude with discussion and limitations of the study.

2 BACKGROUND

In the development phase of IT projects, the ultimate concern of project stakeholders is the project performance. “Project performance” can be defined as the “efficiency and effectiveness with which a software development project was completed”, which is captured by two dimensions: process performance (i.e., how well the process of software development process go) and product performance (i.e., how good the outcome are) (Barki et al. 2001; Na et al. 2004; Wallace et al. 2004). It can be broken into finer categories: schedule, budget, quality of the system, business value, and satisfaction with the project team (Kirsch 2000). Sometimes the expected benefits are not thoroughly realized until a long period of time. Different project stakeholders have different levels of satisfaction towards to project. Therefore, in this study, we examine only the former three dimensions of IT project performance, which are time consumed, cost spent and the quality of the project outcomes.

Project risk is the probability of an unsatisfactory outcome (Barki et al. 2001). Risks are factors that negatively affect project performance. There is an assumption held in IT project risk management studies. Identification of what causes project failure represents an opportunity to control risk by eliminating these potential threats to IT project success (Sauer 1999). Therefore, project risk study is of significant concern to IT project managers. Project managers are eager to take appropriate countermeasures to prevent project risks from present. IT Project Risk Management processes include risk management planning, risk identification, qualitative risk analysis, quantitative risk analysis, risk response planning, and risk monitoring and control (Project Management Institute Inc. 2004). To be successful, the project team should be committed to addressing the management of risk proactively and consistently throughout the project.

3 METHODOLOGY

Delphi method was used extensively in prior research to identify the IT project risks (e.g., Keil et al. 1998; Keil et al. 2002; Moynihan 1997; Schmidt et al. 2001). However, research conducted by Delphi method is likely to suffer from the shortcoming that the respondents report the items they can *think* of, rather than what *actually* happens in the real world situation. Besides, findings generated from Delphi method have limited specificity. All the factors identified may contribute to the topic in question, yet the different magnitudes of their impact may not be captured (Gotterbarn and Rogerson 2005). In order to capture observation of important variance between different cases, Delphi method is not selected as the research method for this study.

The case study, in contrast, allows the respondents to provide not only the essence of the topic in question, but also the context from which the essence is extracted. While the Delphi method results in removing outliers, the case study captures these outliers. Compared with the Delphi method, case study research methodology allows a researcher to take a "close" look at his research question in its real context so that a wealth of detailed data on a small number of individuals can be generated (Patton 1990). It has become more and more popular in the domain of project risk study (e.g. Elkington and Smallman 2002; Chapman and Ward 2004; Dhillon 2004; Taylor 2005). As a particular phenomenon is expected across several cases, multiple case study research design even makes the findings more robust through literal replication (Yin 1994). The use of multiple case study research methodology is anticipated to enhance the depth and nuance of the study.

3.1 Data Collection

Data collection was done in Hong Kong. Setting itself on course to become the centre for innovation and technology in East Asia (HKSAR Government 2004), Hong Kong is highly developed with excellent telecommunication infrastructure and has a high penetration rate of information technology. The city has witnessed a growth in the penetration and usage of information technology in the business sector since 2000. In 2005, 54.7% of its establishments had Internet connection (HKSAR Government 2006 p.32). Hong Kong was the first major city in the world to have a fully digitised telephone network and to implement operator number portability.

The main data source was interviews with the project managers from business organizations of various sizes in Hong Kong. Companies of various scales and natures were selected in order to capture of the common factors of IT project risk in the development phase regardless the size of these projects. Respondents were asked to focus on a particular recent IT project they were involved in and to report the details in that particular project. Each interviewee was asked the same set of questions to ensure consistency and validity of the final results of the study. Clarifying responses were given to interviewees expressing uncertainty about any of the interview questions. All interviews were taped and transcribed for detailed analysis. Each interview lasted for about two hours. Relevant documents are collected, including correspondence, administrative documents, and company web sites. Triangulation of evidence ensured that facts were gathered from various sources and conclusions were drawn on those facts.

3.2 Data Analysis Procedure

The data collected was analysed and summarized into data displays like tables, matrices or graphical representations using the techniques introduced by Miles and Huberman (1994). In particular, we employed a technique called "causal mapping" in this study. Also known as "cognitive mapping", this qualitative data analysis method has been receiving much attention recently (e.g. Nelson et al. 2000; Al-Shehab et al. 2005; Larsen and Niederman 2005; Siau and Tan 2005). It occurred in two stages. First, causal statements (or inferred causal statements) were identified by scrutinizing each interview transcript. For each statement we identified "cause" and "effect" labels and grouped them into a pair of (occasionally multiple) causal relations listed in a table. The purpose of this step was to recognize the "independent variable" and "dependent variable" as well as to identify entities that influenced the value or existence of other entities. Second, with the aid of a graphical design tool, these relations

were transformed into a graphical representation in which bubbles labelled with factor names were linked by arrows to indicate the sequential causal relationship among the factors (Larsen and Niederman 2005).

These labels were subject to change in the mapping phase for either of two reasons. First, in the context of an interview, the meaning of one particular statement sometimes showed a slightly different orientation from that of another. Second, slight differences in phrasing might be collapsed into a single descriptive term. The latter case occurred often in wording of “dependent variables” such as project risk. Similarly, complicated, sometimes indirect, causal relationships were broken down to multiple bubbles linked by arrows to show the sequential causal relationship. These causal relationships were then grouped together to show the whole picture of the case, in which all the factors ultimately point to the last bubble “high project risk” (see Figure 1 as an example). The visual display showed all the cause-and-effect relations as well as the linkages among these relations. This step not only helped to describe the case but also helped to develop understanding and observation of deeper relationships. All cases went through the steps described above.

The unit of analysis was the IT/IS project risk factors. The positivist perspective was taken in analysing and interpreting the data collected. A two-level analysis approach was employed to identify the project risks; within case analysis portrays the situation of individual projects while cross case analysis provides a broad picture of the phenomenon.

4 RESULTS

The data collection process resulted in nine case studies with detailed information, including system development projects of different natures from various industries and of different scales. Some projects were system upgrading and some were new system development. These projects lasted from 3 months to 3 years. The number of project team members ranged from 3 persons to more than a hundred. Information regarding each of the cases is listed in Table 1. Detailed descriptions of the case are presented in Table 1.

4.1 Overall Analysis

Risk factors under each category are identified for the nine cases. These factors affect project performance, in terms of time (schedule overrun), budget (substantial cost), and quality (delivery of fewer functions than promised). Some items with similar meanings are grouped into one item. For example, the three items in user risk (i.e., users with negative attitudes toward the project, users not committed to the project and lack of cooperation from users) are represented by *negative attitude and behaviour of users*. The research finding is summarized in Table 2.

4.1.1 Organizational Environment Risk

Mistrust, organizational politics and conflict of project stakeholders threaten system development projects (Ewusi-Mensah and Przasnyski 1991; Turner and Muller 2004) in terms of insufficient human resource, delay delivery of project deliverables (Yetton et al. 2000) and ultimately increase in project cost (Ewusi-Mensah and Przasnyski 1991). Dhillon (2004) illustrated in a case study why the power relationship is a key factor in IT project failure. He came up with the conclusion that an adequate consideration and understanding of power vested in the system is essential for any successful IT implementation (Eisenhardt 1989).

Political issues appear more or less in every office. They usually lead to other undesirable consequences including miscommunication, disputes, unwillingness to cooperate, and competition for limited company resources such as human resource and investment capital. Conflict between departments is best illustrated in case C where the in-country leader in Singapore and the regional leader experienced conflict regarding in which country the pilot project to implement the new help desk system should be located.

In Case D the respondent also suggested how *change in organizational structure* (i.e., merger) can make the project scope larger than expected. This results in a double of the project development time and a higher level of difficulty in implementing the project. This is also the reason they had to fail to research the target of trimming down 10 authenticated sources of reference data but to compromise with the current 50 data repositories.

4.1.2 User Risk

In some situations, change in an organization's IS, no matter whether it is the installation of a new system or a system upgrade may cause change in related business processes. Human beings tend to be resistant to change. Or more precisely, they tend to be uncomfortable with the unclear, possibly negative, consequences that accompany change. In IT project management, *users' resistance to change* is an unfortunate consequence of unclear purpose of the change, doubt and lack of organizational incentives to live with the change.

McKeen and Guimaraes (1997) praised the importance of user involvement to project success. They even listed out 11 roles by users during system development with high complexity. End users' support is crucial to project success (Jiang et al. 2000; Yetton et al. 2000), even if it is a high-risk project (Barki et al. 2001). In particular, communication between the project team and the end users is decisive to project performance (Turner and Muller 2004). However, not many users are enthusiastic in contributing their valuable time to system project development. Some even have a negative opinion towards the new system, probably they do not want to accept any changes. According to the interviewees, *users' negative attitudes* toward the project usually are reflected in defiant behaviours. They refuse to commit to the project, consider it is a waste of time to do user testing and become unwilling to take training courses, leading to harmful results to the project, including inadequate communication, insufficient feedback for refinement and difficult training process. Our finding is consistent to that of Schmidt et al. (2001) in which the Hong Kong panellists rank the three items related to user risk (i.e., lack of adequate user involvement, failure to gain user commitment, and lack of cooperation from users) much higher than other risks (ranking 2 to 4 out of 15 items).

4.1.3 Requirements Risk

Changing project size and scope causes implementation problems and project risks. In Case A, after the two mergers, the project size doubled since it was an enterprise scale project. Every time there was a merger, everything had to be suspended. When the project team resumed, substantial amounts of the system requirements had been changed forcing the development team to return to square one and start again.

Developing an information system based on a set of *unclear or incomplete system requirements* is another threat to project success. The end users in Case F were dispersed in all the public hospitals in Hong Kong so that gathering users' requirements became a difficult task. Even worse, they have different procedures in reporting incidents. Hence, the system development team had to compromise users' different points of view in submitting the incidents and revise all the requirements in order to find the best way to implement the system.

4.1.4 Project Complexity

Contrary to our expectations, project complexity in terms of technical factors did not contribute significantly to project failure or abandonment (Ewusi-Mensah and Przasnyski 1991, Pinto and Slevin 1987, Yetton et al. 2000). In fact, human behaviour is far more important in determining the project outcomes (Thamhain 2004). Project team members change their behaviour to overcome technical obstacles and adapt to different situations. Matching between system developers and the technology is not an issue in our findings. The interviewees emphasize that they are flexible as reflected in the way they selected the system development tool according to the knowledge and skills of the system developers. For example, if a system development team is not familiar with the programming language C++, there are other programming languages that can cause the same results and achieve the

same goal. They may use Java. Besides, a project manager tends to select the system platform, computer language, etc. of the system based on the knowledge and ability his human resource.

Contrarily, factors under this category are related to the nature of the project. System development projects vary in scale, scope and nature. Complicated projects are exposed to a higher inherent risk of abandonment, redirection, escalation (Keil et al. 2000; Zhang et al. 2003), or, usually, priority shift (Calisir and Gumussoy 2005). Risk is somehow inevitable simply because the inheriting complexity of the project for their size and features. *System complexity* thus measures the complexity of the system being designed and built (McKeen and Guimaraes 1997). Complex project usually implies larger numbers of components in the system, larger numbers of relationships between components, and more pressure to exactness in actions and sequencing (for example, an accounting system that must calculate taxes on each purchased item before totalling is more complex to render than one where the calculation of taxes can proceed or follow totalling.)

The unique nature of each project may cause different risks that need project executives' full attention. For example, the project in Case B, which is building a new subscription management system, implies that phase by phase migration and parallel run of the existing and the new systems is essential to ensure smooth transition. However, it also implies that the project must take longer time to finish. The longer the time a project takes, the more likely the changes in the resources available (including monetary resource and human resource), end user requirements and expectations and the external environment. Project completion is a negative function of project size (Yetton et al. 2000). Furthermore, schedule overrun is the strongest predictor of budget overrun (Calisir and Gumussoy 2005). *Large project scope or scale* thus causes higher risk indirectly. Unfortunately, not much can be done to alleviate or even solve the problem. Another negative consequence resulting from large project scale is illustrated in Case D:

"It's always difficult to maintain a top priority project. It's because if the accessories of your project duration is long, the priority will fluctuate with time. Resources allocation also depends on priority. Whenever your priority is lower, your resources will be diverted to do other things. I encountered exactly the same [problem]. Actually it's not me, it's my counterparts in New York and UK. Yes, why we are 3 teams It's because we can do round-the-clock support and we have the whole firm integrated. But the problem is, they always have different priorities, then the resources are diverted. For example, if New York team didn't finish a job, they passed it on to London. And then London could not complete, they passed it on to Hong Kong."

Last but not least, *poor information system infrastructure* due to purposeful or unintentional damage, obsolescence or poor maintenance of system infrastructure (such as data warehouse) is likely to increase project risk or even lead to project failure. For example, the project in Case A involves extracting customer information from multiple databases which are updated a million times every minute. Even worse, the definitions of the same piece of data in the databases are different. Outdated metadata resulted from poor maintenance of the data warehouse increases the level of difficulty in project development and thus doubles the risk of failure. This increases the level of difficulty and may result in longer delivery time. Similarly, the project team in Case D faced inconsistent interpretation of the meaning of the same data fields from different databases when they intended to combine these data sources and build a few authenticated repositories.

4.1.5 Planning & Control Risk

The majority of project failures originate from management issues rather than technology issues (Scott and Vessey 2002). Poor project management increases the chance of project failure. Lack of effective project management skills and methodology is a big sin of project managers. Syndromes of poor project management include project administration not properly addressed, lack of version control mechanism, fail to achieve milestones, unaware of overall project status, etc.

Ineffective change management is one of the sins. Each project needs a process to manage change. Basic change management measures include involving, informing and motivating project stakeholders (mainly the end users who are mostly affected by the project).

Effective project planning is decisive to project success or failure (Hartman and Ashrafi 2004; Barki et al. 2001). *Poor project planning* refers to the inadequacy in the planning process. Users' requirements are not fully captured in user requirements analysis or impact on a particular stakeholder is incorrectly estimated and is not emphasized enough in project impact analysis, as in case D:

“Whenever we do our project impact analysis, we only understand how much work we need to do from our side, not from their side. At that time, we did not sufficiently emphasize how much work they need to do. Whenever the other application system needed to be changed, there was a big debate around the all lines of business.”

In addition, project managers should touch base with stakeholders and other departments which are involved in the project. As a key to project success (Belout and Gauvreau 2004), communication means open-ended, dyadic exchange of ideas. *Insufficient communication and cooperation* from project stakeholders is likely to result in poor team relationships misunderstanding of the each other's needs, failure to get user commitment, and might lead to project failure.

4.1.6 Team Risk

Team risk is the least consideration of the project managers in the cases. Only one interviewee in case A suggested that *inexperienced colleagues* might be a threat to his project, which was then solved by provision of training and job rotation.

Indirect communication (vis-à-vis face-to-face) is somehow inevitable in projects that involve team members who do not work in the same office. This is especially significant projects that involve regional teams, such as in cases C, D and H. *Ineffective communication* may trigger other problems in system design and development such as misunderstanding of user requirements, erroneous system design, unrealistic milestones and deadlines, etc.

4.1.7 Extraneous Risk

In addition to the factors described above, extraneous risks are factors outside the scope of the project and the organization. Inheriting limitations determined by unique project nature and scope, industrial habit and tendency (for example, financial institutions are tend to be conservative and do not accept open source systems), poor performance of the project's consultant or vendors, and the fact that the organization implements multiple large-scale projects at the same time are typical examples of extraneous risk factors. Unfortunately, in some conditions, nothing can be done to solve the problem. These factors are not avoidable (Sauer 1999 p.291). Even high quality project management tactics cannot eliminate the risk and guarantee promising project performance. For example, case D respondent explained in the interview how the *industrial habit and tendency* affects his project:

“Something is out of our control... In some periods of time, say, year-end, most systems have to be frozen. That's why at the year end, we do documentation and administration work only. Year-end period is from mid-November to mid-February – nearly 3 months. Year-end is very important to the bank. That's why we cannot control that. If you count that as ¼ of the year, you cannot proceed on this period – the development period is only 9 months! If 18 months is needed to complete the project, the actual time needed is 2 years.”

Different organizations have different procedures for implementing IT projects. The only commonality may be that they all suffer from organizational risk factors. Doherty and King (1998) gave an apt description of organizational risk:

“An organizational issue (in the context of information systems development) is any distinct area on the interface between a technical system and either the characteristics and requirements of the host organization or its individual employees, which can lead to operational problems within the organization.”

Organizational culture decides the way employees complete their tasks from strategy planning to daily operation. There is no exception in IT system development. A system development team deals

with different stakeholders in the whole project from user requirement analysis to pilot testing to post-implementation maintenance and support. An example appears in Case F where the system analyst found it difficult to consolidate the user requirements collected from various subordinate institutions, especially when they have very different procedures for doing the same thing. Therefore, projects like this are exposed to the attack of different organizational issues that may cause project failure.

Similarly, people with different cultural background have different mindsets. After all, allocating human resource and having the team work seamlessly is the most difficult part in the art of management and in IT projects. For example, in case C, staff members in Mainland China tend to forget the things they learned in the training sessions. Out of the project team's expectation, they did not ask the team for support and problem solving. Instead, they used their own experience and knowledge to solve the problem, which may result in a disaster if this problem is not discovered at the early product delivery stage. The respondent in case C is faced with another challenge caused by cultural difference:

“Another problem is when we worked with people in the US and Europe. They had different culture and working style. One time we were at a meeting discussing what options we would put in the system for Asians to choose. People in Asia were engaging to the discussion while people from London and France relied on us to make the decision. People in US already had their mind and idea of what to do. So they were not very willing to listen to suggestions.”

5 DISCUSSION AND CONCLUSION

This research has some theoretical implications to researchers as well as practical implications to project managers. When investigating the risks, we found that the some of risks are interrelated and act together to negatively affect the project outcomes. For instance, poor planning also implies that some stakeholders are not given sufficient opportunities to voice their needs. Users may see the implementation of the new system as a mandatory order rather than an initiative to improve the efficiency and effectiveness of their daily tasks. Lack of adequate user involvement may result in imprecise system requirements and poor user participation, reflected in negative behaviours such as incorporate attitude, unwillingness to perform user testing, and unwillingness to attend training sessions. Therefore high levels of planning and control risk are likely to trigger high user risk.

However, on the other hand, in the example described above, the project manager may admit that poor planning is a weakness of the project rather than a risk. Even if it is a risk, it may not necessarily result in failure. The perception whether all end users should be given chances to voice out their needs depends on the role of the stakeholders. The management may perceive that there is enough communication to the end users. Besides, insufficient communication may not necessarily lead to project failure. On the other hand, preventing or even eliminating these project risks does not guarantee project success. Success or failure depends on the eye of beholder. There are no absolute well-recognized standards or perfect formulae to measure the level of success. Whether a project is disaster or triumph depends heavily on the definition of “success”. For example, allocation of overhead to a particular project may run its costs well above its benefits, whereas corporate assumption of such overhead may show the same exact project to be completed well within budget and showing a strong return on investment. Following the same vein, Glass (2005) and Jorgensen and Molokken-Ostvold (2006) questioned the high IT project failure rate and the high percentage of budget overrun reported in the CHAO report (Standish Group International 2004). Therefore, the issues identified in this study are just project risks that precautions should be taken before they really become a threat and lead to project failure.

Although causal mapping is a useful technique in data analysis that enables yielding of quality outcomes, it suffers from some weaknesses. Sometimes it is not easy to present non-linear relationship or moderating effect in one single diagram. Further, the more mediating factors are involved, the more difficult it is to express the relationship in a simple and easy-to-understand method. Another challenge is the standardization of terms across cases. In integrating the findings of several cases, it is sometimes the case that different respondents use different terms to refer to the same object

in describing the same phenomenon. In other situations, they use the same term but under different contexts. It relies heavily on the professional judgment of the researcher to iron out the inconsistency. The third issue in using causal mapping is that it is important to distinguish the symptoms and the underlying factors. The symptoms of a phenomenon may vary from case to case, but the underlying factors are the same.

The aim of this study is to examine the IT project risks as experienced in the Hong Kong context. The findings shed some light on the issue of cross-cultural collaboration of the project team by reporting the practices project team leaders took to handle this issue. Future research should investigate comprehensively the role of culture in projects involving multiple regional project teams. Computer system development and maintenance is a labour-intensive industry. As it is a global trend to outsource IT projects to regions with lower labour cost but high technology such as India and some cities in China, IT project executives are advised to equipped themselves with techniques to deal with the cultural issue. Further studies in IT project risk management are anticipated to provide them some lessons learned and guidelines.

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