TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDIXES

LIST OF APPENDIXES

CHAPTER 1
INTRODUCTION

1.1 General Content

In the third industrial revolution, one of the most useful innovations is the computer science. As a new technology, computer science has changed a lot of our life. It can be found everywhere in your daily life now. And software technology is one of the fastest growing industries in developed countries (Hartman and Ashrafi, 2002). Software projects can implement a rapidly expanding range of equipment, applications, services, and basic technologies that provide information to support the operation, management, analysis and decision-making functions within an organization.

But it isn't doing very during its development. In 2004, the Standish Group International study of 9,236 IT projects revealed that 53% were late or over budget, 18 % were abandoned, scaled back or modified, and only 29% were completed on time and on budget. Since a large proportion of the cause of late, over budget delivery of software are management related, the research for taking managerial actions to solve the problem has been important. Software project risk management is the key to reduce the chance of

failure. And among all the process of risk management, the identifying and analyzing can be the most important parts of all. (Boehm. B 1991)

China is the biggest developed country in the world. According to the National Bureau of Statistics of China, in the year 2002 the software industry increased from 1359 enterprises to 3740 compared with the year 2001. The annual sale in software industry increased from 2 190 472 RMB to 5 855 742 RMB. But it is still a new burgeoning industry in China, they even don not have statistics figure in the year 2000. A lot of management skills such as project management have been just introduced in Chinese software industry.

We found some Chinese and Canadian experts in software projects to help us to do this cross-culture research. This research will try to find out a list of risk factors and the key risk factors in software projects in the frame of project management.

1.2 Research Background and Motivation

In contrast to on-going, functional work, a project is "a temporary endeavor undertaken to create a unique product, service, or result" (A Guide to the Project

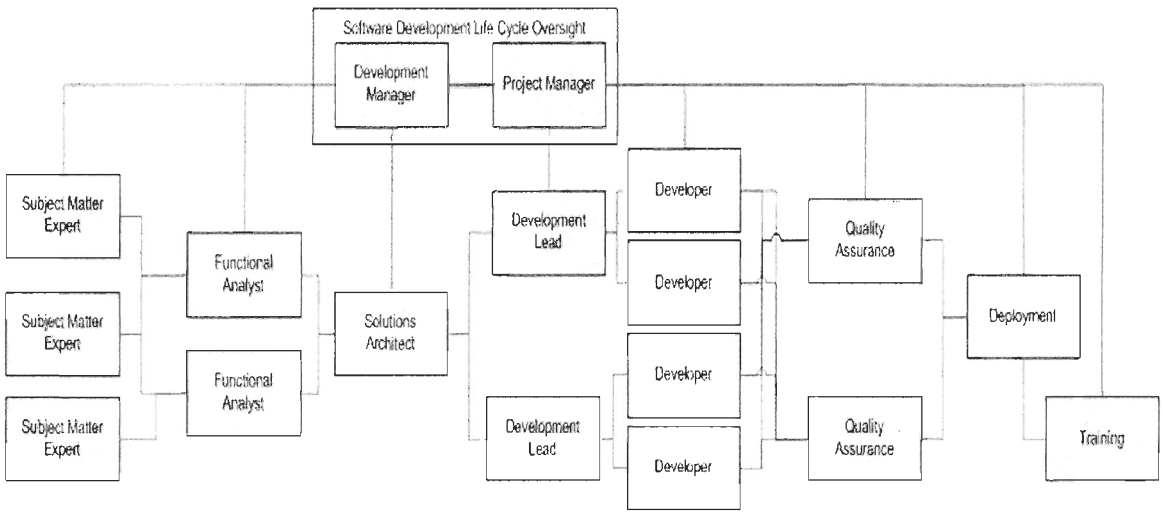
Management Body of Knowledge (PMBOK® Guide, Third Edition, Project Management Institute, 2004, p. 5). Projects are temporary because they have a definite beginning and a definite end. They are unique because the product or service they create is different in some distinguishing way from similar products or services.

What's the project management? Project management is the application of knowledge, skills, tools and techniques to project activities to meet project requirements. Project management is accomplished through the use of the processes of initiating, planning, executing, monitoring and controlling, and closing. The project manager is the individual responsible for managing the project. Project management is the discipline of defining and achieving targets while optimizing the use of resources (time, money, people, space, etc). Thus, it could be classified into several models: time, cost, scope, and intangibles.

Software Project Management is a crucial part of Project Management. Because of more uncertainty of software Projects, it usually means more risks and more potential costs, and the Risk Management of software Projects goes more important and difficult. The research applies to analysis the Risk Source of software Projects, and also offers Risk Resolution for each Risk Source, so we can make it clear about the Risk & Risk Management of software Project.

Within the context of the software development process the project management role is responsible for driving the work through the process and to completion. Starting with the earliest requirements discovery sessions and ending after the training has been completed, the project manager is the one role that should be consistent throughout. Project managers work with both the development team and with business stakeholders to ensure that what is being built will match what the customer expectations and that this development occurs within the expected time frame.

Figure 1.1 Project manage in software development process (Reference 24)



Risk is defined as "The possibility of suffering harm or loss; danger." Even if we're not familiar with the formal definition, most of us have an innate sense of risk. We are aware of the potential dangers that permeate even simple daily activities, from

getting injured when crossing the street to having a heart attack because our cholesterol level is too high. Although we prefer not to dwell on the myriad of hazards that surround us, these risks shape many of our behaviors. Experience (or a parent) has taught us to look both ways before stepping off the curb and most of us at least think twice before ordering a steak. Indeed, we manage personal risks every day.

Risk management is becoming recognized as a best practice in the software industry for reducing the surprise factor. While we can never predict the future with certainty, we can apply structured risk management practices to peek over the horizon at the traps that might be looming, and take actions to minimize the likelihood or impact of these potential problems. Risk management means dealing with a concern before it becomes a crisis.

The term risk management is applied in a number of diverse disciplines. People in the fields of statistics, economics, psychology, social sciences, biology, engineering, toxicology, systems analysis, operations research, and decision theory, to name a few, have been addressing the field of risk management.

Kloman summarized the meaning of risk management in the context of a number of different disciplines in an article for *Risk Analysis*:

What is risk management? To many social analysts, politicians, and academics it is the management of environmental and nuclear risks, those technology-generated macro-risks that appear to threaten our existence. To bankers and financial officers it is the sophisticated use of such techniques as currency hedging and interest rate swaps. To insurance buyers and sellers it is coordination of insurable risks and the reduction of insurance costs. To hospital administrators it may mean "quality assurance." To safety professionals it is reducing accidents and injuries.

For a risk to be understandable, it must be expressed clearly. A statement of Software Engineering Institute (SEI) must include

- A description of the current conditions that may lead to the loss
- A description of the loss

The SEI Software Risk Evaluation (SRE) Service is a diagnostic and decision-making tool that enables the identification, analysis, tracking, mitigation, and communication of risks in software-intensive programs. An SRE is used to identify and categorize specific program risks emanating from product, process, management, resources, and constraints. The program's own personnel participate in the identification, analysis, and mitigation of risks facing their own development effort.

Risk identification is a creative process, which has to be done by risk management personnel. It cannot be replaced by any software. Whether software project managers choose to employ common checklists, but at the end managers will need to think through all processes and identify the steps that can become subject to a threat. Doing risk identification will help managers to get a feeling of the uncertainties in their business or project. They will learn what uncertainties may be combined to a single one or which uncertainty contains different risks and therefore should be divided into separate risk. The task of risk identification is crucial to success of risk management. The software project managers should spend time and thoughts on this. Consistent with the views of March and Shapira (Managerial perspectives on risk and risk taking 1987) regarding management risk, we define a risk factor as a condition that can present a serious threat to the successful completion of a software development project. Though several lists of risk factors have been published in literature (eg: reference No. 2, N0. 3, No. 37), we believe our understanding of the typical risk factors is still not very correct. Because most of the lists are relatively old and their data collect and analyze method is questionable.

1.3 Contributions and Benefits

During their management of Software Projects, the managers would always ask what are the typical risk factors in the software projects? Which risk factors would they consider more deserving of their attention? Which strategies are more effective in mitigating risk, given a particular set of risk factors?

In this research, we will try to figure out the first two questions, as the first two questions are the keys to continue further study and development to answer the third question. We will report a new list of risk factors and make a rank of these risk factors. These findings will help the software projects managers to have a list of risk factors to follow in the risk management process, and particularly pay more attention to the top ranked risk factors. Besides as our research is based on a cross-culture study, we hope our research can help the mangers to deal with different cultures in their software project.

1.4 Document Structure

In the first part, the related research and methodology used to achieve in this research are presented. The second part shows the proposed researched design and methodology used in conducting the whole study. Thirdly we present the major finding

of the research. Finally, the last part presents the application and the conclusion of our research and the potential for future research.

CHAPTER 2
LITERATURE REVIEW

2.1 Risk Theories

2.1.1 High Failure

Project failure is an ongoing issue in software projects. During the relative infancy of computerized information systems in the 1960s, the difficulties of software project management and associated project failure were traced to inadequate system definition, improper vesting of responsibility, inherent complexity and fascination with technology to the detriment of meeting business needs (Gale 1968). Recent authors have concluded that software projects fail due to the inconsistent use of estimation metrics, complexity in both the design and implementation of software, insufficient experiences staff available to complete project tasks, inadequate project management (Glass 1998; Reel 1999).

Another explanation for the high failure rates in software projects is "... that managers are not taking prudent measures to assess and manage the risks involved in

these projects" (Keil 1998, p 76). But taking prudent risk management measures may be hindered by the complexity encountered when attempting to collect sufficient information to develop an informed judgment. It is rarely sufficient to simply ask other project participants for their views about a project's status and its associated risks. Understanding a project's risk characteristics requires reliable information. To acquire this information, a manager could be faced with the overwhelming task of examining a mountain of project documents. This examination could include reading and analyzing project schedules, budgets, status reports and meeting minutes as well as assessing the status and quality of various types of project deliverables.

One research response to the problem of software project failure is the software project risk steam. Gartner (1995) believes that the goal of studying risk detection is to facilitate identification of risks that may lead to larger problems in the future. Heemstra and Kusters (1996) and Lister (1997) both emphasize the relationship between effective risk management and increased probabilities in the success of a software project.

As project management and project control principles and practices become familiar and established, the technology for estimating, budgeting, planning, and scheduling are becoming well understood and are coming into everyday use. In many

organizations, upper management is now expanding the envelope to include risk management as a routine requirement in any project management effort.

2.1.2 Risks varies by project and activity

Many authors have made a well-reasoned case that risks vary by project and that risk management practices must accordingly deal with the specific detail in each case (Lister 1997). Project attributes that have discussed in the literature include size (Moynihan 1997) and activity – maintenance vs. new development (Charette 1997).

Charette et al. (1997) argue that software maintenance risks differ in fundamental ways from new develops. The authors describe a project that endeavors to institutionalize risk management processes for an organization's software maintenance processes. Key differences from new development risk management arise due to the software maintenance project's need to sustain existing system availability while adding functionality. The authors believe maintenance can be an inherently risky activity because application systems may be decades old. Changes to existing software can be complicated by the existence of little or poorly kept documentation and software code that has been subjected to lays of changed. Charette et al. (1997) cite one other

difference between maintenance and new development. The typical risk reassessment cycle of six to eight weeks for new development projects was considered to infrequent to meet the demands caused by the respective and cumulative nature of software maintenance releases (Charette 1997).

2.2 Project management theories

2.2.1 General PM theories

In contrast to on-going, functional work, a project is "a temporary endeavor undertaken to create a unique product, service, or result" (A Guide to the Project Management Body of Knowledge (PMBOK® Guide, Third Edition, Project Management Institute, 2004, p. 5). Projects are temporary because they have a definite beginning and a definite end. They are unique because the product or service they create is different in some distinguishing way from similar products or services.

What's the project management? Project management is the application of knowledge, skills, tools and techniques to project activities to meet project requirements. Project management is accomplished through the use of the processes of initiating,

planning, executing, monitoring and controlling, and closing. The project manager is the individual responsible for managing the project. Project management is the discipline of defining and achieving targets while optimizing the use of resources (time, money, people, space, etc). Thus, it could be classified into several models: time, cost, scope, and intangibles. (PMBOK 2004)

2.2.2 Project Management in Managing Risk

The Project Management role is the first role in the software development process that isn't on the main line. The project manager isn't a person doing "real work." The project management role is one that is designed to help ensure that the software development process works as it is intended. The project management role works closely with the development management role in order to facilitate, encourage and prioritize the process.

The project management role is perhaps the most clearly defined role within the software development process due to the development of project management as a profession.

While the software industry is nascent, the project management industry is enjoying the advancement of a powerful organization in the Project Management Institute. They have assembled a guide to the body of knowledge for the project management profession that is often referred to as the PMBOK Guide. This organization has developed a widely recognized certification, Project Management Professional (PMP), which has both practical experience requirements as well as traditional testing requirements.

Project Risk Management includes the processes concerned with conducting risk management planning, identification, analysis, responses, and control on a project. The objectives of Risk Management are to increase the probability and impacts of positive events and decrease the probability and impacts of events adverse to project objectives. Figure 2.1 provides an overview of the Project Risk Management processes and Figure 2.2 provides a process flow diagram of those processes and their inputs, outputs, and other related knowledge area processes. The Project Risk Management processes include the following. (PMBOK 2004)

1. Risk Management Planning - deciding how to approach, plan and execute the risk management activities for a project.
2. Risk Identification - determining which risks might affect the project and documenting their characteristics.

3. Qualitative Risk Analysis - prioritizing risks for subsequent further analysis or action by assessing and combining their probability and impacts.
4. Quantitative Risk Analysis - analyzing numerically the effect on overall project objectives of identified risks.
5. Risk Response Planning - developing options and actions to enhance opportunities and to reduce threats to project objectives.
6. Risk Monitoring and Control - tracking identified risks, monitoring residual risks, identifying new risks, executing risk response plans, and evaluating their effectiveness throughout the project life cycle.

Figure 2.1 Project Risk Management processes

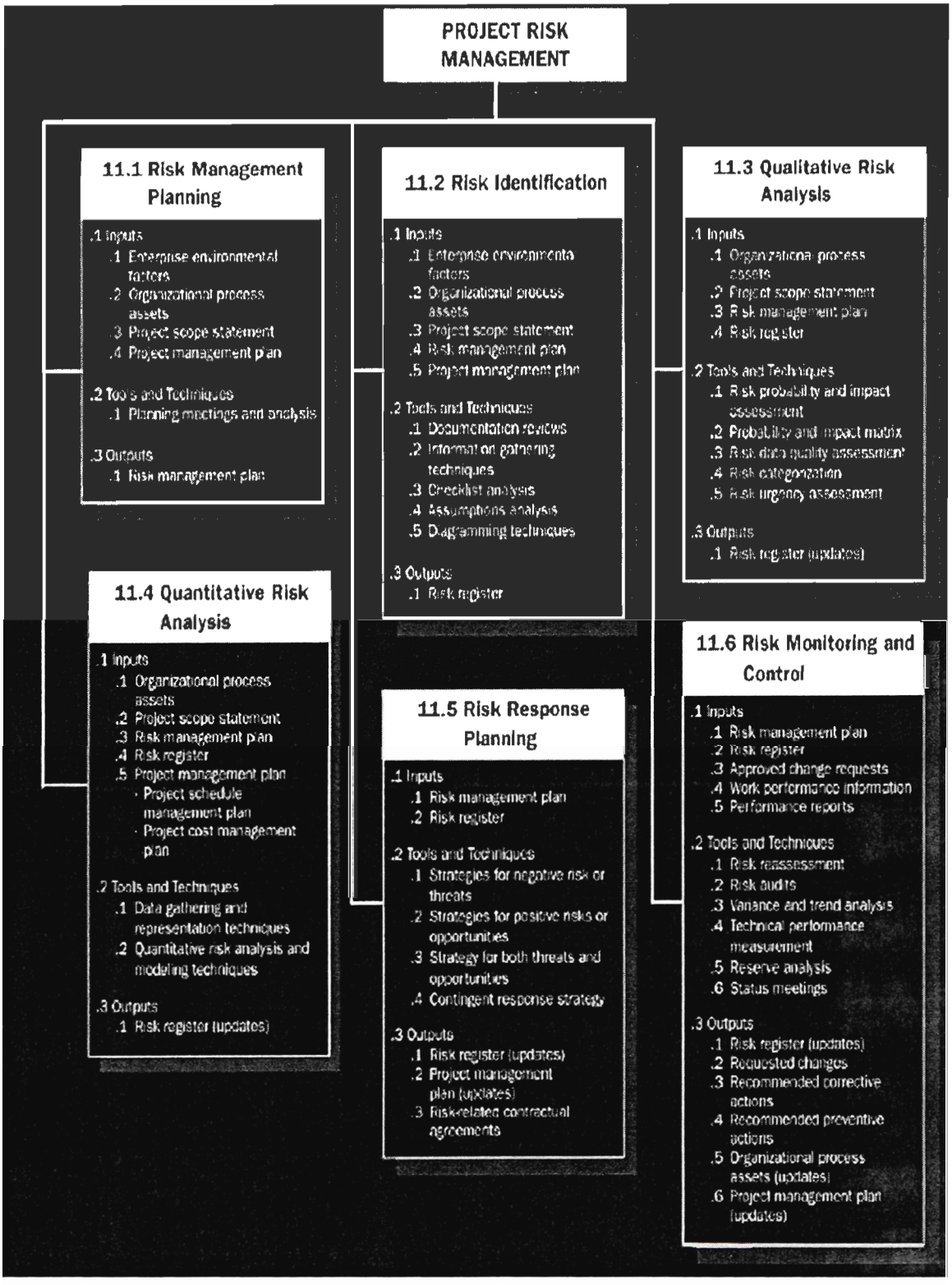
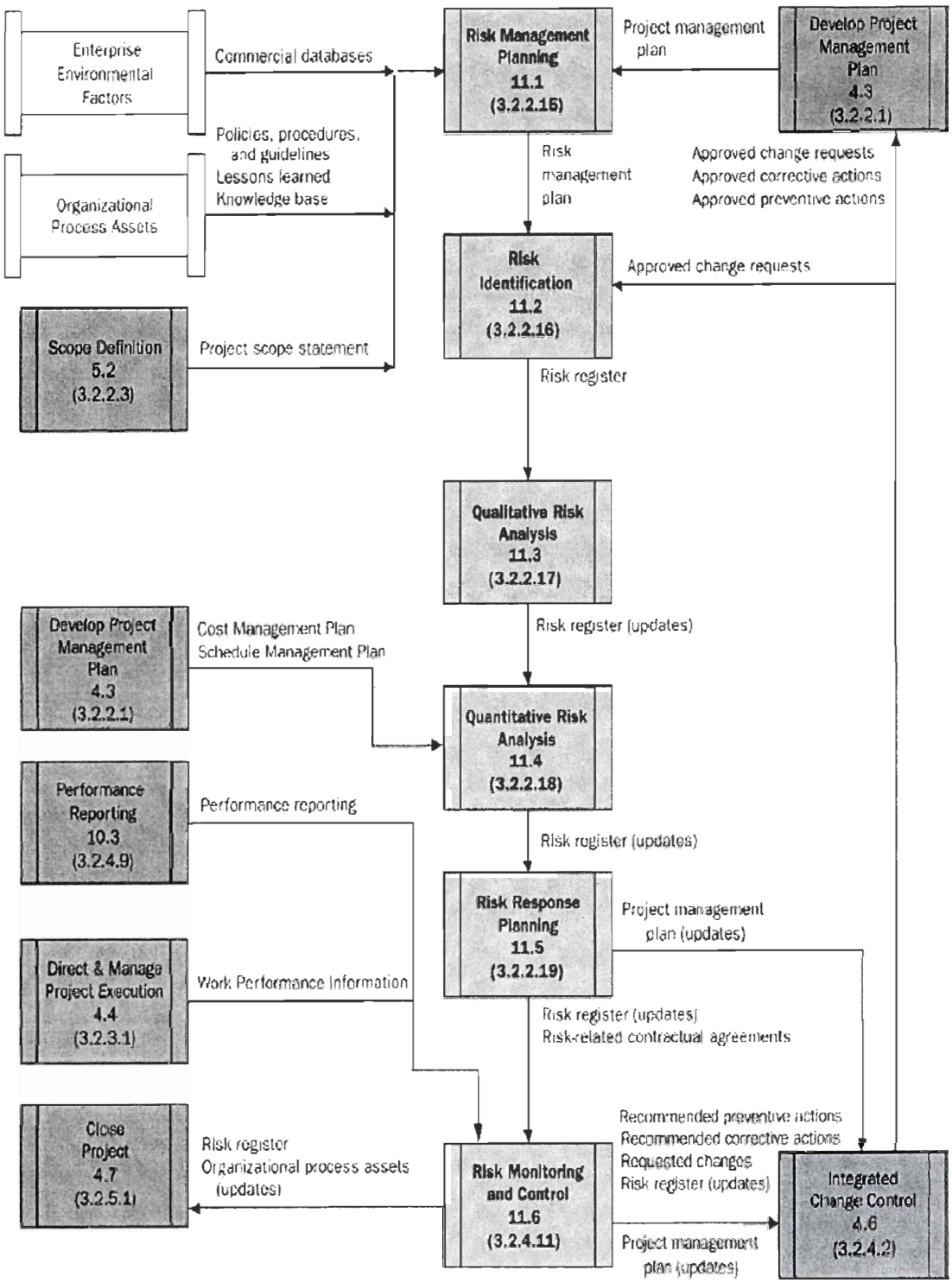


Figure 2.2 Process Flow Diagram of Risk Management by PM



Note: Not all process interactions and data flow among the processes are shown.

2.3 Risk Management Theories

Risk management covers a range of topics and uses a portfolio of tools. The process of risk management covers risk planning, risk identification, risk assessment, risk response, and risk documentation.

Every human endeavor involves risk (Wider and Davis, 1998). A risk has two components-probability of occurrence and the effect of each occurrence. Projects are unique undertakings that involve a degree of uncertainty and are inherently risky (Chapman, 1998; Conroy and Soltan, 1998; Mak et al., 1998; PMI, 2000; Czuchry and Yasin, 2003). Risk in projects can be defined as the chance of an event occurring that is likely to have a negative impact on project objectives and is measured in terms of likelihood and consequence (Wideman, 1992; Carter et al., 1993; Chapman, 1998). Risk management is an essential practice in achieving the successful delivery of SOFTWARE projects (Tuman, 1993; Remenyi, 1999). More specifically, it consists of the following processes (Standards Australia, 1999):

- Establish the context;
- Identify risks;
- Analyze risks;
- Evaluate risks;

- Treat risks;
- Monitor and review;
- Communicate and consult.

The treatment of risk involves the determination of the most appropriate strategies for dealing with its occurrence (Standards Australia, 1999). According to Zhi (1994), there are four main strategies for responding to project risks:

- Avoidance – not undertaking the activity that gives rise to risk.
- Reduction – reduce the probability of a risk event occurring, and/or the impact of that event. Risk reduction is the most common of all risk-handling strategies (Pritchard, 1997).
- Transfer – transfer of risk in whole or part to another party.
- Retention – accept risk and therefore the consequences should it eventuate.

McFarlan (1981) suggested that projects fail due to lack of attention to individual project risks, aggregate risk of portfolio of projects and the recognition that different types of projects require different types of management. Yet, software risk management is either not undertaken at all or is very poorly performed by many, if not most organizations (Remenyi, 1999). A reason for this is that focusing on potential problems

may be viewed as being negative. However, management often wants to instill a positive attitude towards the implementation of software, as it is often viewed as "flagship" for change and subsequent process improvement within organizations.

2.4 Theories of Risk Management in Software Projects

Numerous attempts have been made to advance the understanding of the underlying causes of and ways to alleviate software project failure. According to Software Productivity Center Inc. Root causes of the most common project problems:

- Poor requirements definition and scope control
- Project estimation and risk planning
- Project planning
- Quality assurance
- Testing
- Configuration management
- Development process

Schmidt et al. (2001) identify possible avenues for future research in their study of software project risks. The authors' recommendations include the following research priorities:

1. Identify countermeasures for individual risks and specify both the underlying behavior and sources of each risk.
2. Investigate the possible interactions between risks.
3. Assess the different perceptions about a software project's risks that stem from multiple organization perspectives.
4. Evaluate changes in software project risks over time for any given project and combined project manager evaluations of the most important software project risks.
5. Add cultural and environmental factors to account for perception variances in software project risk.
6. Advance theory development for risk management especially in the area of risk domains and behaviors.

Schmidt et al. (2001) conclude by starting "there is also a need to investigate how managers today are actually managing risks – what works, what does not and why" (Schmidt 2001, P. 30)

2.4.1 Management and Control Software Project Risks

It is generally agreed (Heemstra 1996; Lister 1997) that effective risk management in software projects can help increase the probability of success. This can be accomplished by providing projects managers with risk management approaches that enable managers to:

1. Cope with uncertainty inherent in software projects by identifying potential problems before they occur.
2. Improve the process of risk identification and mitigation definition with consistent application of these processes across multiple projects
3. Describe and address a project's unique issues and circumstances.
4. Develop mitigation measures to address a project's unique characteristics.
5. Justify the inclusion money and time in the form of contingency funds.
6. Provide cost rustication for proposed mitigation measures.
7. Demonstrate and address a divergence in opinion as to the risk that troubles any given software project.
8. Periodically review and update risk mitigation approaches.

Risk management underlies two components of software projects – management behavior and methodology. A risk manager's behavior may be described as proactive,

reactive or non-existent. Risk management methodology encompasses systematic approaches to identifying and addressing risks. Together, behavior and methodology can be used to explain the capacity of software project teams to deal with both foreseen and unforeseen risks (Phelps 1996).

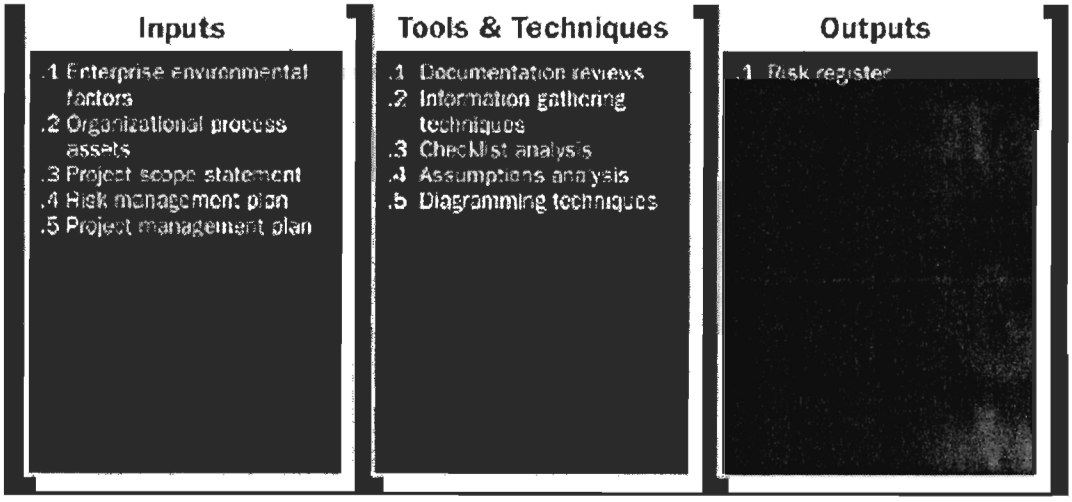
2.5 Risk Identification (PMBOK 2004)

Risk Identification determines which risks might affect the project and documents their characteristics. Participants in risk identification activities can include the following, where appropriate: project manager, project team members, risk management team (if assigned), subject matter experts from outside the project team, customers, end users, other project managers, stakeholders, and risk management experts. While these personnel are often key participants for risk identification, all project personnel should be encouraged to identify risks.

Risk Identification is an iterative process because new risks may become known as the project progresses through its life cycle. The frequency of iteration and who participates in each cycle will vary from case to case. The project team should be involved in the process so that they can develop and maintain a sense of ownership of,

and responsibility for, the risks and associated risk response actions. Stakeholders outside the project team may provide additional objective information. The Risk Identification process usually leads to the Qualitative Risk Analysis process. Alternatively, it can lead directly to the Quantitative Risk Analysis process when conducted by an experienced risk manager. On some occasions, simply the identification of a risk may suggest its response, and these should be recorded for further analysis and implementation in the Risk Response Planning process.

Figure 2.3 PM Risk Identification



2.5.1 Risk Identification: Tools and Techniques

2.5.1.1 Documentation Reviews

A structured review may be performed of project documentation, including plans, assumptions, prior project files, and other information. The quality of the plans, as well as consistency between those plans and with the project requirements and assumptions, can be indicators of risk in the project.

2.5.1.2 Information Gathering Techniques

Examples of information gathering techniques used in identifying risk can include:

- **Brainstorming.** The goal of brainstorming is to obtain a comprehensive list of project risks. The project team usually performs brainstorming, often with a multidisciplinary set of experts not on the team. Ideas about project risk are generated under the leadership of a facilitator. Categories of risk such as a risk breakdown structure can be used as a framework. Risks are then identified and categorized by type of risk and their definitions are sharpened.

- **Delphi technique.** The Delphi technique is a way to reach a consensus of experts. Project risk experts participate in this technique anonymously. A facilitator uses a questionnaire to solicit ideas about the important project risks. The responses are summarized and are then recirculated to the experts for further comment. Consensus may be reached in a few rounds of this process. The Delphi technique helps reduce bias in the data and keeps any one person from having undue influence on the outcome.
- **Interviewing.** Interviewing experienced project participants, stakeholders, and subject matter experts can identify risks. Interviews are one of the main sources of risk identification data gathering.
- **Root cause identification.** This is an inquiry into the essential causes of a project's risks. It sharpens the definition of the risk and allows grouping risks by causes. Effective risk responses can be developed if the root cause of the risk is addressed.
- **Strengths, weaknesses, opportunities, and threats (SWOT) analysis.** This technique ensures examination of the project from each of the SWOT perspectives, to increase the breadth of considered risks.

2.5.1.3 Checklist Analysis

Risk identification checklists can be developed based on historical information and

knowledge that has been accumulated from previous similar projects and from other sources of information. The lowest level of the RBS can also be used as a risk checklist. While a checklist can be quick and simple, it is impossible to build an exhaustive one. Care should be taken to explore items that do not appear on the checklist. The checklist should be reviewed during project closure to improve it for use on future projects.

2.5.1.4 Assumptions Analysis

Every project is conceived and developed based on a set of hypotheses, scenarios, or assumptions. Assumptions analysis is a tool that explores the validity of assumptions as they apply to the project. It identifies risks to the project from inaccuracy, inconsistency, or incompleteness of assumptions.

2.5.1.5 Diagramming Techniques

Risk diagramming techniques may include:

• **Cause-and-effect diagrams** These are also known as Ishikawa or fishbone diagrams, and are useful for identifying causes of risks.

• **System or process flow charts.** These show how various elements of a system interrelate, and the mechanism of causation.

• **Influence diagrams.** These are graphical representations of situations showing causal influences, time ordering of events, and other relationships among variables and outcomes.

CHAPTER 3
RESRARCH DESIGN AND METHODOLOGY

3.1 Design of the Study and Research Method

This study aims to provide a list of risk factors of the software projects, and finds out which of these risk factors are the key factors for the software project managers. Software development is the daily work for the software experts, as to be an expert need a lot of experiences; nobody knows better software risks than them. Obviously to find out a list of risk factors in software projects, the software experts would be the best source of information. And more experts join in this research; the list of risk factors will be more valid and comprehensive. So we decided to have two panels of experts: Chinese and Canadian, to present the Orientals and the Westerns. We also noticed that only one round of research is not enough to have the feedback from the experts, we designed 3 steps of study: brainstorming, narrowing down and ranking. We will use systematic procedures to elicit and rank factors.

3.2 Composition of the panels

We formed our panel of experts by recruiting software project managers from two different socioeconomic environments to achieve variation in respondents' background and culture settings.

We placed the members of the two panels from among experienced software project managers in each culture. In China, we communicated with Beihang University who has a research center of Project Management. They provided us a list of experts of 14 panelists. In Canada, my director of Research Didier Urli who is an expert in software project management built up a list of 11 panelists that he knows. These two lists are quite valid that the experiences of the panelists are minimum 5 years and the education level is minimum bachelor degree.

3.3 Data Collection and Analysis Method

The survey process will be divided into three phrases: Brainstorming, Narrowing Down and Ranking. In the first phase, a brainstorming technique will be used to contribute as many factors as possible from the panels. We will demand each panelist to

submit at least six factors of risk, and to provide short descriptions of each of them to help the researchers in their collation. Exact duplicates will be removed, and the list of all the factors will be provided to every panelist for correction, addition and validation. The validation will be used to confirm that the factors we removed were exactly the same factors, not just the similar factors.

In the second phase, we will divide the panels by country into two panels. Every panel will narrow down the factors independently in their corner. We expect the list of factors to be narrowed down into a manageable number: about 20 factors. This narrow down process is to help the researchers to rank the factors in a meaningful way. But the number of factors is just suggested, we will leave the panelists to decide the size of the list. The panelists will be asked to choose (not to rank) at least ten factors as the most deserving due to their experiences. Finally in this process, we will choose 15- 25 factors as the most important ones in each panel. The criterion for narrowing the list could be that factors chosen as important by over certain percentage of the panelists will be maintained for ranking phase.

In the Ranking process we will find out the most important factors according to the project managers' attention. The panelists will be asked to rank the factors of the second process due to their influence to the success of a project. Several ranking rounds will be

conducted until each panel reached an acceptable level of consensus. We will use Kendall's coefficient of concordance (W) to measure the degree of consensus among the panelists.

3.3 Results

In this part, we will present the results of our research which contain the list of risk factors, the list of new factors, the ranking of risk factors. Furthermore, we will analyze the results by comparing with previous literature, analyzing the influences of culture differences.

3.3.1 Compared with Previous List

Table 1 presents the risk factors identified in the brainstorming phase. We have cataloged total 58 Risk Factors into 13 Catalogues. The experts were asked to mark the importance of risk factors from 1 to 10 (1 not important… 10 most important). We also asked the experts to correct and validate the list. The scale in the table 1 now is the average.

The first purpose of this research is to figure out an updated and multicultural-based list of software projects risk factors. We compared the new list with prior list of the literature. The prior list of risk factors is based on the references [2], [3] and [37]. This list is combination of these three references, and the risk factors are the top ranked factors in their studies. These risk factors are well known in the concept of risk management of software projects. However, some of these factors are too old or the detail level is not very appropriate for the further study or managing of the risks. So we hope that the new list will cover most of these prior factors, and of course some of them will disappear. More importantly, the new list will also provide some new factors that never appeared in the prior list. We have 11 factors presented in table 2 are the new factors in this research.

In the appendix (Table B: Compared with the list of literature), the risk factors that didn't appear in this new list are the No.3 developing the wrong user interface from Boehm. This factor is somehow related to the user's requirements study and stakeholder study, but in this research, the experts don't think that it is necessary to have this specific factor in this list. And another factor from Boehm No. 9 real time performed shortfall is one of the top 10 risk factors in his age, but how it seems that it is too old for our days. The experts even didn't mention this factor. No. 24 type of users is a key risk factor

according to Barki et al.. We think that this factor is also a part of study of stakeholder and user's requirements; different types of users will have different requirements.

Some of those factors that remain in our list are not exactly the same detail level as we described in our list. No. 2 unrealistic schedules and budgets, we separated into two factors: No. 36 Non-availability of the funds or the budget and No. 37 Artificial or unrealistic deadlines. We believe that No.6 Continuing stream of requirements changes is a result of No. 7 Lack of consensus among the partners and No. 12 Continuing stream of requirements changes of the new list. No. 7 Shortfalls in externally furnished components contains the No. 47 Bad control of the work of the consultants or external experts and No. 53. An internal development oriented culture often puts the projects that carried out with external suppliers in danger. And there is same situation like No.10 Straining computer-science capabilities contains No.51 Level of interdependence with other projects or modules and No.52 Transitional measures between the new system and the old one are inadequate. The No.16 Lack or loss of resources contains No.32 Problem of under financing of the project and No. 46 Problem of non-availability of experienced human resource. The No.20 Team experiences contain No. 41 Lack of skills of the manager of project and No.42 Lack of skills and expertise on the developers in their respective field. Some others may be not the exactly same description as in the prior

literature, but they are similar, example: No.1 of prior list Personnel shortfall is similar as No. 42 Lack of skills and expertise on the developers in their respective field.

Table 1 List of Risk Factors

No.	Cataloged List of Risk Factors
1	**Organizational environment**
1	A climate of change in the organization, which creates the instability in managing the projects.
2	Many new resources which have to be integrated into the organizational culture
3	Many changes in the manage team that caused problems of both project and organization objectives
2	**Support/sponsorship of the project**
4	Lack of top management support in the projects
5	Lack of engagement of the future user who thus prefer the manager for project to take responsible. (Ex: No the technical support)
6	Conflicts between departments aimed by the project. Everyone just considers his own benefits.
7	Lack of consensus among the partners as for objectives etc.
8	Conflict between operational department and department of IT, who want to continue to keep control on the IT projects.
9	The business objective or the anticipated benefit of the project is unrealistic
3	**Management of client relationship**
10	Lack of the interests of users to take their responsibilities. It takes time for the clients to deliver his opinion on the plan or the design of IS
11	Lack of consensus of user departments on the problem and/or the suggested solution (objective of the system and suggested functions)

12	Does not consider waiting for the users. (Not only of the needs)
13	Lack of adequate involvement (or no implication) of the users in the project.
14	Little or bad experiences with this user
15	Bad taking into account of some stakeholders. Forget certain very influential people.
16	Too much waiting for certain customers already involved in the IT.
17	Lack of experience of certain users. Hard to clearly explain the operation of the system for them.
4	**Project Management**
18	Does not use suitable methodology of project management (procedures, standards, documents.)
19	An inappropriate management of change. Does not take or not well record the minors or major change of the project (extra costs)
20	Does not study enough the scope (extent) of the project, which can thus waste times.
21	Confusions between the roles and the responsibilities of the participants.
22	Bad or non-existent risk management. The important risks are badly followed.
23	No control of project (progress report, syndrome of the 90% completed, etc.)
24	Problem of communication if there are several departments or organizational units, which take part in the same project.
25	Does not study enough the customer requirements, which can thus waste time.
26	Size of project team.
27	Badly definite manager of project
28	Conflict of the team
29	Bad management of team (ex: Confusion of the roles between the members of the team, several roles held by the same task)
30	Bad planning (not practices or difficult to make)
31	Bad organizational structure to carry out the projects
5	**Financing**
32	Problem of under financing of the project. Project team make out a figure before analyzing the more precise need and does not modify the financing.
33	Bad estimate: use little or not tools or method to estimate suitably the project (frequent undervaluation)
34	Bad estimates of project when the project is distributed on several sites.
35	Tendency "almost natural" of the developers to underestimate the workload to be carried out
36	Non-availability of the funds or the budget

6	**Time/Schedule Aspect**
37	Artificial or unrealistic deadlines which create a very strong pressure on the effected tests or on the training of the users
38	Problems of use of the resources when there are several projects.
7	**Process of development**
39	Absence of test methodology to carry out a project
40	Use of a not tested new methodology by the developers
8	**Skills of project team Aspect**
41	Lack of skills of the manager of project
42	Lack of skills and expertise on the developers in their respective field (ex: new language or turn towards new platform)
9	**Hunan Resource Management Aspect**
43	Part-time allocation of resources on the project (generally late and a lack of implication creates)
44	Bad human resource management (when engage or select the consultants and experts)
45	Use too many external consultants, consequence: problem of over cost or lack of managers' involvement.
46	Problem of non-availability of experienced human resource when you need some.
47	Bad control of the work of the consultants or external experts.
48	Lack of key resources
10	**Technologies Aspect**
49	Introduction a new technology not tested
50	The level of performance of the awaited system is critical for the system (ex: time, authentification, others.)
51	Level of interdependence with other projects or modules
52	Transitional measures between the new system and the old one are inadequate
11	**External dependences Aspect**
53	An internal development oriented culture often puts the projects that carried out with external suppliers in danger
12	**Quality Aspect**
54	Lack of standards which can induce a development not standardized and non-reproducible
55	No external quality assurance with the team of development

56	Lack of assigned resources to control the quality related to the additional costs
57	Bad comprehension of what is a risk, a problem... briefly confusion on the concepts
13	**Other dimensions**
58	Sale of the new version not developed yet to the customer

Table 2 List of New Factors

No.	Name of Risk Factors
1	A climate of change in the organization, which creates the instability in managing the projects.
22	Bad or non-existent risk management. The important risks are badly followed.
31	Bad organizational structure to carry out the projects.
34	Bad estimates of project when the project is distributed on several sites.
36	Non-availability of the funds or the budget
45	Use too many external consultants, consequence: problem of over cost or lack of managers' involvement.
50	The level of performance of the awaited system is critical for the system (ex: time, authentification, others.)
51	Level of interdependence with other projects or modules
52	Transitional measures between the new system and the old one are inadequate
55	No external quality assurance with the team of development
57	Bad comprehension of what is a risk, a problem... briefly confusion on the concepts

Table 2 presents the new risk factors. Although most of the risk factors remain stable, we still find some new factors. It shows that there are some new elements of risk added during last few years. A lot of new factors are in the catalog of project

management. As we study the risk factors in a dimension of project management, the experts paid more attentions to the catalog of project management. In the catalog of technology, we have 3 more new factors; it means that we have a lot of new technologies introduced these years. We have a new catalog of quality; it shows that the quality control is one of the most important risk management aspects.

3.3.2 Rank of Risk Factors

The Table 3 shows the final rank of risk factors by the Canadian and Chinese experts. There are totally 26 risk factors ranking in this list, the Chinese experts chose 15 factors, and the Canadians chose 18 factors. We have 7 factors that are chosen by both Canadian and Chinese: No.4 Lack of top management support in the projects, No.19 An inappropriate management of change, No.23 No control of project, No.24 Problem of communication if there are several departments or organizational units, No.30 Bad planning, No.41 Lack of skills of the manager of project, No.42 Lack of skills and expertise on the developers in their respective field. Most of these common factors are located in the catalog of project management and the catalog of skill of project team aspect. Although the most risky factor that the two countries chose is not the same one, it is still similar: the factor No. 25 Does not study enough the customer

requirements that the Chinese experts chose is one aspect of No. 20 Does not study enough the scope (extent) of the project that the Canadian chose.

The differences are obvious. When we look at the catalogs the experts chose, we can find that the Canadian shared the risk factors in 7 catalogs, but the Chinese emphasized in the catalog of project management. The Canadian chose several factors in the catalog of Management of the client relationship and the catalog of financing, but the Chinese didn't chose any in these two catalogs.

Table 3 Rank of Risk Factors

Rank	Canada	China	Risk factors
1	1		20. Does not study enough the scope (extent) of the project, which can thus waste times.
2		1	25. Does not study enough the customer requirements, which can thus waste time.
3	2		37. Artificial or unrealistic deadlines which create a very strong pressure on the effected tests or on the training of the users
4	4		13. Lack of adequate involvement (or no implication) of the users in the project.
5		3	29. Bad management of team (ex: Confusion of the roles between the members of the team, several roles held by the same task)
6	5		33. Bad estimate: use little or not tools or method to estimate suitably the project (frequent undervaluation)

7		4	27. Badly definite manager of project
8	6		35. Tendency "almost natural" of the developers to underestimate the workload to be carried out
9	6		44. Bad human resource management (when engage or select the consultants and experts)
10		6	6. Conflicts between departments aimed by the project. Everyone just considers his own benefits.
	3	5	22. Bad or non-existent risk management. The important risks are badly followed.
		13	2. Many changes in the manage team that caused problems of both project and organization objectives
	18	12	4. Lack of top management support in the projects
	16		12. Does not consider waiting for the users.
	12		15. Bad taking into account of some stakeholders. Forget certain very influential people.
	8	7	19. An inappropriate management of change. Does not take or not well record the minors or major change of the project (extra costs)
	11	2	23. No control of project
		9	24. Problem of communication if there are several departments or organizational units, which take part in the same project.
	13	8	30. Bad planning (not practices or difficult to make)
		14	31. Bad organizational structure to carry out the projects
	17		32. Problem of under financing of the project. Project team make out a figure before analyzing the more precise need and does not modify the financing.
	14		34. Bad estimates of project when the project is distributed on several sites.
	9	11	41. Lack of skills of the manager of project
	15	10	42. Lack of skills and expertise on the developers in their respective field
		15	43. Part-time allocation of resources on the project
	10		49. Introduction a new technology not tested.

3.3.3 Analyses of Results

In this part, we will analyze the region difference influence to the ranking of the risk factors.

Obviously we can not ignore the influences of the culture differences to this research. China and Canada are two of the biggest countries in the world, but China is still a developing country, and he has the biggest population in the world. Canada is second biggest country, but he has a very little population and he is much more developed than China. It is very interesting to discuss the influences of the culture. It is a huge work to research how the culture differences affect the ranking of the risk factors, the author can only provide their own opinions of the influences according literature and the discussion with some of the experts.

An approach that may be useful in identifying the various dimensions along which cultural differences could be measured is one developed by Geert Hofstede' (Arvind V. P. 1995:132). Hofstede (1984) proposed four dimensions:

- **Power distance** refers to the distance between individuals because of different social hierarchy, educational level and occupation;

- **Uncertainty avoidance** measures the extent to which people tend to feel threatened by uncertain ambiguous future;
- **Individualism** is the tendency of people to look after themselves which is in direct contrast with collectivism, the tendency of people to belong to groups;
- **Masculinity** tends to assertiveness, materialism and less concern for others, while femininity emphasizes a concern for others and relationships.

We would like to discuss his four dimensions separately. Initially, China had many traditional cultures about centralism, which was one person control the main power at hand. In this case, we can easily find that the phenomena occurred before because of factors that have been important historically in China, such as traditional thoughts under traditional education, inequality and authority of different classes. Hence low-power classes accept the big pressure resulted from the dominant class's high power and class-consciousness. We observe that the top ranked risk factors chosen by Chinese experts can be easily influenced by superiors. Such as No. 4 Lack of top management support in the projects; No.19 An inappropriate management of change, when the superior what to change the Chinese project management team have to obey the order; No. 27 Badly definite manager of project, the top management decide who is in charge; No. 31 Bad organizational structure to carry out the projects which is also according to top

management's decision. Comparatively, in North-America people will have more liberty of speech and action.

Countries with a high level of uncertainty avoidance have clear rules and regulations. Jobs provide more security and stability. Opposite to it, low level of uncertainty avoidance leads to lower anxiety and stress form jobs. Companies are less formal and some managers take more risks. For instance, China may change their decisions after business contract has been signed and prefer to keep necessary silence during business meetings. We have examples: No. 3 Many changes in the manage team that caused problems of both project and organization objectives No.25 Does not study enough the customer requirements, because customers' requirements always change. While North-Americans are convinced contract should be a stable element in the changeable international environment.

When referred to individualism, Hofstede (1984) found that economically advanced countries tend to place greater emphasis on individualism than do developing countries. Thus Chinese project management team has a tendency to share the responsibility. In other words, nobody wants to take the responsibility. That can explain why Chinese experts chose several factors about conflict management and human

resources management: No. 6 Conflicts between departments aimed by the project, No. 29 Bad management of team, No.43 Part-time allocation of resources on the project.

When mentioned masculine cultures, China represents a "masculine" culture, where personal inadequacies are not readily admitted.

When we look at the ranked risk factors that the experts chose, we can discover that the catalogs the chose are really different. The Canadian ranked the factors averagely in eight catalogs, but the Chinese ranked the most of risk factors in the catalog of project management. It shows that the Chinese managers are still lack of project management. We discussed with the Chinese experts, they said that the project management theory had been just introduced in China. They think that the Chinese managers should earn more project management skills. Thus it can be seen that the socioeconomic environment can also affect the ranking of the risk factors.

In sum, Canada and China have some differences in the ranking of the risk factors. These differences are not only caused by the culture difference, but also it is affected by the socioeconomic environment. Institutional theory does explicitly incorporate the role of the state on organization through coercive and normative isomorphic pressure, example at the individual level, (Weber et al 1998) obtained significant differences in

managerial preferences for risk taking between managers from China and the USA. According to the Hofstede's theory, we analyze the differences by four dimensions. And we discussed the socioeconomic environment influences with the experts. We found that it is a very important element affecting the risk ranking.

3.4 Limits of Research

Because this research is based on a Delphi method, the number of samples is limited. We didn't have many experts involved in our study. Though we chose the experts according their experiences of software projects management, we didn't consider the type or size of the projects as variables. As Canada and China are big countries, we only chose the samples in Quebec in Canada and Beijing in China. We believe that in other region of these two countries, there could be some differences because of the level of development or other factors.

The amount of data collected was only sufficient for the first step of brainstorming. The number of respondents in last two steps was insufficient. The low response rate is indicative of two issues: (1) the type of information being requested and (2) the length of survey. Though a significant consideration for email-based studies, non-response bias

was assessed but no action deemed appropriate. One method considered was the use of late-arriving responses as indicative of non-responders (Armstrong 1977).

Another limit is the language, we write this thesis in English. But during our survey, as the native language in China is Chinese and in Quebec a lot of people's native language is French, the responses sometimes were in Chinese or French. We can not assure the translation is one hundred percent as they describe in their native language.

3.5 Future Research

The data collection method we use is a Delphi technology, because of the time and budget limits we can only use email to contact our respondents. If we can meet the project managers or interview them by phone, the validation and the quality of the responses could be much better. We also hope that in the future, we can have more choice of respondents to make the list more general and authoritative.

Although we think this research is very useful, we believe that there are a lot more to do in the future. As we focus on the first step of the risk management, identification of risks, we provide a useful foundation of the software risk management, the further study

will try to find out the proper strategies or develop a model of risk management process. For the project managers, they should update and enrich the new risk factors during their daily work.

In this study, we only request the project managers to provide the risk factors. In fact, the risks in software projects should vary according to the level of management. The level of management will not only affect the number of risks, but also the ranking of risk. In addition, there are more variables affecting the results of study, such as type of software projects, size of projects, future researchers could make a study more specifically.

CHAPTER 4
CONCLUSION

In this article, we represented the recent statistics of the success rate of the software projects published by Standish Group in 2004, the rate is still very dissatisfied. Previous studies have proposed that risk is a complex construct. In software projects the risk performs as a factor that affects the success of a project. Project manager recognize and accept the fact that risk is inherent in software projects. The most successful project managers choose to deal proactively with risk. The process of risk management involves two steps, the identification and subsequent mitigation of project variables. However proper risk management is based on the identification of the risk factors, to address the identification step, researchers have focused extensively on establishing lists of risk factors. In other words, before we assess risk or develop strategies to counter the risks, we should know what the risks are existed in projects; what are the most important risks the project managers should pay more attention. We addressed these two questions by providing a cataloged list of 58 risk factors and a ranking of risk factors. We also tried to analyze the influence of culture difference.

After having made this study by a Delphi method between Canadian and Chinese experts, we can conclude that the factors of risk have certain persistence. We find in our

study the majority of the risk factors were already enumerated in the former studies. However, we still discovered 11 new risk factors. We also list the top 10 factors of all the risk factors. We think that this study can be extremely useful for the managers of projects which are brought to manage the risks in the projects of system development of information. The project managers can use the list of risk factors as a fundamental risk management, and the project managers can pay more attentions to the top 10 risk factors. The cross-culture study provides a general idea of culture differences in software projects risk management for both Canadian and Chinese. We talk a lot about culture differences when we manage a cross country project, but it is not easy to analyze the influences of culture differences. In this research, we use Hofstede's culture difference theory to analyze the differences that the Canadians and Chinese treat the risk in the identification step, we found that the Hofstede's theory can really help us explain the culture differences' influences.

REFERENCES

1. Alter, S., and Ginzberg, M. Managing uncertainty in MIS implementation. *Sloan Management Review*, 20, 1 (Fall 1978), pg. 23-31

2. Barki, H.; Rivard, S.; and Talbot, J. Toward an assessment of software development risk. *Journal of Management Information Systems.* 1, 2, (Fall 1993), pg.203-225.

3. Boehm, B. *Software Risk Management Tutorial*. Washington, DC: IEEE Computer Society Press, 1989.

4. Boehm, B. Software Risk Management: principles and practices. IEEE Software, January 1991, pg. 32-41.

5. Brooks, Frederick P. No Silver Bullet, *Computer* 20, 4 (April 1987), pg. 10-19.

6. Carr, Marvin J.; Konda, Suresh; Monarch, Ira; Ulrich, Carol; & Walker, Clay. Taxonomy-Based Risk Identification (CMU/SEI-93-TR-6, ADA266992). Pittsburgh, Pa.: Software Engineering Institute, Carnegie Mellon University, 1993.

7. Chittister, Clyde & Haimes, Yacov. Assessment and Management of Software Technical Risk, IEEE Transactions on Systems, Man, and Cybernetics 24, 2 (February 1994), pg.187-202.

8. Christopher K. Hsee; Elke U. Weber, *Cross-national differences in risk preference and lay predictions Journal of Behavioral Decision Making*; Jun 1999; 12, 2; ABI/INFORM Global pg. 165

9. Cule, P., Strategies for heading off is project failure, *Information Systems Management,* March 1, 2000, Vol. 17, Issue 2

10. Ginzberg, M.J. (1981), *Early diagnosis of MIS implementation failure: promising results and unanswered questions*, Management Science, Vol. 27 No. 3, pg. 349-378.

11. D. McComb, J.Y. Smith, System project failure: the heuristics of risk, *Journal of Information Systems Management* 8 (1), 1991, pg. 25–34.

12. Davis, G.B. and Olson, M.H. (1984), *Management Information Systems, Conceptual Foundations, Structure, and Development, 2nd ed.*, McGraw-Hill, New York, NY.

13. Department of Information Resources. I*nternal Quality Assurance Guidelines.* May 2005. State of Texas. http://www.dir.state.tx.us/eod/qa/index.htm.

14. Fredrik, B., *Institutional theory: A new perspective for research into IS/IT security in organizations* 0-7695-2056 IEEE, January 2004

15. Heemsta, F and Kusters, R Dealing with risk: a practical approach. *Journal of Information Technology*, (December 1996), pg.333-346

16. Hervé Courtot. *La gestion des risques dans les projets*. Paris, France Economica, 1998

17. Hofstede, G., *Culture's Consequences,* London, Sage. 1984

18. Jean-Claude, U., *International & Cross-Cultural Management Research*, London, Sage.1998

19. Jiang,J.J. and Klein G. Risks to different aspects of system success, *Information and Management* 36, 1999, pg. 264–272.

20. Jiang, J.J. and Klein, G. (2001), Software project risks and development focus, *Project Management Journal*, Vol. 32 No. 1, pg. 3-9.

21. Jones, C. (1993), *Assessment and Control of Software Risks*, Prentice-Hall, Englewood Cliffs, NJ

22. J. Ropponen, K. Lyytinen, Can software risk management improve systems development: an exploratory study, *European Journal of Information Systems* 6 (6), 1996, pg. 41–50.

23. J. Cumming, IT portfolio management: balancing risks and rewards of projects yields significant returns, *Network World* 19 (13), 2002, pg. 48.

24. Keil, M. Pulling the Plug: Software Project Management and the Problem of Project Escalation, *MIS Quarterly 19, 4*, 1995, pg. 421-447.

25. Keil, M.; Cule, P.; Lyytinen, K.; and Schmidt, R. A Framework for identifying software project risks. *Communications of ACM, 41*, 11 (November 1998), pg. 227-251

26. Keil, K. Bernard C Y Tan, Kwok-Kee Wei, and Timo Saarinen, A cross-cultural study on escalation of commitment behavior in software projects. *MIS Quarterly*. Minneapolis: Vol.24, Iss. 2; June 2000.pg. 299-326.

27. Kwak Y.H. and Stoddard, J. Project risk management: lessons learned from software development environment. *Agilent Technologies*, 2679 Monument Drive, Santa Rosa, CA 95407, USA.

28. Linda Wallace, Mark Keil, Arun Rai, Understanding software project risk: a cluster analysis. *Information & Management* 42-2004, pg. 115–125

29. Lyytinen, K., Mathiassen, L., and Ropponen, J. Attention Shaping and Software Risk: A Categorical Analysis of Four Classical Risk Management Approaches, *Information Systems Research 9, 3*, 1998, pg. 233-255.

30. McFarlan, F.W. (1981), Portfolio approach to information systems, *Harvard Business Review*, Vol. 142, September- October, pg. 142-150.

31. Moynihan, T. How experienced project managers assess risk. *IEEE Software*, (May-June 1997), pg. 35-41.

32. Moynihan, T., Coping with 'requirements-uncertainty': the theories-of-action of experienced IS/software project managers. *Journal of Systems and Software* Volume 53, Issue 2, 31 August 2000, pg. 99-109

33. March, J. G., and Shapira, Z. Managerial Perspectives on Risk and Risk Taking, *Management Science 33,11*, 1987, pg. 1404-1418.

34. Nidumolu, S.R., 1996. Standardization, requirements uncertainty and software project performance. *Information and Management 31,* pg. 135–150.

35. Project Management Institute (PMI) (2004), *Project Management Body of Knowledge (PMBOK)* – 2004 Exposure Draft, PMI, Pennsylvania, PA.

36. Ropponen, J., and Lyytinen, K. Components of Software Development Risk: How to Address Them? A Project Manager Survey, *IEEE Transactions on Software Engineering 26, 2*, 2000, pg. 98-112.

37. Ronald P. Higuera, Yacov Y. Haimes, Software Risk Management. *CMU/SEI-96-TR-012. ESC-TR-96-012*

38. Roy Schmidt; Kalle Lyytinen; Mark Keil; Paul Cule. Identifying software project risks: An international Delphi study. *Journal of Management Information Systems;* Spring 2001; 17, 4; ABI/INFORM Global pg. 5

39. Seigel, S., and Castellan, N. *Nonparametric Statistics for The Behavioral Sciences.* New York; McGraw-Hill, 1988

40. Trompenaars, F., *Riding the Waves of Culture,* London, Brealey. 1997.

41. Van Genuchten, M., 1991. Why is software late? An empirical study of reasons for delay in software development. *IEEE Transactions on Software Engineering 17 (6),* 582–590.

42. Van Scoy, Roger L. Software Development Risk: Opportunity, Not Problem (CMU/SEI-92-TR-30, ADA 258743). Pittsburgh, Pa.: Software Engineering Institute, Carnegie Mellon University, 1992

43. Wallace L., *The development of an instrument to measure software project risk*, unpublished Doctoral Dissertation, Georgia State University, 1999.

Appendix A. Average Scale of Risk Factors

Table A: Average Scale of Risk Factors

No.	Cataloged List of Risk Factors	Average Scale	
		Canada	China
1	**Organizational environment**	**6.14**	**5.92**
1	A climate of change in the organization, which creates the instability in managing the projects.	6.00	4.75
2	Many new resources which have to be integrated into the organizational culture	6.00	5.50
3	Many changes in the manage team that caused problems of both project and organization objectives	6.43	7.50
2	**Support/sponsorship of the project**	**7.17**	**6.52**
4	Lack of top management support in the projects	7.86	8.87
5	Lack of engagement of the future user who thus prefer the manager for project to take responsible. (Ex: No the technical support)	7.57	5.37
6	Conflicts between departments aimed by the project. Everyone just considers his own benefits.	7.00	7.62
7	Lack of consensus among the partners as for objectives etc.	7.43	5.62
8	Conflict between operational department and department of IT, who want to continue to keep control on the IT projects.	6.17	5.12
9	The business objective or the anticipated benefit of the project is unrealistic	7.00	6.50
3	**Management of client relationship**	**7.45**	**6.63**
10	Lack of the interests of users to take their responsibilities. It takes time for the clients to deliver his opinion on the plan or the design of IS	7.57	6.62
11	Lack of consensus of user departments on the problem and/or the suggested solution (objective of the system and suggested functions)	7.57	7.37
12	Does not consider waiting for the users. (Not only of the needs)	8.86	6.37
13	Lack of adequate involvement (or no implication) of the users in the project.	8.43	6.37
14	Little or bad experiences with this user	5.68	6.75

15	Bad taking into account of some stakeholders. Forget certain very influential people.	7.71	6.50
16	Too much waiting for certain customers already involved in the IT.	7.33	6.00
17	Lack of experience of certain users. Hard to clearly explain the operation of the system for them.	6.29	7.00
4	**Project Management**	**7.12**	**7.70**
18	Does not use suitable methodology of project management (procedures, standards, documents.)	6.57	7.37
19	An inappropriate management of change. Does not take or not well record the minors or major change of the project (extra costs)	8.29	8.50
20	Does not study enough the scope (extent) of the project, which can thus waste times.	8.14	7.25
21	Confusions between the roles and the responsibilities of the participants.	6.86	6.75
22	Bad or non-existent risk management. The important risks are badly followed.	7.71	8.25
23	No control of project (progress report, syndrome of the 90% completed, etc.)	8.00	8.37
24	Problem of communication if there are several departments or organizational units, which take part in the same project.	6.43	8.00
25	Does not study enough the customer requirements, which can thus waste time.	7.57	9.25
26	Size of project team.	6.29	4.75
27	Badly definite manager of project	6.29	7.50
28	Conflict of the team	6.29	6.25
29	Bad management of team (ex: Confusion of the roles between the members of the team, several roles held by the same task)	6.14	8.12
30	Bad planning (not practices or difficult to make)	7.71	8.50
31	Bad organizational structure to carry out the projects	6.57	7.50
5	**Financing**	**7.77**	**6.75**
32	Problem of under financing of the project. Project team make out a figure before analyzing the more precise need and does not modify the financing.	7.71	6.12
33	Bad estimate: use little or not tools or method to estimate suitably the project (frequent undervaluation)	8.43	7.37
34	Bad estimates of project when the project is distributed on several sites.	7.71	6.70
35	Tendency "almost natural" of the developers to underestimate the workload to be carried out	7.71	6.50
36	Non-availability of the funds or the budget	7.29	7.00

6	**Time/Schedule Aspect**	**7.71**	**7.06**
37	Artificial or unrealistic deadlines which create a very strong pressure on the effected tests or on the training of the users	7.86	7.25
38	Problems of use of the resources when there are several projects.	7.57	6.87
7	**Process of development**	**7.21**	**5.19**
39	Absence of test methodology to carry out a project	7.29	6.25
40	Use of a not tested new methodology by the developers	7.14	4.12
8	**Skills of project team Aspect**	**8.00**	**8.13**
41	Lack of skills of the manager of project	8.14	7.62
42	Lack of skills and expertise on the developers in their respective field (ex: new language or turn towards new platform)	7.86	8.62
9	**Hunan Resource Management Aspect**	**7.42**	**6.56**
43	Part-time allocation of resources on the project (generally late and a lack of implication creates)	7.29	7.50
44	Bad human resource management (when engage or select the consultants and experts)	8.00	7.25
45	Use too many external consultants, consequence: problem of over cost or lack of managers' involvement.	6.86	5.63
46	Problem of non-availability of experienced human resource when you need some.	7.57	7.12
47	Bad control of the work of the consultants or external experts.	7.29	5.12
48	Lack of key resources	7.50	6.75
10	**Technologies Aspect**	**7.18**	**4.88**
49	Introduction a new technology not tested	7.86	5.25
50	The level of performance of the awaited system is critical for the system (ex: time, authentification, others.)	7.43	5.63
51	Level of interdependence with other projects or modules	6.86	4.12
52	Transitional measures between the new system and the old one are inadequate	6.57	4.50
11	**External dependences Aspect**	**6.43**	**5.50**
53	An internal development oriented culture often puts the projects that carried out with external suppliers in danger	6.43	5.50
12	**Quality Aspect**	**7.11**	**6.27**
54	Lack of standards which can induce a development not standardized and non-reproducible	7.00	6.50
55	No external quality assurance with the team of development	7.43	6.34

56	Lack of assigned resources to control the quality related to the additional costs	7.67	6.71
57	Bad comprehension of what is a risk, a problem... briefly confusion on the concepts	6.33	5.50
13	**Other dimensions**	**6.57**	**2.88**
58	Sale of the new version not developed yet to the customer	6.57	2.88

Appendix B. Compared with the List of Literature

Table B: Compared with the list of literature

	Prior Risk Factors from literature	Factors of this research
1	Personnel shortfall [3, 37]	42
2	Unrealistic schedules and budgets [3]	36,37
3	Developing the wrong function and properties [3,37]	25
4	Developing the wrong user interface [3]	None
5	Gold-plating [3,37]	9
6	Continuing stream of requirements changes [3,37]	7,12
7	Shortfalls in externally furnished components [2,3]	47,53
8	Shortfalls in externally performed tasks [2,3]	53
9	Real time performance shortfalls [3]	None
10	Straining computer-science capabilities [3,37]	51,52
11	Size [2,37]	24,26
12	Multiple implementers [2,37]	21
13	Staffing level/team size [2,37]	26
14	New technology/experience with technology [2]	49
15	Application novelty [2]	15
16	Lack or loss of resources [2]	32,46
17	Unclear task [2]	25

18	Team turnover [2]	29
19	Team members have no work together before	None
20	Team experiences [2,37]	41,42
21	Number of users [2]	21
22	User turnover [2]	17
23	Number of user department [2]	12
24	Type of users [2]	None
25	Unwilling users [2]	10
26	Resistance to change [2]	13
27	User's feeling of responsibility [2,37]	5
28	Conflicting preferences [2,37]	11
29	Interpersonal conflicts [2]	28
30	Lack of top management support [2,37]	4
31	Failure to manage end user expectation [37]	25
32	Changing scope/objectives [37]	19
33	Failure to gain user commitment [37]	10
34	Lack of adequate user involvement [37]	13

This list is based on the references:

2. Barki, H.; Rivard, S.; and Talbot, J. Toward an assessment of software development risk. *Journal of Management Information Systems.* 1, 2, (Fall 1993), pg. 203-225.

3. Boehm, B. *Software Risk Management Tutorial*. Washington, DC: IEEE Computer Society Press, 1989.

37. Roy Schmidt; Kalle Lyytinen; Mark Keil; Paul Cule. Identifying software project risks: An international Delphi study. *Journal of Management Information Systems;* Spring 2001; 17, 4; ABI/INFORM Global pg. 5

Appendix C Text in French

Identification des risques des projets informatiques : une comparaison multiculturelle et historique

Par le biais d'une approche Delphi auprès d'experts canadiens et chinois, nous avons constitué une liste comprenant 57 facteurs de risques. Cette liste a par la suite était étudiée selon une dimension culturelle et historique.

Introduction

La collecte d'information pour dresser un état des lieux de la production de logiciel est difficile. On estime donc qu'aujourd'hui 90% du coût d'un système informatique repose sur le logiciel. Le développement et la maintenance des logiciels représentent dans le monde des sommes colossales. Et malgré ce marché, les industriels considèrent encore l'industrie du logiciel comme « risquée », « mal

maîtrisée », source de coûteux dépassements de budget et de délai. En 1990, une étude effectuée sur 9 projets du Département de Défense des USA (DoD), correspondant à quelques millions de dollars, affichait les résultats suivants :

- 28.8% avait été payé mais non livré
- 19.2% avait été transformé ou abandonné
- 47.27% n'avait pas été utilisé avec succès
- 2.95% avait été utilisé après quelques modifications
- 1.77% avait été utilisé tel que livré

Des statistiques plus récentes publiées par le Standish Group en 2004 montre toujours des résultats mitigés malgré les nombreuses études et standards publiés depuis ces dix dernières années. En effet, on remarque que seulement 29% des projets sont des succès alors que 18 % sont des échecs et 53% ont connu de sérieux problèmes (Standish Group, 2004).

Ces données sont d'autant plus inquiétantes que l'on développe de plus en plus de logiciels pour des systèmes de plus en plus complexes. Il est vrai que l'industrie du logiciel est relativement immature au regard des autres industries. Immaturité qui s'explique par sa relative jeunesse, par le caractère abstrait du produit, par la taille du

système à automatiser et par l'évolution rapide des technologies et des techniques de modélisation et de programmation.

C'est donc dire également que les défis pour améliorer la production de logiciels sont toujours d'actualité. En fait, on constate que si la technologie évolue, l'industrie souffre d'une inertie assez forte. En fait, il semble que l'organisation du développement logiciel progresse lentement, mais surtout que son déploiement dans l'industrie se fasse à tout petit pas. Il est plus difficile de changer les habitudes d'organisation des personnes que de changer leurs outils de travail, même quand la volonté est là.

Par ailleurs, le développement de logiciel est toujours considéré comme une activité «créatrice » qui ne peut être rationalisée. Le mythe du «génial programmeur» traîne encore dans les esprits. Pourtant, tout comme n'importe quelle activité menant à satisfaire les besoins de personnes, la production de logiciel se modélise et se contrôle, bref se gère.

Schématiquement, on peut ainsi considérer que cette industrie est confrontée aux principaux problèmes que sont :

- Le manque de connaissance et de compréhension de ce que le développement logiciel implique.

- Le manque de rigueur dans la mise en place des techniques d'organisation. Les bonnes intentions sont contraignantes et paraissent parfois alourdir un processus déjà sous de fortes contraintes budgétaires et de calendrier.
- Le manque d'outils pour maîtriser les risques du développement. Les outils d'organisation, de prévision, de contrôles sont complexes et difficiles à mettre en oeuvre.
- Le manque d'anticipation et d'analyse des risques inhérents au développement logiciel.

Dans cette article et prenant en considération les deux derniers points énumérés ci-dessus, nous allons nous concentrer sur la gestion des risques dans les projets de développement de systèmes d'information. De plus, tenant compte qu'un projet est toujours le reflet de la façon dont une organisation ou une société humaine, envisagent et préparent leur avenir, nous avons voulu également savoir s'il y a un effet culturel sur cette gestion des risques ?

Problématique

La gestion des risques a été longtemps appliquée de façon accessoire et implicite dans la gestion des projets ormatiques. À l'heure actuelle, de plus en plus d'organisations formalisent un tel processus, principalement pour les projets d'envergure ou stratégiques. En fait, dès 1994, le « Software Engineering Institute » a publié un rapport technique concernant l'adoption de programmes visant à réduire le nombre et la fréquence des problèmes reliés au processus de développement et d'entretien d'applications (CMU/SEI-94-TR-013). Dans le même ordre d'idées, le « Project Management Institute » définit la gestion des risques comme l'une des neuf pratiques clé de la gestion de projets. La gestion des risques connaît donc une popularité grandissante et fait maintenant partie des « meilleures pratiques » en informatique. En schématisant, on considère que l'analyse du risque peut se modéliser par les phases suivantes :

1. Identification du risque
2. Évaluation du risque
3. Réaction au risque
4. Apprentissage

Dans cette étude, nous nous sommes concentrés sur la première phase, soit celle portant sur l'identification des risques. Trois raisons expliquent ce choix. La première

raison s'explique par le fait que cette phase sert de fondation aux autres phases. Elle est donc primordiale. La deuxième raison provient du fait que les réponses proposées par les différents auteurs sont souvent datées historiquement et ne prennent pas forcément en compte les évolutions récentes tant au niveau des méthodes de développement des systèmes d'information qu'au niveau des nouvelles technologies. La troisième raison s'explique par le fait que la plupart des modèles proposés par le SEI, le PMI et par de nombreux auteurs sont souvent idiosyncrasiques. Dans cette dernière perspective, la contrainte culturelle semble inexistante et sans importance. Or, en se basant sur les travaux de Geert Hofstede et en poursuivant les travaux entamés par Schmidt (Schmidt, 2001 ; Keil, 1998), nous pensons que la culture peut avoir une certaine influence dans l'identification des risques.

Par ailleurs et de façon plus conceptuelle, on remarque aussi que les solutions apportées à l'identification des risques proviennent de trois champs disciplinaires complémentaires à savoir la gestion de projet, le génie logiciel et la littérature portant sur l'implantation des systèmes d'information. Ceci peut expliquer certaines visions restrictives qui n'ont pas pris en considération ces trois approches complémentaires.

Méthodologie de recherche

Pour identifier les risques, diverses approches ont vu le jour. Parmi les plus connues, on peut citer la méthode des scénarios, la méthode par analogie (Boehm, 1991 ; Heemstra, 1996) et la méthode par checklist (Barki, 1993 ; Boehm, 1989 ; Boehm, 1991 ; Keil, 1998 ; Ropponen, 2000 ; Schmidt, 2001).

Par ailleurs, on peut aussi citer les études de Zmud et Lucas sur l'identification et la catégorisation des facteurs qui peuvent influencer le succès des projets et donc indirectement les risques (voir aussi McFarlan, 1981 ; Alter, 1978).

Pour les fins de cette recherche, et allant dans la même veine des travaux entamés par Schmidt (Schmidt, 2001), l'approche Delphi a été retenue. Les experts ont été sélectionnés au sein de deux contextes socio-économiques différents mais surtout au sein de deux cultures différentes, à savoir la Chine et le Canada. En Chine, nous avons communiqué avec l'université de Beihang qui nous a introduit à 14 experts. Par ailleurs, le fait qu'un des auteurs soit chinois a sans aucun doute été utile pour établir de bons liens de communication. Au Canada, par le biais de notre réseau, nous avons contacté 11 experts. Tous ces experts ont tous un minimum de 6 ans d'expérience, ont pour la

plupart un baccalauréat et ont une bonne expertise avec les nouvelles technologies et méthodologies de développement.

L'enquête a été divisée en trois phases: une phase de brainstorming, une phase de réduction et de consolidation et une phase de rangement. La première phase visait à obtenir le plus de facteurs de risque possible avec une courte description pour chacun tout en évitant les doublons syntaxiques et sémantiques. La deuxième phase servait à réduire le nombre de facteurs à un nombre "opérationnel". Cette opération s'est faite au sein des deux panels d'experts chinois et canadiens. Chaque expert devait indiquer sa préférence pour chaque facteur sur une échelle de 1 à 10. Des seuils ont été retenus pour réduire le nombre de facteurs à une quinzaine. Finalement, la troisième phase consistait à effectuer le rangement. En fait, on voulait aussi tester le degré de consensus des experts en utilisant le coefficient de concordance de Kendall.

Principaux résultats de l'étude

La table 1 ci-après présente les facteurs de risque identifiés suite à la première phase de brainstorming. Cette phase a duré quatre mois. Ce sont les experts canadiens

qui ont fourni les listes les plus détaillées, les plus fournies. Nous ne savons pas pourquoi les experts chinois semblaient plus réticents à donner leur opinion.

Table 1 : Liste des facteurs de risque (Canada et Chine)

No	Facteur	Canadien	Chinois
	Environnement de l'organisation	**6,14**	**5,92**
1	Un climat de changement dans l'organisation a créé de l'instabilité dans la gestion des projets.	6,00	4,75
2	Beaucoup de nouvelles ressources qui ont du s'intégrer à la culture organisationnelle	6,00	5,50
3	Beaucoup de changement dans l'équipe de direction ont causé des problèmes de fit entre les objectifs des projets et ceux de l'organisation	6,43	7,50
	Appui / parrainage du projet	**7,17**	**6,52**
4	Manque d'engagement clair de la direction à s'investir dans les projets	7,86	8,88
5	Manque d'engagement de la part des futurs clients qui préfèrent ainsi rendre responsable le gérant de projet. (Ex: pas de support technique)	7,57	5,38
6	Conflits entre départements visés par le projet. Chacun voulant tirer à soi la couverture.	7,00	7,63
7	Problème de manque de consensus entre les partenaires quant aux objectifs etc.	7,43	5,63
8	Conflit entre département opérationnel et département des NTIC qui veulent continuer à garder le contrôle sur les projets NTIC	6,17	5,13
9	Les objectifs d'affaires, les bénéfices anticipés par le projet sont irréalistes	7,00	6,50
	Gestion de la relation Client	**7,45**	**6,63**
10	Manque d'intérêt du client à prendre ses responsabilités. Il prend du temps pour donner son avis sur le plan ou la conception du SI	7,57	6,63
11	Manque de consensus sur le problème et/ou sur la solution proposée (objectifs du système et fonctions proposées)	7,57	7,38

12	Mauvaise prise en considération des attentes des usagers. (et pas uniquement des besoins)	8,86	6,38
13	Manque d'implication adéquate (ou pas d'implication) des utilisateurs dans le projet.	8,43	6,38
14	Aucune expérience ou mauvaise expérience avec ce client	5,86	6,75
15	Mauvaise prise en compte des diverses parties prenantes. On peut oublier certaines personnes très influentes.	7,71	6,50
16	Attentes très élevées de certains clients déjà au fait des NTIC et qui ont des attentes presque démesurées.	7,33	6,00
17	Manque d'expérience de certains utilisateurs pour expliquer clairement le fonctionnement du système à l'étude.	6,29	7,00
	Gestion de projet	**7,12**	**7,70**
18	On n'utilise pas de méthodologie appropriée de gestion de projet (procédures, normes, documents..)	6,57	7,38
19	Une gestion de changement inappropriée. On ne tient pas ou pas bien compte des changements mineurs ou majeurs au projet. (coûts additionnels)	8,29	8,50
20	On ne gèle pas assez le scope (l'étendue) du projet qui peut ainsi déraper avec le temps.	8,14	7,25
21	Il peut avoir des confusions entre les rôles et les responsabilités des participants.	6,86	6,75
22	Mauvaise gestion du risque ou inexistante. On suit mal les risques importants.	7,71	8,25
23	Pas de contrôle de projet (état d'avancement, syndrome du 90% achevé, etc..)	8,00	8,38
24	Problème de communication s'il existe plusieurs départements ou unités organisationnelles qui participent au même projet.	6,43	8,00
25	On ne gèle pas assez les besoins du client qui peuvent ainsi déraper avec le temps.	7,57	9,25
26	Taille de l'équipe de projet trop importante	6,29	4,75
27	Imputabilité de l'équipe et du gérant de projet mal définis	6,29	7,50
28	Mauvaise gestion d'équipe (ex: Confusion des rôles entre les membres de l'équipe, plusieurs rôles tenus par la même personne)	6,14	8,13
29	Mauvaise planification (pas pratique ou difficile à faire)	7,71	8,50

30	Mauvaise structure organisationnelle pour réaliser les projets	6,57	7,50
	Financement	**7,77**	**6,75**
31	Sous financement du projet. On lance un chiffre avant de faire l'analyse des besoins plus précise et on ne modifie pas le financement.	7,71	6,13
32	Mauvaise estimation : on utilise peu ou pas d'outils ou de méthode pour estimer convenablement le projet (sous-estimation fréquente)	8,43	7,38
33	Mauvaises estimations de projet quand le projet est réparti sur plusieurs sites.	7,71	6,75
34	Tendance "presque naturelle" des développeurs à sous-estimer la charge de travail à effectuer	7,71	6,50
35	Non-disponibilité des fonds ou du budget	7,29	7,00
	Aspect temps/cédule du projet	**7,71**	**7,06**
36	On crée des deadlines artificiels ou non réalistes qui créent une pression très forte sur les tests à effectuer ou sur le training des usagers	7,86	7,25
37	Problèmes d'utilisation des ressources sur plusieurs projets. Le plus « fort » aura gain de cause mais avec quelles conséquences ?	7,57	6,88
	Processus de développement	**7,21**	**5,19**
38	Absence de méthodologie éprouvée pour réaliser un projet	7,29	6,25
39	Utilisation d'une nouvelle méthodologie pas encore éprouvée par les développeurs	7,14	4,13
	Aspect habiletés des ressources	**8,00**	**8,13**
40	Manque d'habiletés du gestionnaire de projet	8,14	7,63
41	Manque d'habiletés et d'expertise des développeurs dans leur domaine respectif (ex: nouveau langage ou virage vers nouvelle plate-forme)	7,86	8,63
	Aspect gestion des ressources humaines	**7,42**	**6,56**
42	Affectation à temps partiel de ressources sur le projet (crée généralement des délais et un manque d'implication)	7,29	7,50
43	Mauvaise gestion des ressources humaines (ex: lors de l'embauche ou de la sélection des consultants/experts)	8,00	7,25
44	On utilise trop de consultants externes, conséquence : problème de surcoût ou de manque d'implication de la part des gestionnaires sur place.	6,86	5,63

45	Problème de non-disponibilité d'une ressource d'expérience quand vous en avez besoin.	7,57	7,13
46	Mauvais contrôle du travail des consultants ou experts externes.	7,29	5,13
47	Risque de perdre des ressources clés (dans le marché des NTIC très volatile)	7,50	6,75
	Aspect Technologies	**7,18**	**4,88**
48	Introduction une nouvelle technologie pas encore testée par d'autres compagnies, l'effet de mode.	7,86	5,25
49	Le niveau de performance du système attendu est critique pour le système (ex: délai, authentification, autres..)	7,43	5,63
50	Niveau d'interdépendance avec d'autres projets ou modules	6,86	4,13
51	Mesures transitoires entre le nouveau système et l'ancien qui sont inadéquates	6,57	4,50
	Aspect dépendances externes	**6,43**	**5,50**
52	Une culture très orientée développement interne met souvent en péril les projets réalisés avec des fournisseurs externes	6,43	5,50
	Aspect Qualité	**7,11**	**6,27**
53	Manque de standards qui peuvent induire un développement non normalisé et non reproductible	7,00	6,50
54	Pas d'assurance qualité externe à l'équipe de développement	7,43	6,38
55	Manque de ressources affectées au contrôle de la qualité impliquant des coûts supplémentaires	7,67	6,71
56	Mauvaise compréhension de ce qu'est un risque, un problème, une problématique....bref confusion sur les concepts	6,33	5,50
	Autres dimensions	**6,57**	**2,88**
57	Vente de la nouvelle version pas encore développée au client	6,57	2,88

Nous avons ainsi recueilli 57 facteurs de risque. Dans un premier temps, nous pouvons constater qu'il y a une proximité avec les études antérieures sur le sujet tels que

les études de Barki, Boehm et Schmidt. On retrouve ainsi la plupart des facteurs (voir annexe 1). On peut donc déjà affirmer que ces facteurs ont une certaine persistance dans le temps. Par ailleurs, nous avons catégorisé les risques en grande dimension en reprenant celle proposé par Schmidt. Ceci nous a permis de constater que certaines dimensions étaient absentes des études antérieures. La table 2 ci-après nous indique ces nouvelles dimensions apparues dans notre étude.

Table 2 : Liste des nouveaux facteurs de risque (Canada et Chine)

No	Facteur	Canadien	Chinois
1	Un climat de changement dans l'organisation a créé de l'instabilité dans la gestion des projets.	6,00	4,75
22	Mauvaise gestion du risque ou inexistante. On suit mal les risques importants.	7,71	8,25
30	Mauvaise structure organisationnelle pour réaliser les projets	6,57	7,50
33	Mauvaises estimations de projet quand le projet est réparti sur plusieurs sites.	7,71	6,75
35	Non-disponibilité des fonds ou du budget	7,29	7,00
44	On utilise trop de consultants externes, conséquence : problème de surcoût ou de manque d'implication de la part des gestionnaires sur place.	6,86	5,63
49	Le niveau de performance du système attendu est critique pour le système (ex: délai, authentification, autres..)	7,43	5,63
50	Niveau d'interdépendance avec d'autres projets ou modules	6,86	4,13
51	Mesures transitoires entre le nouveau système et l'ancien qui sont inadéquates	6,57	4,50

54	Pas d'assurance qualité externe à l'équipe de développement	7,43	6,38
56	Mauvaise compréhension de ce qu'est un risque, un problème, une problématique....bref confusion sur les concepts	6,33	5,50

Parmi ces nouvelles dimensions, on ne peut passer sous silence le facteur 22 qui traite de la gestion de risque. Ce facteur obtient pour les deux panels d'experts, le chiffre le plus important. On voit ainsi apparaître une prise de conscience importante sur la nécessité de gérer les risques. Par ailleurs, les facteurs 33 (estimation) et 49 (criticité) peuvent sûrement être mis en relation avec la webification de nombreux processus d'affaires réalisés depuis quelques années.

Nous avons comparé le jugement des experts chinois et canadiens. Dans un premier temps, nous avons calculé une différence absolue pour nous permettre d'établir éventuellement un profil type. La table 3 ci-après donne ces comparaisons.

Table 3 : Liste des principaux écarts entre experts canadiens et chinois (en valeur absolue)

No	Facteur	Canadien	Chinois	Différence
57	Vente de la nouvelle version pas encore développée au client	6,57	2,88	3,70
39	Utilisation d'une nouvelle méthodologie pas encore éprouvée par les développeurs	7,14	4,13	3,02
50	Niveau d'interdépendance avec d'autres projets ou modules	6,86	4,13	2,73
48	Introduction une nouvelle technologie pas encore testée par d'autres compagnies, l'effet de mode.	7,86	5,25	2,61
12	Mauvaise prise en considération des attentes des usagers. (et pas uniquement des besoins)	8,86	6,38	2,48
5	Manque d'engagement de la part des futurs clients qui préfèrent ainsi rendre responsable le gérant de projet. (Ex: pas de support technique)	7,57	5,38	2,20
46	Mauvais contrôle du travail des consultants ou experts externes.	7,29	5,13	2,16
51	Mesures transitoires entre le nouveau système et l'ancien qui sont inadéquates	6,57	4,50	2,07
13	Manque d'implication adéquate (ou pas d'implication) des utilisateurs dans le projet.	8,43	6,38	2,05
28	Mauvaise gestion d'équipe (ex: Confusion des rôles entre les membres de l'équipe, plusieurs rôles tenus par la même personne)	6,14	8,13	1,98
7	Problème de manque de consensus entre les partenaires quant aux objectifs etc.	7,43	5,63	1,80
49	Le niveau de performance du système attendu est critique pour le système (ex: délai, authentification, autres..)	7,43	5,63	1,80
25	On ne gèle pas assez les besoins du client qui peuvent ainsi déraper avec le temps.	7,57	9,25	1,68

Pour interpréter ces résultats, nous croyons nécessaire de reproduire la table 4 adaptée de Geert Hofstede ci-après. Table qui dresse un portrait de divers pays en fonction de caractéristiques culturelles que sont la distance au pouvoir, le droit à la différence, la masculinité, l'individualisme et l'orientation à long terme. Ces

caractéristiques peuvent éventuellement apporter un éclairage intéressant sur les écarts de jugement entre les experts canadiens et chinois.

Table 4 : Caractéristiques culturelles définies par Geert Hofstede

Academy of Management Executive, 2003	Distance au pouvoir (Power distance)	Droit à la différence (Uncertainty avoidance)	Individualisme (Individualism)	Masculinité (Masculinity)	Orientation à LT (Long term orientation)
Chine	80	60	20	50	118
Finlande	33	59	63	26	
Etats-Unis /Canada	40	46	91	62	29
Hong-Kong	68	29	25	57	96
Médiane 53 pays	62	70	38	50	

En analysant la table 3, on peut constater qu'il existe une différence marquée sur les facteurs 12 (Mauvaise prise en considération des attentes des usagers)et 13 (Manque d'implication adéquate des utilisateurs dans le projet). Cette différence est d'autant plus importante que ces deux facteurs occupent les deux premières places d'importance dans le classement canadien. Nous pouvons peut-être avancer que cette différence est due à la conjonction des caractéristiques Distance au pouvoir et Individualisme de la société canadienne.

Dans le même ordre d'idées, on peut aussi constater qu'il existe une différence marquée sur les facteurs 28 (Mauvaise gestion d'équipe (ex: Confusion des rôles entre les membres de l'équipe, plusieurs rôles tenus par la même personne))et 25 (On ne gèle

pas assez les besoins du client qui peuvent ainsi déraper avec le temps). Cette différence est d'autant plus importante que ces deux facteurs occupent des places prépondérantes dans le classement chinois. Pour le facteur 28, nous pouvons peut-être avancer que cette différence est due à la conjonction des caractéristiques Distance au pouvoir et Individualisme de la société chinoise. Nous n'avons pas d'explication pour le facteur 25.

Finalement, ce qui est le plus surprenant dans cette étude est sans aucun doute que nous avons pu démontrer que les facteurs de risque à prendre en considération diffèrent selon les pays et varient dans le temps. Ceci vient un peu en opposition avec les approches classiques du PMI ou du SEI qui se veulent anhistorique et non dépendante d'une culture en particulier.

Conclusion

Dans cet article, nous avons rappelé que des statistiques récentes, sur le taux de succès des projets informatiques, publiées par le Standish Group en 2004 présentaient encore des résultats très mitigés. Parmi les problèmes auxquels cette industrie est confrontée, nous avons retenu la gestion des risques et plus précisément la phase d'identification des risques. Ce choix s'expliquait par le caractère historique et

parcellaire de certaines études antérieures et par la caractéristique idiosyncrasique des modèles proposés.

Après avoir réalisé cette étude par le biais d'une méthode Delphi auprès d'experts canadiens et chinois, nous pouvons conclure que les facteurs de risque ont une certaine persistance dans le temps. Nous retrouvons ainsi dans notre étude la plupart des facteurs de risque déjà énumérés dans les études antérieures. Toutefois, nous avons découvert de nouveaux facteurs de risque. Nous pouvons aussi mentionner que l'importance relative de ces facteurs varient selon une dimension culturelle. Toutefois, il nous semble essentiel d'être prudent quant à la lecture que nous pouvons faire de ces caractéristiques culturelles. On peut néanmoins dire que les méthodes de gestion des risques qui veulent imposer le « one best way » (comme le PMI) doivent être prises avec beaucoup de précaution. Nous sommes aussi conscients que cette étude a certaines limites comme celle due aux panels d'experts retenus et celle due au nombre de pays retenus. Toutefois, nous pensons que cette étude peut être fort utile pour les gérants de projets qui sont amenés à gérer les risques dans les projets de développement de système d'information.