Project Management

For Information System Development

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ABSTRACT

Nowadays, with thedevelopment of the information and communication technology, information systems have been developing rapidly. More and more software companies choose to develop the information system to be their main business. They want to increase their business profits by developing the information system. However, the failure rate of developing information system has been high during these years. The purpose of the thesis is to discover how to use project management knowledge to improve the success rate of information system development in an organization.

The thesis covers a literature review and a practical case study. The literature review part is theoretical material about project management. In this theoretical part, I will discuss about the definition of project management and the nature of project management. The main references for there theories are from the internet. In this paper, the lifecycles of project management will be discussed.

In the practical part of this thesis, there is one case of using project management to develop a supply chain system. In this case, I will analyse their project process and find out what makes this project team achieve success.

Key word: project management; information system development.

CONTENTS

1. Introduction

1.1 Background

If a word can be used to sum up the characteristics of the current society, this word would be 'change' and this change is reflected in the software industry: an increasing rate of technological innovation, changing requirements of customers and markets, the variation of personal distribution. In this environment, the software companies need to respond to the challenges and to manage problems brought by this change.

Software industry is full of challenges and innovations. In this industry, the crucial part is the project. Each successful implementation of a project is an opportunity for a company to expand their markets, to increase the number of clients and to make a profit. However, more and more problems in projects arise because of a lack of management.a survey by a large consulting firm found that 25% of large projects were cancelled, 60% experienced significant cost overruns, 75% had quality problems, and less that 1% of all system development project were delivered on schedule and met requirements (Ward J. A., 1994).

Nowadays, the managers of the software industry realize that, in the project, management impacts the whole project and technology only affects the local part (Stellman & Greene, 2005). To make the project successful, the managers need to improve the quality of management

Currently, project management has been widely used as a modern approach in all walks of life. Project management is a systematized to management which can define the requirements of the customers, reduce the cost of the budget, cut down the project time and assure the quality of the project. Because of these reasons, more and more IT companies take this effective management approach as their management strategy. Thus, project management becomes increasingly important in the IT industry.

1.2   Problem Discussion

Nowadays, more and more software companies choose to develop information systems as their main business.Though developing the information systems has become one of the most valuable projects, the development of informaion systems still faces many problems.

First of all, the information systems cannot meet the complex requirements of the customers. There are a lot of companies that want to run the information systems inside. However, they don't know how to define their requirements, which cause misunderstandinds among the project team during the implementation.

Secondly, the project team cannot define the business needs of the systems. Different companies have different business culture. To develop information systems for these companies requires strong business backgrounds and good technical information knowledge of the developers. The developers should understand the background of the company so that they can develop a suitable information system for the company.

Thirdly, the information systems development is overtime. The project team does not have a reasonable plan to arrange the process of the information system development. This makes the information system development hard to control and to implement.

2. Methodology

2.1 Objective of The Thesis

The research style of this thesis is deductive research. It refers to specific data obtained from a general theory. The theory leads to predictions about what is likely going on. For example, a hypothesis follows this as it is a theory-based prediction. A problem of deductive research is the biased imposed on people as one is more likely to see what they want to see in order the prove their theory and fail to see other circumstances which could have led to the results obtained. (Saleem, 2008)

The objective of the thesis is to discover the critical success factors of project management. Three key factors of them are chosen to show how these key factors solve the problems of information system development.

2.2 Research Question

The research question of this thesis is: how can we use the success factors of project management to improve the success rate of information system development?

2.3 Research Methodology

2.3.1   Research Purpose

The research purposes of this thesis are exploratory research and descriptive research. Exploratory research is a type of research conducted for a problem that has not been clearly defined. Exploratory research helps determine the best research design, data collection method and selection of subjects. It should draw definitive conclusions only with extreme caution. Given its fundamental nature, exploratory research often concludes that a perceived problem does not actually exist. (Babbie, 1989)

Descriptive research, also known as statistical research, describes data and characteristics about the population or phenomenon being studied. Descriptive research answers the questions who, what, where, when and how. (Babbie, 1989)
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In this thesis, the objective is to discover the key success crucial factors of the project management and how these key success factors of project management could solve the problems of information system development in an organization, the answer of this research question is not clearly defined. So exploratory research and descriptive research are suitable for this thesis.

2.3.2   Research Approach

In this thesis, the research approach is qualitative research.

Qualitative research is a method of inquiry employed in many different academic disciplines, traditionally in the social sciences, but also in market research and further contexts. Qualitative researchers aim to gather an in-depth understanding of human behavior and the reasons that govern such behavior. The qualitative method investigates the why and how of decision making, not just what, where, when. Hence, smaller but focused samples are more often needed than large samples. (Denzin, 2005)

According to the research question above, qualitative research is found to be appropriate for this thesis.

2.3.3   Research Strategy

Based on the research question, the research strategies of this thesis are case study and interview. Case study is an appropriate approach in order to gain a better understanding of the research area and interview is a tool to get more detail information. In this thesis, the case study is about a software company which develops an information system and their ways to solve the problems during the process of

development; also I also interviewed the project manager of the software company and the manager of the customer company about their perspectives on this project.

After the case analysis, the problems of the case and their fitting solutions are listed, and then the results are analyzed comparing with the key success factors of the project. At the end, the answer of the research question is offered.

3. Project Management

3.1 The Definition of Project and Project Management

The project management institute's (PMI) guide to the project management body of knowledge (PMBOK) defines a project as; 'a temporary endeavor undertaken to create a unique product or service (outcome or result), temporary means that every project has a definite end. Unique means that the product or service is different in some distinguishing way from all similar products or services.'(Burke, 2007)

Project management is defined by the PMBOK as; 'the application of knowledge, skills, tools and techniques to project activities in order to meet stakeholders need and expectations from a project.'(Burke, 2007)

In the APM book, the project management is defined as; "the most efficient way of introducing change. … Achieved by:
Defining what has to be accomplished, generally in terms of time, cost, and various technical and quality performance parameters;
Developing a plan to achieve these and then working this plan, ensuring that progress is maintained in line with these objectives;
Using appropriate project management techniques and tools to plan, to monitor and maintain progress; employing persons skilled in project management- including normally a project manager- who are given responsibility for introducing the change and are account table for its successful accomplishment. (Burke, 2007)
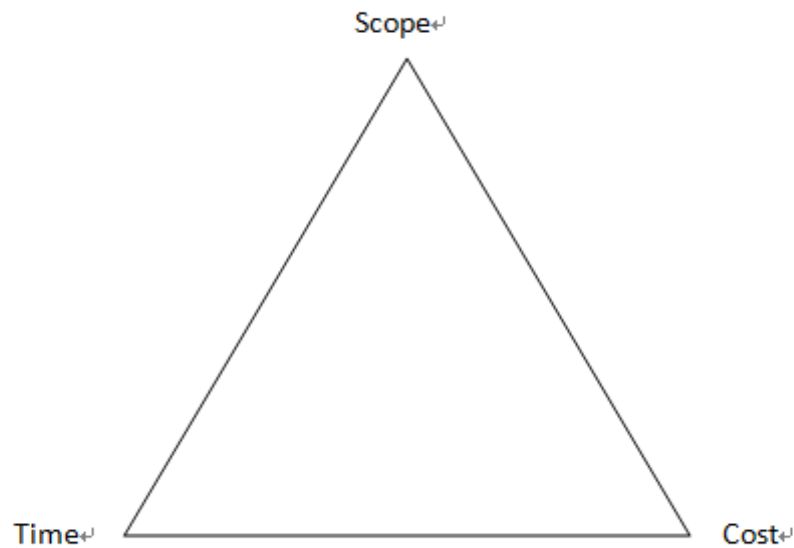
Figure-1 Time, Cost, Scope Triangle (A Guide to The Project Management Body of Knowledge（Fourth Edition), 2008)

In the Figure time-cost-scope triangle(A Guide to The Project Management Body of Knowledge（Fourth Edition), 2008), this is an important theory in the project management. Time, cost and Scope are three basic construction elements. the change of each two elements will change the whole project. This situation makes the project manager concerted on these three elements.

✓ Time：For analytical purposes, the time required to produce a deliverable is estimated using several techniques. One method is to identify tasks needed to produce the deliverables documented in a work breakdown structure. The work effort for each task is estimated and those estimates are rolled up into the final deliverable estimate. (A Guide to The Project Management Body of Knowledge（Fourth Edition), 2008)

✓ Cost: to develop an approximation of a project cost depends on serveral variables including: resources, work packages suck as labor rates and mitigating or controlling influencing factors that create cost variances tools

used in cost are cost escalation and indirect costs. (A Guide to The Project Management Body of Knowledge（Fourth Edition), 2008)

✓ Scope: requirements specified to achieve the end result. The overall definition of what the project is supposed to accomplish. A major component of scope is the quality of the final product. The amount of time put into individual tasks determines the overall quality of the project. (A Guide to The Project Management Body of Knowledge（Fourth Edition), 2008)

3.2 Project Lifecycle

Organizations performing projects will generally subdivide their projects into several phases or stages to provide better management control. Collectively these project phases are called the project lifecycle. (Burke, 2007)

The state of the project lifecycle is based on the project, the similar projects can use the same lifecycles, and others are unique. However, there are two typical project lifecycles can be adopted by all projects: plan-do-act-check lifecycle and project manage lifecycle.
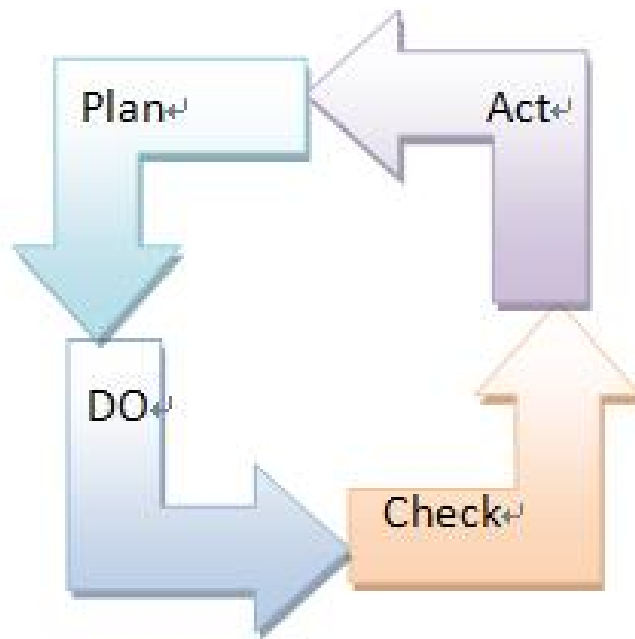
Figure-2 Plan-DO-Act-Check Lifecycle (Burke, 2007)

In the plan-do-act-check lifecycle (American Society for Quality Handbook 2nd), it makes a basic framework for the project.

✓ Plan: a perfectly project plan is the foundation stone of success. In the project, the project plan is like a guidebook, in general, in the plan, it will define the problems, analyze the causes, give solutions and make an action plan. (Burke, 2007)

✓ Do: it seems easy to understand this step by the literal, just do it? However, it is hard to put it into practice. In this step, the implementation of the bset solution is essential. (Burke, 2007)

✓ Check: a significant step of this lifecycle. The project managers should measure the results, against goals, check effectiveness of solutions. This phase makes sure the project is running on the correct train. (Burke, 2007)

✓ Act: find a correct and suitable way for the project, if necessary, the project team needs to establish a new way to finish the project. (Burke, 2007)
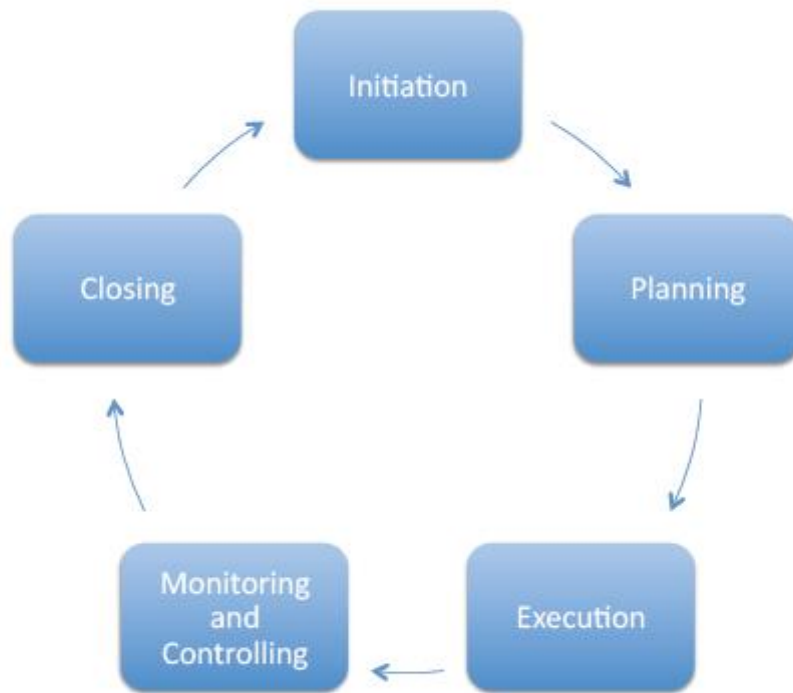
Figure-3 Project Manage Lifecycle (Burke, 2007)

In the project manage lifecycle, the management of the project concerns.

✓ Initiating: this process defines and authorizes the project or a project phase

– Project assignment
– Project establishment

✓ Planning: this process defines and refines objectives and plans the course of actions required to reach the goals and deliver according to the scope agreed

✓ Execution: during this process the project team carries out the project management plan for the project

✓ Monitoring and controlling: during this process, the project progress is measured and monitored to indentify variances from the agreed project management plan

✓ Closing: this process formalizes the acceptance of the product, service or deliverable from the project or project phase. Thisstep is the laststep of theproject. (Burke, 2007)

3.3 Project Requirement Analysis

According to IEEE standard glossary project (1997) of requirement is described as follows: the necessary for the purpose or authority or other documentation required for the formal requirements with the condition or power for the owners to solve problems or meet the conditions. In the PMBOK, the project scope is based on the project requirement analysis.

Requirements analysis is critical to the success of a development project. (Alain Abran & editors Pierre Bourque, 2004). Requirements can be accessed in a variety of ways such as by doing telephone inquiries and visits, interviewing the customers and reading the relevant documents prepared by the usesr. In fact, these methods are in GET method. There is also another way that can guide the users. For example, the project team can arrange one team member as requirements engineer and the main job of this requirements engineer is to define the project scope and requirements change management. In the requirements management, interaction of these two processes is necessary for defining the requirements.

According to different projects, there will be different requirements. For example, in the IT project industry, there are three levels of requirements which are business requirements, user requirements and functional requirements (including non-functional requirements). Business requirements support the initial benefits for the customers and the product developers, and reflect the requirements from the organization or customers. User requirements define the basic requirements from the users group. According to the user requirements, functional requirements define the software features to the developer and the function will enable users to complete their tasks, to meet the business need.(Laplante, 2009) For the project team, they need to have enough business background and technical background and to explore the customers' requirements from these three different levels.

3.4 Human Resource Management

Human resource management is the management of an organization's employees. While human resource management is sometimes referred to as a "soft" management skill, effective practice within an organization requires a strategic focus to ensure that people resources can facilitate the achievement of organizational goals. Effective human resource management also contains an element of risk management for an organization which, as a minimum, ensures legislative compliance. (Armstrong, 2006)

The Human Resources Management (HRM) function includes a variety of activities, and key among them is deciding the staffing needs of an organization and whether to use independent contractors or hire employees to fill these needs, recruiting and training the best employees, ensuring they are high performers, dealing with performance issues. (Becker, 1996)

3.5 Work Breakdown Structure

A work breakdown structure (WBS) in project management and systems engineering, is a deliverable oriented decomposition of a project into smaller components. It defines and groups a project's discrete work elements in a way that helps organize and define the total work scope of the project. (Booz, 2010)

The work breakdown structure is a tree structure, which shows a subdivision of effort required to achieve an objective; for example a program, project, and contract (NASA, 2001). In a project or a contract, the WBS is developed by starting with the final objective and successively subdividing it into manageable components in terms of size, duration, and responsibility, which include all necessary steps to achieve the objective.

3.6 Critical Success Factors of Project Management

Definition of the Project Success:

The project meets the requirement of customer, the product of the project is available and efficient which make customer satisfied, the project is finished on time and within budget. This is the definition of the project success. (Krigsman)

Overall, the following literature review has shown the critical success factors of project management.

Table-1 summary of critical success factors of project management (Lavagnon A. Ika, 2011)

(Khan, 2003)	(Vickland, 2005)	(Struyk, 2007)	(Clarke, 1999)	(Khang, 2008)
Flexible project planning	Interated solutions vs. " Best of breed"	Degree and consistency of local leadership	Communication throughout the project	Clear understanding of project environment
Implementation approach	Big Bang vs. incremental implementation	Policy characteristics	Clear objectives and scope	Clear defining the roles and responsibilities for the project members in the project team
Awareness and sense of urgency for change	Strong project management	Availability of resources	Breaking the project into ' bite sized chunks'	Effective consultations with stakeholders
Publication of success stories	Extensive training	Number of implementing actors	Using project plans as working documents	Adequate resources

Creation of a powerful group of "champions" of change	Use of the appropriate individuals from each functional area	Attitude of implementing personnel		Continuing support of stakeholders
Networking and team building	Senior manager's understand of project	Alignment of clients		Commitment to goals and objectives
Anchoring changes in the organization's culture	Top-down implementation	Learning opportunity among implementers and between projects		Compatible rules and procedures for project management
Project management structure		Past experience of implementers		Clear policies by donors and recipients to support sustainability
Selecting the right project team		Local environment		Adequate local capacities
				Strong locak ownership pf the project

Among these critical success factors, three of them are are comparatively more desisive in information system development:

Success factor one: clear objectives and scope (Clarke, 1999)

Clear objectives and scope is the most crucial part of the project. Scope and objectives are the guiding principles that direct the efforts of the project team (Randolph, 1994). And they will determine a project's success or failure (Ward, 1995).

For information system development, objectives and scope are often regarded as separate entities, and there is a good reason for grouping them together. Without a well-defined scope, the objectives of information system development can be vague and people may start to lose sight of what they are trying to develop.

Success factor two: clear defining the roles and responsibilities for the project members in the project team (Khang, 2008).

Clearly defined the roles and responsibilities for the project members enable all relevant personel to develop the project. This will enhance the efficiency and success rate of the projects.

Success factor three: breaking the project into 'bite sized chunks' (Clarke, 1999)

Breaking large projects down into sub-projects or work packages is regarded as one of the most important tasks in new or development project (Lewis, 1996). It ensures greater ownership by all those owning a 'chunk' of the project, spreading responsibilities and accountability across a greater number of people. (Clarke, 1999)

For a information system development, it is easier to manage in a number of ways: delegating responsibilities to the project team, monitoring against the objects, communicating progress of the project, identifying problems upfront and making modification to the information system development.

4. Case Company, Project and Project Analysis

4.1. The Introduction of The Case Company

Case company 1： A software design company. The main service of this company is to help organizations in the field of software designing. The key customers of this company are business organizations, sometimes; they will get a big order from abroad. The company is a small-size one in China; there are about 30 employees in the company.

Since 2001, information systems got popular in China. Accordingly, this software company started to change their main business to develop information systems.

Case company 2: (Customer Company) A clothes manufacture company. The manufacturing factories are in South Africa and the purchasing department is in China. The orders are from Europe and America. The Headquarters is in Hong Kong ，China.

Every year, the headquarters gets orders from European companies or American companies. The headquarters will send a purchase list to the purchasing department. The purchasing department will collect these materials scattering throughout China. There is a lot of raw material purchased from China and the logistics department of this company will be responsible for transporting these raw materials to Africa for manufacturing and packaging. Afterwards, the products will be delivered to Europe or America.

4.2. Project Case Define

The manager of the purchasing department came to the software company consulting about developing an information system for their purchasing and logistics department to **improve the working effectiveness and to reduce the cost of the distribution**.

The interview content:

For the manager of the customer company

Question: "why do you want to implement the informationsystem in your company and what is your expectation for this information system?"

Answer: "Every year, we order a lot of raw materials from China and deliver them to Bengal,, and we always use phones and paper to run our business, which cost us a large amount of money and time. I read some information about information systems on the internet; I think it can help our company. However, I don't know much about information technology."

The customer company wants to use this application as soon as possible.

For the project manager of the software company

Question: "What do you think of this project?"

Answer: "according to the description of the customers, we know that the customers want a **logistic information system and they need this application as soon as possible**. However, they have not enough knowledge of the information and communication technology, this means that they have no idea of the detail function of this information system. And this is our first time to cooperate with this company; we just know a little information about the customer company. In general, this is a challenge of our company; we will try our best to do it."

4.3. Project Analysis

According to the basis required by the customers, the software company decides to design a supply chain system for them.

Supply chain management system is the management of a network of interconnected businesses involved in the ultimate provision of product and service packages required by end customers (Harland, 1996).

Supply chain management spans all movement and storage of raw materials, work-in-process inventory, and finished goods from point of origin to point of consumption (Nagurney, 2006).

Supply chain management is a methodology and approach for companies to manage, control and organize their distribution, cash flow and business information.

However, the project team has met some problems during the system development.

4.3.1 Problem List

Problem 1: The project team has a little amount of information which makes requirements hard to define. For the information system development, the clear requirements can help the project team member to figure out what kind of the information system they are going to create. However, in the case, the manager of the customer company and his employees are business men and have not much knowledge about information and communication technology; they only know some basic functions and cannot give more information about clear ideas or detail requirements.

Problem 2: Business background of the project. The purpose of supply chain system is to give support to the decision makers in the company based on the logistic background. It requires that the project team have enough background support on the business site.

Problem 3: According to presentation of the purchase department manager, customer company wants this information system as soon as possible. However, the process of information system development needs step by step to achieve scopes.

The method to control the process of the project and to improve the work efficiency is still remained to be explored.

4.3.2   Solution List

Based on these problems, the software company implemented these solutions to solve the problems.

Problem 1 solution:

According to the situation of the customer company, the project team made a specific requirement analysis form and sent two employees to the customer company. The roles of employees are requirement analyst and logistic specialist. These two persons work with the customers for a few days, the responsibilities of these two employees are to fill the requirement analysis form, and to write reports for the company

Table 2- Requirement Analysis Form

Softwa-rename	Supply Chain System Development		
User of the soft-ware	department	roles	Main mission
	Purchasing-department	Manager and employees	Purchase the raw material from order list.
Entity	EntityName		Relationship
	Name of raw material Employees Order list		According to the order list, the employees will purchase the raw material from the different place in China.
require-ments for functiona tiona-lanalysis	Customer information management Warehouse management Transport management Financial management Customer value analysis Warehouse optimal decision Warehouse arrangement management		

	Auto dispatch			
Problem	Low-level of informationization No analysis for the historical data			
Software perfor-man-ceana-lysis	Database		Operating system	Others
	Customer database Warehouse database Raw material database Suppler database Category of clothes		Windows Vista	
security	Authoriztion	Data serurity	Others	
	Employee can research the information , input and de-lete data	User name and password, login , log out and print his-tory	Need Training	

Based on the requirements analysis, the project team defined the users of the information system, the entities of the database, the problems of the customer company, the requirements for the functional analysis, the security of the information system.

Based on the requirement analysis for the customer company, the definition and agreement of the project team and generally understoond objectives of the supply chain management system.This result makes the process of the project be monitored effectively. Ultimately, its success will be measured more easily because the objectives are clear stated at the outset of the project.

Problem 2 solution:

According to the situation of the project, the software company prepared a detailed personnel distribution.

Table 3- Human Resource Management Form

Project Team	requires-number	Ability	Time for wor-king

Project Manager	1	High skills on project management Decisions making Good communication Knowledge Background : IT and business	Whole project
Requirement analyst	1	good communcation knowledge about market research, financial strong responsibility basic knowledge of IT	Whole project
Database Designer	3	Master the concepts of database technology, methods and technologies. SQL database Database system installation , configuration and database management	System analysis, design and implementing
Software designer	2	Master the C, C++, Java Familiar with database, network. Understanding of information standards, security and the relevant laws.	System analysis, design and implementing
Testers	5	Same person with database designer and software designer.	System analysis, design and implementing
Training group	1	proficient in all kinds of business management software good communication and high teaching skills sales experience understand the basic principles	Project closed

		of computer	
FileManager	1	Same person with requirement analyst	Whole project
Consultant for business intelligence system	1	familiar with requirements analysis Selection the category of business intelligence. 5 years experience for business intelligence system developing	Whole project
logistic specialist(Outsource)	1	Master the knowledge of logistic. 10 years working experience	Whole project

During the project meeting, the project manager defines the number and the requests of the teammates. In the project team, the project manager and the requirement analyst are the important roles, the project manager and the requirement analyst should no only understand and define the requirements from the customers, but also recognize the trends of markets to meet the changing requirements. The logistic specialist analyzes the background of the clothing factory, and gives a number of suggestions to the project team.

Problem 3 solution:

According to the result of the requirement analysis, the project team made the work breakdown structure based on the requirement level.

Table 4- Work Breakdown Structure

Requirement level	Level 1	Level 2	Level 3

	Requirement analysis		
		Prototype design	
		User interface Design	
	System Design		
		Structure Design	OLAP(On line analytical Processing)
		Functional Design	Test Library Picture Library Data Library Model Library Method Library Knowledge Library
		Database Design	Collect data
	System Implement		
		Coding	
	Testing	Test plan	
		Test case	
		Test conduct	
	Closed	Deliver and installation	installation on the company's computer
		Training	User communication and training
		System closed meeting and report	documentation

The project manager use the work breakdown structure to breaks this supply chain system project down into work packaged. The work breakdown structure ensures these sub-projects and defines the total work scope of the project. The project manager can use it to control the schedule of the project.

According to the work breakdown structure, the customer company can observe the lifecycle of the whole project the software company makes a promise to the customer company that they will complete the project by this WBS.

4.3.3   Problem Solution Vs Project Success Factors

Success factor one: Clear objectives and scope (Clarke, 1999)

Problem solution 1: the project team makes a comprehensive requirement analysis for the customer company to define the business requirements, the users' requirements and the functional requirements of the supply chain management system. Through these three levels requirements, the project team can plan precisely with a clear goal and avoid the misunderstanding of business culture difference. On the other hand, the clear requirements defining help the project team to ensure the quality of the information system.

Success factor two: Clear defining the roles and responsibilities for the project members in the project team (Khang, 2008).
Problem solution 2: the software company makes approached arrangement of human resources, which avoid misunderstanding in different business environment. On the other hand, the project members can understand their responsibilities and position in the project team, which can promote working efficiency.

Success factor three: Breaking the project into 'bite sized chunks' (Clarke, 1999)
Problems solution 3: The work breakdown structure makes a framework of the project. In the case, the project team put the project into 5 phases. The benefits of using breakdown structure in this case are as follows: First of all, it defines the different phases.The project team members can find the details and the scope of

each phase. Secondly, the project team can find a solution to control the process with the work breakdown structure. Finally, it is a kind of communication between the team members. In the project, there is a lot of information needs analyzing, and the work breakdown structure is like a communication connector for the team members, it enables the project team understand the process of completing the project.

5. Conclusion

Based on the case analyzed, there are three factors found from project management which can improve the success rate of information system development. There are requirement analysis, human resource management and work breakdown structure.

In the information system development, clients always have some basic functional requirements at the begining of the project, but they are clear about what equipment and detail functions which they need. The quality and other requirements require the project team to analyze and to make judgments. Therefore, the project scope is based on requirement analysis of the project team. Using the requirement analysis in the information system development can help the developer deeply understand the requirements of the systems. Clear specification of the requirements can increase the success rate of information system development

Information system development is a mental and physical labor intensive project which is mainly affected by human resource. To develop an information system, the implementers need not only to know how to design the functions of the information system, but also to understand the background of this information system. The human resource management can help the project team to discover the suitable person to finish the job.

In the work breakdown structure of the project, the level of each phase is clearly defined, and the relationship between each phase is clearly established. These make the projects' time well- arranged on each level.

In general, applying the project management knowledge to information system development can make it easier to achieve the goals and can improve the success rate of information system development.

6.   Recommendations For Future Research

This thesis is based on a literature review and a practical case study. However, there are still some areas which are not covered in this thesis remaining to be explored.

First of all, in the project management, there are other factors, such as performance management and risk management. Will these two factors influence the success rate of the project, and how will they influence the information system development?

Secondly, the failure rate of information system development is still high during these years. Using project management knowledge is one way to support the information system development to be successful. However, are there any different ways to improve the success rate of information system development? That's another question I need to think about in the future study.

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