CHAPTER IV
DATA COLLECTION

4.1 General

This chapter clearly reveals the real situation of project managers based on their knowledge and competencies implemented in construction projects in Cambodia, Lao PDR, and Thailand. The needed data and information were mostly collected and investigated from construction sites and personal interviews in accordance with developed questionnaire as perceived by the principal actors in construction projects; the contractors, the consultants, and the owners.

4.2 Background

A developing country is a country that has improper standards of democratic governments, civil service, industrialization, social programs, and human rights guarantees that are yet to develop to those met in the developed world or alternative goals of material progress. Developing countries are in general countries which have not achieved a significant degree of industrialization relative to their populations, and which have, in most cases a medium to low standard of living. There is a strong correlation between low income and high population growth. Despite this definition, the levels of development may vary, with some developing countries having higher average standards of living.

4.2.1 Cambodia Background

Cambodia has a land area of 181,035 square kilometers in the southwestern part of the Indochina peninsula, about 20% of which is used for agriculture and the population was estimated about 14,494,293 in 2009. Geographically, it lies completely within tropics with its southernmost points slightly and western regions; the Dangrek Mountains of the north adjoining the Korat Plateau of Thailand; and the Ratanakiri Plateau and Chhlong highlands on the east merging with the Central Highlands of Viet Nam. On the west by a narrow coastal plain: facing the Gulf of Thailand that contains Kampon Som Bay. The Dangrek Mountains at the northern rim of the Tonle Sap Basin, consisting of a steep escarpment on the southern edge of the

Korat Plateau in Thailand, marks the boundary between Thailand and Cambodia. The country's capital city is Phnom Penh. Cambodia has 800 km with Thailand to the west, 450 km with Lao PDR to the north, 1250 km with Viet Nam to the east and coastline of 440 km long. The physical landscape is dominated by the lowland plains around the Mekong River and the Tonle Sap Lake. Of the country's surface, approximately 49% remains covered by forest. There are about 2.5 million hectares of arable land and over 0.5 million hectares of pasture land. The map of Cambodia is shown as below:

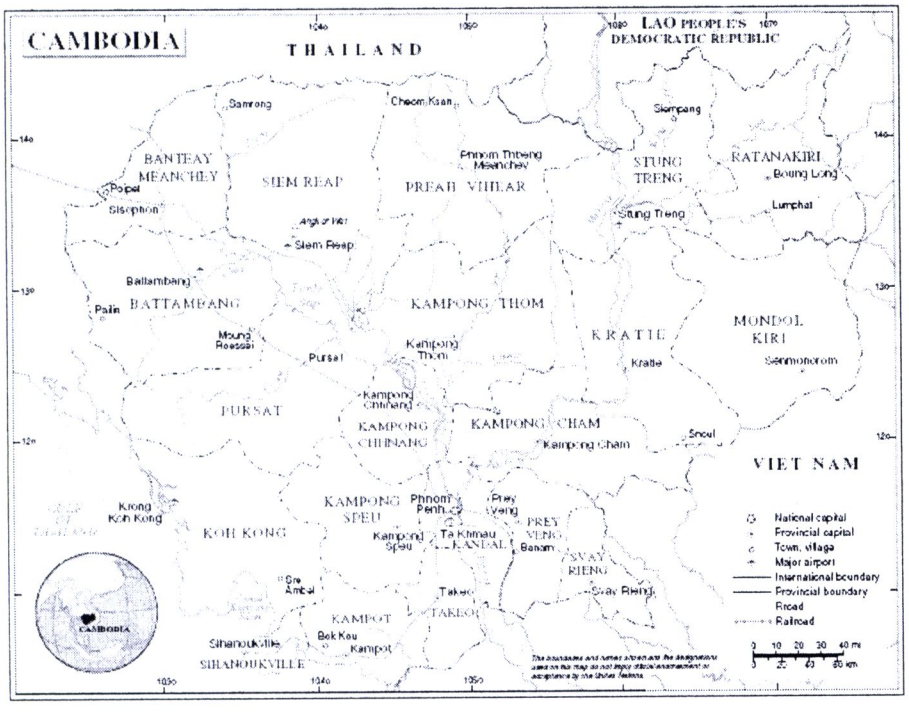

Figure 4.1 Map of Cambodia (Wikipedia, 2009)

From 2004 to 2007, the economy grew about 10% per year, driven largely by an expansion in the garment sector, construction, agriculture, and tourism. GDP dropped to below 7% growth in 2008 and probably contracted in 2009 as a result of the global economic slowdown. The global financial crisis is weakening demand for Cambodian exports, and construction is declining due to a shortage of credit. The long-term development of the economy remains a daunting challenge. The Cambodian government is working with bilateral and multilateral donors, including the World Bank and IMF, to address the country's many pressing needs. The major economic challenge for Cambodia over the next decade will be fashioning an

economic environment in which the private sector can create enough jobs to handle Cambodia's demographic imbalance. The population lacks education and productive skills, particularly in the poverty-ridden countryside, which suffers from an almost total lack of basic infrastructure. (UNDP, 2009)

The below figure indicates the ranking of global good practice economy in South East Asia in 2010:

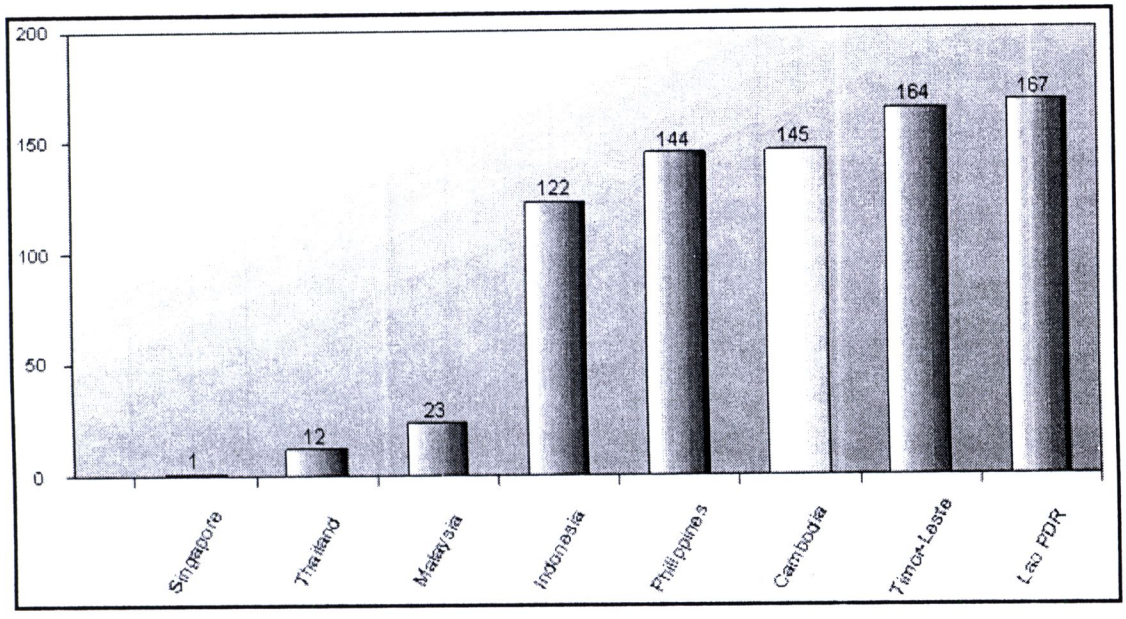

Figure 4.2 Ranking of global good practice economy (World Bank Report, 2010)

Cambodia's construction sector boomed over the last decade with projects increasing. Construction projects have increased in both scale and value with a large number of high-rise apartments, office buildings, residential, commercial and public facilities, villas, condominiums, trade and financial centers, office buildings, shopping centers, hotels, schools and hospitals, currently under construction. Imports of construction materials have rapidly increased hand-in-hand with the construction boom. The importance of the construction sector in relation to international competitiveness depends more on its role as an enabler than as industry in itself. It plays a fundamental role in the economy by providing the necessary public infrastructure and structures for government, business and domestic spheres of life.

The infrastructures in existence in Cambodia nowadays are shown in the figure below:

Figure 4.3 Pictures of infrastructures in Cambodia

4.2.2 Lao PDR Background

The Lao People's Democratic Republic is spread over total area of 236,800 square kilometers and its population is probably about 6,834,942 in 2009. Lao PDR is geographically a landlocked nation in Southeast Asia occupying the northwest portion of the Indochinese peninsula; Lao PDR is surrounded by China, Vietnam, Cambodia, Thailand, and Burma. It is a mountainous country, especially in the north, where peaks rise above 2,800 meters. Dense forests cover the northern and eastern areas covering an estimated 45 percent of Lao PDR, making it one of the most heavily forested countries in South East Asia. Thus, it has significant natural resources like forestry, minerals and hydro-electric power. The Mekong River, which forms the boundary with Burma and Thailand, flows through the country for 1,500 kilometers of its course. The World Bank estimated 70 percent of the country is considered mountainous or hill terrain with altitudes varying between 1,500 and 3,000 meters,

and less than 10 percent of the total area of Lao PDR is suitable for agriculture. The climate is tropical with a wet season from May to October and dry season from November to April. Agriculture is the major sector contributing 51 percent of Gross Domestic Product (GDP) and employing 80 percent of the labor force; the industrial and service sectors account for the rest (23% for industry and 26% for services).

The major cities are Vientiane (the capital), Savannakhet, Pakse, Luang Prabang and Khammoune (Thakek) which are located along Mekong River. Buddhism is the dominant religion with more than 85% of the population as believers. Lao PDR is a popularly communist state which is further sub divided into 15 regions and 1 municipality for convenience of administration. The map of Lao PDR is indicated as the following:

Figure 4.4 Map of Lao PDR (Wikipedia, 2009)

Lao PDR is the Least Development Country (LDC) with high levels of poverty as indicated by UNDP's Human Development Indicators. It is placed 133 out of 177 countries on the UNDP Human Development Index. The government of Lao PDR, one of the few remaining one-party Communist states began decentralizing control and encouraging private enterprise in 1986. The results, starting from an extremely low base, were striking-growth averaged 6% per year from 1988-2008 except during the short-lived drop caused by the Asia financial crisis that began in

1997. Economic growth has reduced poverty rates from 46% in 1992 to 26% in 2009. The economy has until recently benefited from high foreign investment in hydropower, mining, and construction. Despite this growth rate, Lao PDR remains a country with an undeveloped infrastructure, particularly in rural areas. It has a rudimentary, but improving, road system, and limited external and internal telecommunications. The three pillars of the strategy are to foster economic growth with equity, develop and modernize its social and economic infrastructure and enhance human resource development. (UNDP Report, 2009)

Figure 4.1 demonstrates that Lao government has planned from 2005 to 2020 to implement the economic strategy in order to increase the citizen's income following the population in the country.

Table 4.1 Economic strategy plans of Lao government from 2001-2020

Economic Strategy Plans	**Years**		
	2005	2010	2020
Population (million)	5.9	6.7	8.3
GDP (%)	7	7	7
Income/person (US$)	500-550	700-750	1200-1500

(Source: The report of 7th Laos Public's Revolution Committee Conference, 2005)

The construction fields continue growing in Lao PDR, reflecting a big increase in private demand for new construction. Many of private sectors from China, Korea, and Japan, have simultaneously invested various capitals to develop their new assets in this country including commercial banks, and shopping malls. Additionally, not only private works, but also public or infrastructure projects have arising extensively in both cities and rural areas in order to serve such public demands such as road, bridges, and dam system development and public facilities. The public projects are mostly supported by World Bank and Asian Development Bank since Lao government does not have adequate budget or capital to enable conducting many construction projects.

The infrastructures are being developed in the whole country, including building, road, bridge, and dam, which are illustrated in the below figure:

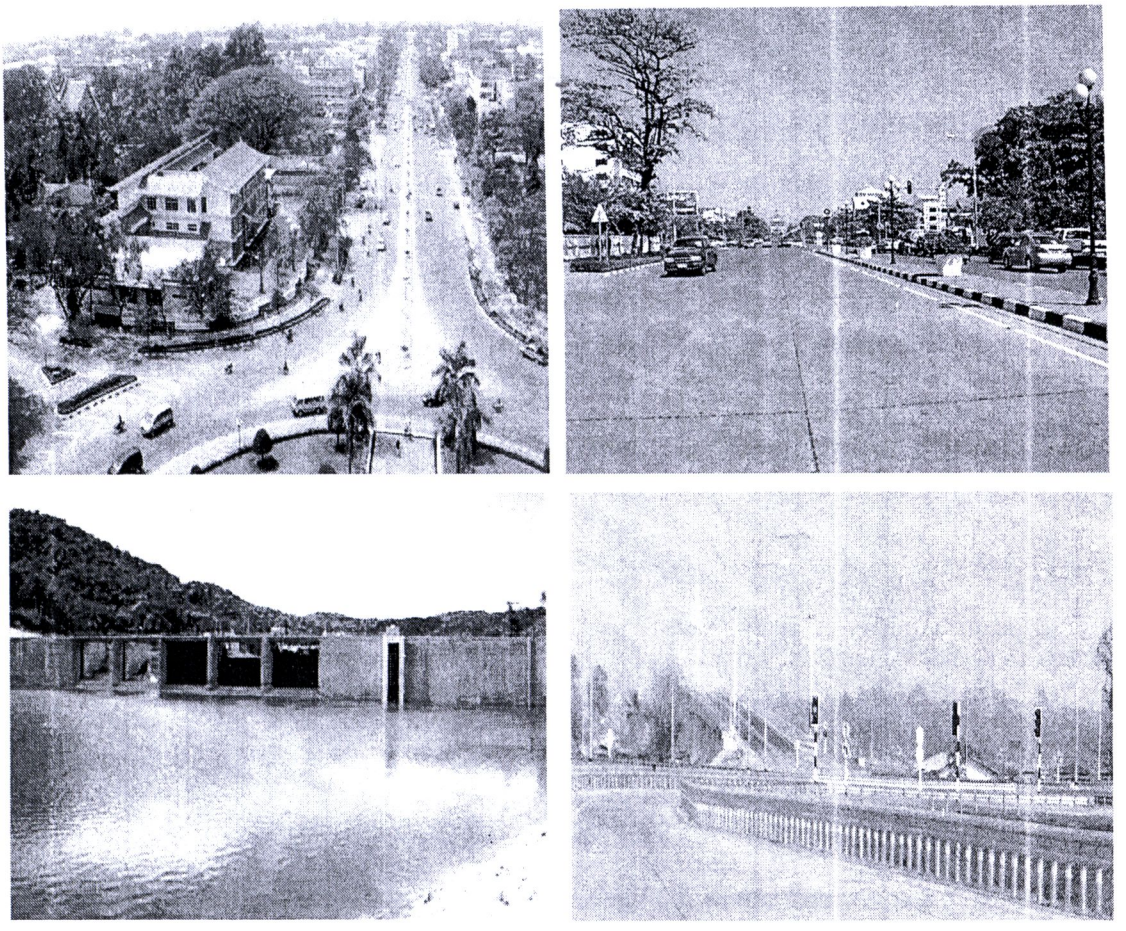

Figure 4.5 Pictures of infrastructure in Lao PDR

4.2.3 Thailand Background

Thailand is on the Southeast Asian mainland, adjoining the Lao PDR and the Union of Myanmar to the North; the Royal Kingdom of Cambodia and the Gulf of Thailand to the East; and the Andamann Sea to the West and Malaysia to the South. The area of Thailand, composed of 99.6% of land and 0.4% of marine territory, is approximately 514,000 square kilometers. Bangkok is the well-known city as the capital of Thailand. The population of Thailand was approximately 62.4 million in 2009, with many ethnic groups. The climate in this country is tropical, with an average low temperature of 23.6 degrees celsius and high temperature of around 39-40 degrees celsius during summer. Three seasons are present in Thailand: monsoon from July to October, cool from November until February and hot from March until June. The map of Thailand is shown in Figure 4.6:

Figure 4.6 Map of Thailand (Wikipedia, 2009)

Thailand is an emerging economy and considered as newly industrialized country in South East Asia, especially for construction industry. In this country, the construction industry has been growing since 1961, when the first National Economic and Social Development Plan was implemented, new technique have been introduced to construct infrastructure. The construction business grows side by side with the rapid development and expansion of the community (Sattayanon, 1984). In other words, Thailand is a rapidly developing country in terms of industrialization especially compared to other countries South East Asia. It also has own budget for infrastructure development. At the present, Thailand is considered as a strong country in terms of finance for infrastructure development. With a well-developed infrastructure, a free enterprise economy, generally pro-investment policies, and strong export industries, Thailand enjoyed solid growth from 2000 to 2008; averaging more than 4% per year, as it covered from the Asian financial crisis of 1997-1998. Thai exports, mostly machinery and electronic components, agricultural commodities, and jewelry, continue to drive the economy, accounting for as much as three-quarters of GDP. The global financial crisis of 2008-2009 severely cut Thailand's exports, with most sectors experiencing double-digit drops. In 2009, the economy contracted

about 2.8%. The Thai government is focusing on financing domestic infrastructure projects and stimulus programs to revive the economy, as external trade is still recovering and persistent internal political tension and investment disputes threaten to damage the investment climate. (UNDP, 2009)

The construction in Thailand derived from a combination of many factors such as local demands in the country, compared to many neighboring countries, the booms in tourism and external investments, mainly from Japan and other Asian tigers (Korea, Taiwan, Hong Kong, and Singapore). There have been lots of construction projects booming in this country consisting of high rise building projects, condominiums, hotels, shopping centers, factories, and other civil engineering projects. Figure 4.7 indicates the current infrastructures in Thailand:

Figure 4.7 Pictures of infrastructures in Bangkok

4.3 Data Collection in Cambodia

The infrastructure sector has been growing remarkably in the whole country including bridges, roads, canals, dams, and building projects. One city and one province in Cambodia; Phnom Penh and Siem Reap, respectively were thoroughly

investigated and surveyed to use in this research by referring to some building construction sites. As mentioned in Table 4.2, there are totally 14 construction sites; mostly large projects, were investigated and also 36 respondents consisting of 14 contractors, 12 consultants, and 10 owners, which were interviewed in detail in accordance with the developed questionnaire to clearly acquire the necessary data and information about specific aspects.

Table 4.2 Number of surveyed construction projects and respondents in Cambodia

Number of Construction Projects	**Number of Respondents**			
14	*Contractors*	*Consultants*	*Owners*	*Total*
	14	12	10	**36**

4.3.1 Construction Project Surveys in Phnom Penh

Phnom Penh Capital city was established at four intersections of rivers; Mekong, Tonle Sab, Tonle Bassac. These rivers provide potential freshwater and river ecosystem as important resource for sustainable environment condition, natural beauty and prosperous culture for people of Phnom Penh Capital City from the past and the present. Phnom Penh lies along the Mekong River which is the main river in Asia, 4,200 kilometers long. The original source of the river is from highland Tibet China. The river crosses Cambodia from North to South with total length 486 kilometers and passes Phnom Penh as an intersection of rivers to create attractive freshwater and ecosystem for the city. Phnom Penh covers on 375 square kilometers which is in rice field 11,401 hectares and wetland, lake, settlement and in roads 26,106 hectares. The agriculture land located in suburban areas in 3 Khans (Khan Doung Kuor, Khan Meanchey and Khan Resey Keo) is 34, 685 square kilometers, which is in irrigated land 1,476 hectares and non-irrigated land 6,724 hectares. Others cropped land is 1,330 hectares. The population in Phnom Penh is approximately 1,325,681 people (2009), with a total population density of 4,571 inhabitants per square kilometer.

The main economy is based on commerce such as garments, trading, small and medium enterprise, especially construction sector. Double-digit economic growth rates in 2008 triggered an economic boom, with new urban development such as new hotels, restaurants, bars, and residential buildings springing up around the Phnom Penh capital city. Unfortunately, the number of construction projects in Phnom Penh has been decreasing slightly due to the world economic crisis. Some projects which were under construction have been suspended or stopped for financial problems. However, there are still small and large construction projects operating in Phnom Penh city such as housing projects and commercial building projects.

In this research, there are only 10 big construction sites in Phnom Penh which were surveyed including tall condominiums, suburban small towns, large supermarkets, office buildings, and five star hotels, as shown in Figure 4.8 and Figure 4.9. Most of those construction projects belong to private owners which have invested the budget resources in developing their assets in Phnom Penh. Some investors have spent their own capital to build high class condominiums and office buildings, and after that they sell or rent these properties to those who can afford them. Similarly, small towns around the city have been developed mostly in the suburbs of the city. Those towns consist of small villas and tall condominiums surrounding them.

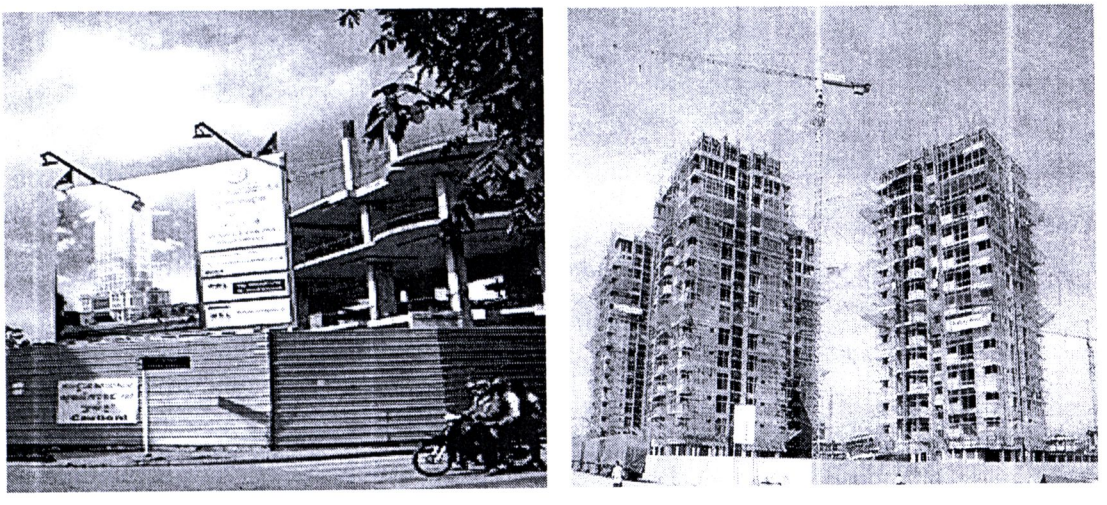

Figure 4.8 Building projects under construction in Phnom Penh

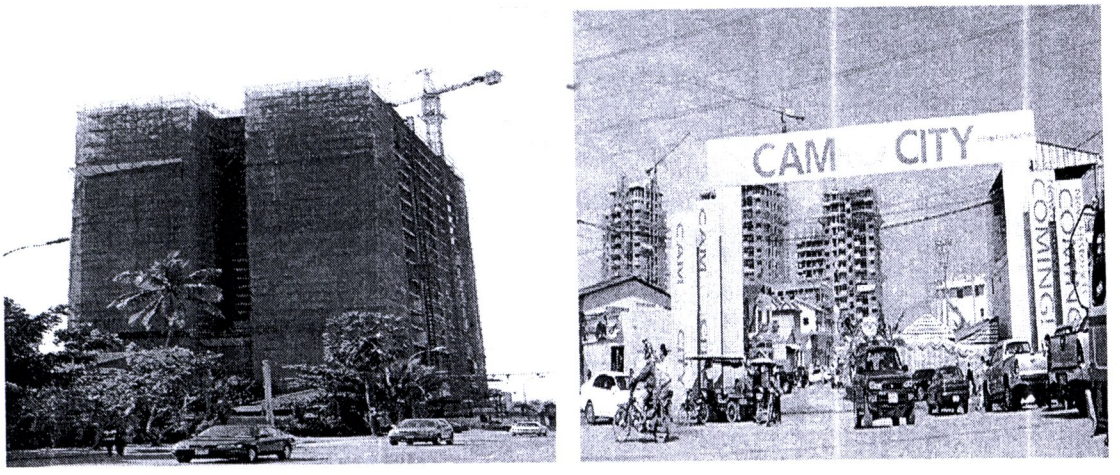

Figure 4.8 Building projects under construction in Phnom Penh

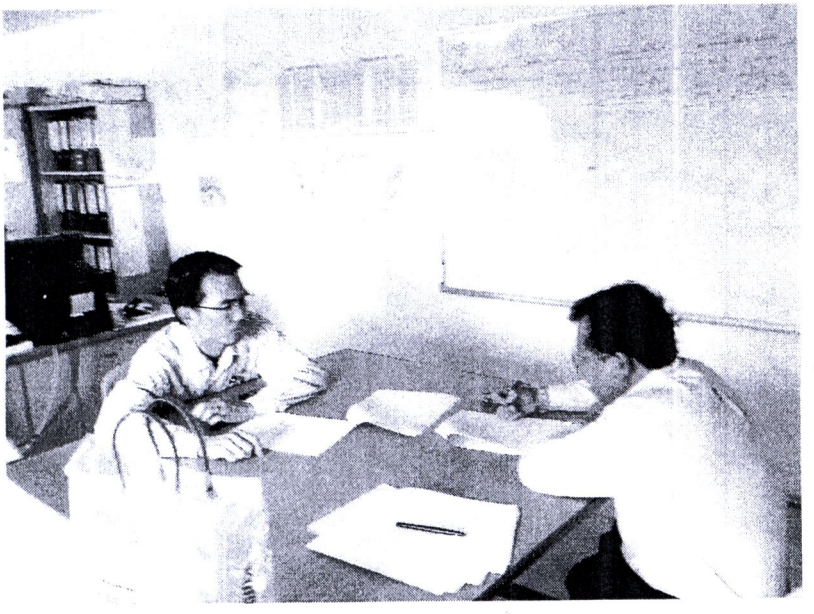

Figure 4.9 Interviewing a project manager of contractor in Phnom Penh

4.3.2 Construction Project Surveys in Siem Reap

Siem Reap is one of the best known provinces in the Northwest of Cambodia and is 314 kilometers from Phnom Penh. It borders Oddor Meanchey to the North, Preah Vihear and Kompong Thom to the East, the Tonle Sap Lake to the South and Banteary Meanchey to the West. The area of the province is 10299 square kilometers, while the population is estimated about 896,309 people. The topography of the province is variable from the Tonle Sap floodplains along the Southern border through a belt of lowland paddy fields to lowland/upland mosaic upland forested areas to the north. Siem Reap is classified as a rural province. The World Heritage Site of

Angkor Wat is located in this province. Since Siem Reap is well known for its tourist's spots, there are thousands of visitors from all over the world every year. In order to make them more comfortable and also to increase the number of visitors Siem Reap provincial government is taking a lot of steps to make visitors comfortable. Hotels and guesthouses in Siem Reap are found everywhere and afford able for the budget of tourists. There are about 142 hotels in Siem Reap operating at present. Political stability and improved safety, allied to the active promotion of Angkor Wat as a tourist destination, has resulted in rapidly rising visitor figures, turning sleepy Siem Reap into a Cambodian tourist hot spot. A new local airport was recently completed and is linked to several Asian capitals as well as Phnom Penh, while National Route 6 south to the capital and north to Thailand has been improved and the express boats are popular. With tourism, the town is developing apace, and a steady stream of new hotels, restaurants and bars are appearing though surprisingly, a small-town atmosphere still pervades, giving visitors the best of both worlds.

Like in Phnom Penh city, the construction projects in Siem Reap have been slowing down in recent years due to global financial crisis. This problem has resulted in suspending the construction process of many big projects. At present, there are some projects under construction including a few hotels, and some housing projects, etc. Additionally, Most of housing projects have been constructed by simple or minor contractors which are not the registered companies. This is because those small contractors provide lower charge of construction to clients than standard contractors do.

Consequently, there are merely 4 construction sites in Siem Reap which were surveyed and necessary information gather to study in this research. Those construction projects accordingly consist of one office building, two hotels, and one big flat project zone.

The Figure 4.10 shows the site investigation and the activity of data collection in one of the construction sites in Siem Reap.

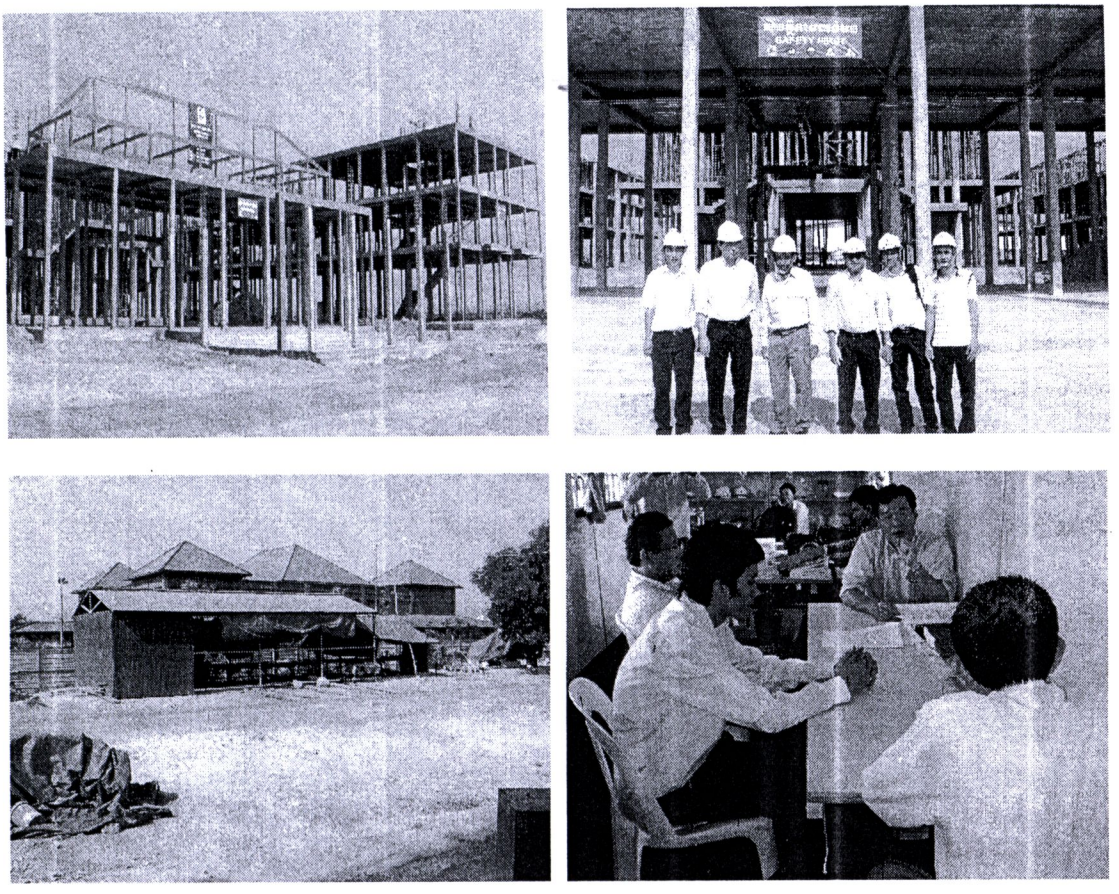

Figure 4.10 Interviewing with a project manager of contractor in Siem Reap

4.3.3 Knowledge of Project Managers in Cambodia

All construction project managers who were interviewed and evaluated are local and working for private projects in accordance with the identified scope of study. They were interviewed in detail based on the developed questionnaire about information pertaining to the knowledge areas which are compulsory for project manager's responsibility. Another two interviewees; consultants and owners, also were asked to perceive their own opinions on the importance of knowledge areas for construction project managers of contractors.

According to the survey, the knowledge of local project managers of contractors which is used in construction projects mostly comes from their practical experiences. In other words, some of the local project managers obtain the knowledge and experiences through extensively working and practicing with foreign seniors in the companies. Of course, the construction project management is not available in the program of educational institution due to lack of human resources being capable of

lecturing project management field. After interviewing some contractors, consultants, and owners, the significant 13 knowledge areas for project manager's duties were obtained as the following:

- Cost management
- Time management
- Quality management
- Contract management
- Material management
- Labor management
- Equipment management
- Safety management
- Subcontractor management
- Documental management
- Communication management
- Human resource management
- Risk management

4.3.4 Competencies of Project Managers in Cambodia

Owing to the survey in Cambodia, the competencies of local project managers are partially elaborated and evaluated in terms of current situations and problems appearing in their construction works, which affect the competencies of project managers.

❖ ***Cost management***

Cost is one of the critical attributes that must be controlled by the project manager of contractor. Project costs are estimated to develop a budget within which the project manager must work. By the interviews with all principle actors in construction project, there are always many problems occurring in project process due in Cambodia for the local project managers' responsibilities. Starting with the cost estimating, some local project managers estimate the project cost through collective past experiences and information in order to yield the current project budget. That is to say, when possible, the project manager and superintendent are always responsible for developing the estimate or at a minimum, work as integral members of the estimating team. Their individual inputs regarding constructability and their personal commitments to the estimating product are essential to assure not only success of the estimate, but also the ultimate success of the entire project. In this survey, some project managers in Cambodia do not get along well with some superintendents, and also some team members do not rely on each other, which causes their jobs or cost estimating to be done inaccurately and inefficiently. Moreover, most project managers

in contractor companies are just able to use simple software to develop their estimates. Thus, this may cause some inconveniences in approximating the anticipated cost of a project.

Another issue of cost management in Cambodia is cost control. Some project managers do not start with a detailed estimate, so it is difficult to control the project costs.

❖ ***Time management***

Time management is just as crucial to project success as is cost management. It consists of project planning and project scheduling. Planning must be completed before a schedule can be developed. Certainly, most construction projects experience schedule delays due to many factors such as contractor, consultant, and owner, although, the local project managers of contractors in Cambodia in this study have taken into account project delay problems. Construction projects surveyed in Cambodia are mostly delayed in the completion of the tasks because the project managers do not determine or develop the exact construction schedules. Furthermore, the project managers in Cambodia determined the duration for each activity by using past experiences. Sometime, duration estimating is not accurate enough to be acceptable due to insufficient historical data.

Some of project managers do not update or revise schedules properly when the projects are significantly behind schedule or there has been many change orders. Consequently, the projects get serious delays due to low responsibility and qualification of local project managers.

❖ ***Quality management***

Quality management; an important project management function, is also one of the critical attributes of project success, with the others being cost, time, and safety because it has short-term implications affecting material and labor costs on a project and long-term implications affecting the overall reputation of construction firm. After interviewing consultants and owners in Cambodia, they complain that most project managers of contractors do not seriously take into consideration about quality of project works which is the most essential focus for owners. The project managers and superintendents do not work together well to ensure that all materials used and all

work performed on a project conform to the requirements of the contract plans and specifications. The project managers sometime organize or delegate careless or unreliable superintendents to work as quality controller. This means that project managers ignore or are not very concerned about the selection of those who are under project organizations which reduces the quality of work leading to low level. Relating to quality management, some of serious problems often occur in Cambodia after the construction work items are already installed such as failure of testing, because the project managers do not appropriately develop the quality control plans to use on the project prior to initiating actual construction.

❖ ***Contract management***

The construction contract describes the rights and responsibilities of the owner and the general contractor, as well as the terms and conditions of their relationship. This knowledge is essential if the project manager is to supervise the project effectively. In Cambodia, most construction firms have prepared and used their own contract forms or have had their attorneys customize documents for their firms. Such documents, for the most part, are unproven; they are easily challenged and may end up in court. But some parties in construction projects, especially owners and contractors; can negotiate together to solve the problems when the construction projects have troubles such as schedule delay, based on the construction contracts without going to the court. In additional, some project managers of contractors in Cambodia do not read completely or understand well each contract document of projects to identify contract requirements and any associated risks before deciding to pursue a project. This may causes many troubles to contractors during project execution because contract documents are the basis for determining a project budget and schedule. According to the surveys, there are not many significant problems occurring in construction projects in Cambodia involving contract management because of project managers' accountabilities.

❖ ***Material management***

Building materials are necessary to complete the project. As the surveys in Cambodia, some materials in construction projects are furnished by the subcontractors especially formworks, while others are procured by the main contractors. Most major

construction materials, especially steel, must be imported from other countries such as China, Thailand, and Vietnam, since there is not any steel construction plant in Cambodia yet. Thus, the cost of imported materials is very high if compared to neighboring countries. Material procurement is also a main issue of material management for project managers in Cambodia since some of them are not able to initiate material procurement early in the construction process to ensure that materials are available on site when needed by the construction workers, which causes the project schedules delay. The reason why the materials cannot be delivered on time to the sites is that some of project managers do not develop the appropriate scheduling material deliveries clearly. For instance, special manufactured items including structural steel, reinforcing steel, and some inferior finished items that must be shipped long distances must be ordered early, and adequate time must be scheduled to allow for the submittal and review of shop drawings, product data, and product samples.

Furthermore, some of project managers in Cambodia always concern about material usage during the construction process. This means that it is very difficult to control the materials stocks due to lack of up-to-date software.

❖ ***Labor management***

Labor management is one of the critical problems often occurring in construction sites in Cambodia during the construction processes. From the interviews, local project managers mostly complained that it is very difficult and complicated to control the workers' activities. Starting with the unavailability of workers, most of construction workers are farmers coming from the country side in the dry season in an attempt to perform the works in construction sites at cities or central areas. Then, they usually return to their hometowns to do farming when the rainy season comes, while construction sites require workers to carry out such works. As a result, construction projects are continually delayed due to the uncontrolled variation in amount of workers. Concerning the skills, it is extremely hard to find skillful laborers to work in construction sites because most of them do not formally get any work training before coming into construction fields. In other words, they execute the current construction tasks by using their past experiences from previous sites that causes unsatisfactory quality of works.

Since most of local workers possess very low education, even morality, the conflicts among unknowledgeable workers unavoidably arise in construction sites during the construction process. The local project managers do not pay much attention to this matter which can seriously impinge on the projects' performances including time constraint, limited cost, and requirement quality.

❖ ***Equipment management***

Equipment is a vital resource to the accomplishment of a construction project. Without those things, the construction works are not able to operate smoothly and might take too long time to be achieved. Simultaneously, a correct and complete understanding of the equipment costs is essential for project manager's responsibilities because it can economically provide companies a market advantage that leads to greater profits.

As seen in the surveys in Cambodia, core equipment used in building construction sites such as excavators, pile-driving equipment, and cranes, are mostly supported by owners and sometime they are from subcontractors. That is to say, some contractors do not have adequate resources to purchase the principle equipments due to high cost of machinery. Hence, the project managers of contractors do not frequently participate in managing construction equipment in construction sites beside the determination of the needed equipment to perform the works in project sites. However, the project managers have been largely in charge of the safety of equipment utilization and also the subcontracted cost relating to equipment.

❖ ***Safety management***

The safety management of construction projects in Cambodia is not standardized enough because there have been many workers injured and fatal during construction executions. The primary cause of job site injuries are falling from an elevation, while there are other incidents in industrial work force such as electric shock, being struck by something, and being caught between two objects. The project managers are responsible for orienting the safety management of the workers, equipment, and materials on their project sites. According to the interviews, many construction sites have set safety programs to reduce the risk of injury and to increase worker productivity. For instance, they have some worker training for using machines

and conduct weekly safety meetings with workers to maintain a continuous emphasis on hazard removal and safe work practices. However, some of project managers of contractors often encounter the problem of worker's safety. This means that it is very hard for them to control the worker's safety during construction process because most construction workers have low level knowledge related to the construction safety, and they do not understand how important the safety is. The management's commitment to safety of project managers is crucial in construction sites because job site safety is a significant project management issue which is costly leading to disruption of the construction schedule and demanding significant management time for investigation and reporting.

❖ ***Subcontractor management***

General contractors in Cambodia typically use subcontractors to execute most of the construction tasks involved in the projects in order to reduce risk and provide access to specialized skilled workers and equipment. By subcontracting significant segments of work, the project managers can partially transfer much of the risk to subcontractors because one of the risks in contracting is accurately forecasting the amount and cost of labor required to complete the projects. From the interviews, however, there have been such risks and problems occurring in construction projects in Cambodia involving the subcontractor management since some project managers give up some control when working with subcontractors. Moreover, there has not frequently been mutual trust and respect appropriately between the project managers or superintendents and the subcontractors, which leads to impact on the overall quality, cost, and schedule for the projects.

Another issue is the quality subcontractor selection that is essential for project success and also being able to complete the project to the desired standards without experiencing financial problems. In Cambodia, some project managers select subcontractors simply on price regardless of qualification such as good safety record, skilled workers, and good equipment, which often leads to problems on the projects with quality control or timely execution.

❖ ***Documental management***

A submittal, which is a document or product turned in by the construction team to verify that what they plan to purchase, deliver, and ultimately install, is in fact what the design team intended by their drawings and specification. From the interviews, there are many types of submittals in construction projects in Cambodia such as shop drawings, product data sheets, samples, and monthly progress payments. Late submittal is also one of the main problems for Cambodian project managers, which leads to the delays of construction process. Starting with the determination of submittal requirements from contract specifications, some local project managers fail to do that in such works, which results in the construction projects not progressing smoothly.

Furthermore, most project managers only establish or develop the master project schedules regardless of the submittal schedules which allow project managers to be aware of what critical documents to submit to the stakeholders and also to identify some of the hidden errors of the individual works of all parties in projects.

❖ ***Communication management***

Communication means acquiring and transmitting information. It is the most critical project management tool. In terms of language, English is widely used in construction projects in Cambodia for exchanging information regarding a project to expedite the flow of information among members of the project team in case of having foreign stakeholders.

As stated by the surveys, most of local project managers are able to use English language formally as a communication tool. Electronic mail is being used to coordinate field questions with designers and subcontractors, coordinate material deliveries with suppliers, and coordinate project issues with owners. Therefore, in Cambodia, there is not any significant problem in communication management in construction projects.

❖ ***Human Resource management***

It describes human resource management of construction project responsibilities of the project manager, which involves staffing, performance measurement, and engineer development. Of course, there have been many issues

related to human resources in Cambodia due to lack of qualified engineers. For instance, from the interviews, all of large building projects including condominiums, high rise buildings, and supermarkets..., have been definitely designed by foreign engineers such as Korean, Thai, and Vietnamese..., since local engineers possess insufficient capability to afford the designs of such large projects.

Furthermore, there are not much skill enhancement training and development training conducted by project managers in construction firms in Cambodia to improve local engineer performances in their current position and to provide the local engineers with necessary skills to allow them to compete for higher level positions within the company. This is because most construction companies in Cambodia have limited budgets to support the specific training programs for their staff. However, there are still some construction firms sending their staff to implement some training in other countries in order to get and expand their knowledge.

❖ ***Risk management***

Construction projects are initiated in complex and dynamic environments resulting in circumstances of high uncertainty and risk, which are compounded by demanding time constraints, given budget, satisfactory quality. From the surveys, beginning with risk identification, before performing construction phase some project managers in Cambodia do not properly determine which risks are likely to affect the project such as cost estimates and quality planning, and documenting the characteristic of each. This has caused many complicated problems occurring repeatedly in construction projects after the tasks were finished.

Mostly, owners commissioning the construction projects are concerned that the project is within the budget price and operate on time. The contractors have the same objective but their aim is to make a profit on the construction. The contractors' view of the risk is to manage the project within their cost estimate. This means that both parties are seeing the risk from a different viewpoint. Obviously, the primary project risks that most of project managers in Cambodia rarely foresee and control are project schedule and project quality. For instance, one of the real problems occurring in construction sites in Cambodia is bored pile issue. The test indicated that some bored piles did not pass standard strength after installation. This unexpected result caused serious trouble for project manager of contractor regarding bored pile quality.

4.4 Data Collection in Lao PDR

Because there are many construction projects when compared to other cities and provinces, one capital city and one province; Vientiane and Luang Phrabang, was selected to conduct the surveys in order to collect the required data in accordance with this research. Based on the limit of construction projects and proper assumption, only 11 construction projects were investigated and elaborated with detail in this thesis by referring to knowledge and competencies of project managers of contractors in this country. There were 24 respondents including 9 contractors, 8 consultants, and 7 owners, who were directly interviewed in an attempt to obtain the detailed information, as indicated in Table 4.3:

Table 4.3 Number of surveyed construction projects and respondents in Lao PDR

Number of Construction Projects	**Number of Respondents**			
11	*Contractors*	*Consultants*	*Owners*	*Total*
	9	8	7	**24**

4.4.1 Construction Project Surveys in Vientiane

Vientiane is the capital city and also the largest city of Lao PDR, situated on a bend of the Mekong River, which forms the border with Thailand at this point. The estimated population of the city is about 600,000. When compared to the hectic capitals in other Southeast Asian countries, Vientiane offers something unusual for an Asian City, the possibility of some peace and quiet. Moreover, Vientiane is a safe city in terms of crime. This city is served by Wattay International Airport. Economically, an interesting shopping venue is the Morning market that is a large collection of indoor stalls selling most anything. There are also department stores, craft outlets and many restaurants around and in the city. Furthermore, tourism is also one of the main incomes of local people. Many hotels, restaurants, and variety of facilities are comfortably serving domestic and foreign tourists.

After passing a period of data collection, 11 construction projects in Vientiane were surveyed by gathering compulsory information from main actors in projects; contractors, consultants, and owners. Figure 4.11 and Figure 4.12 demonstrate the explored construction projects consisting of shopping mall, commercial building, office building, and road system. Some Korean, Chinese, and Vietnamese investors have invested their capital to establish commercial properties in Vientiane in order to gain mutual benefits. This investment pushes the Lao economic growing by providing various jobs for local people and open-mind trades. Simultaneously, ADB and World Bank also help develop public facilities in Vientiane such as hospitals, and road network, in an attempt to correspond to the local needs.

Figure 4.11 Pictures of surveyed construction sites in Vientiane

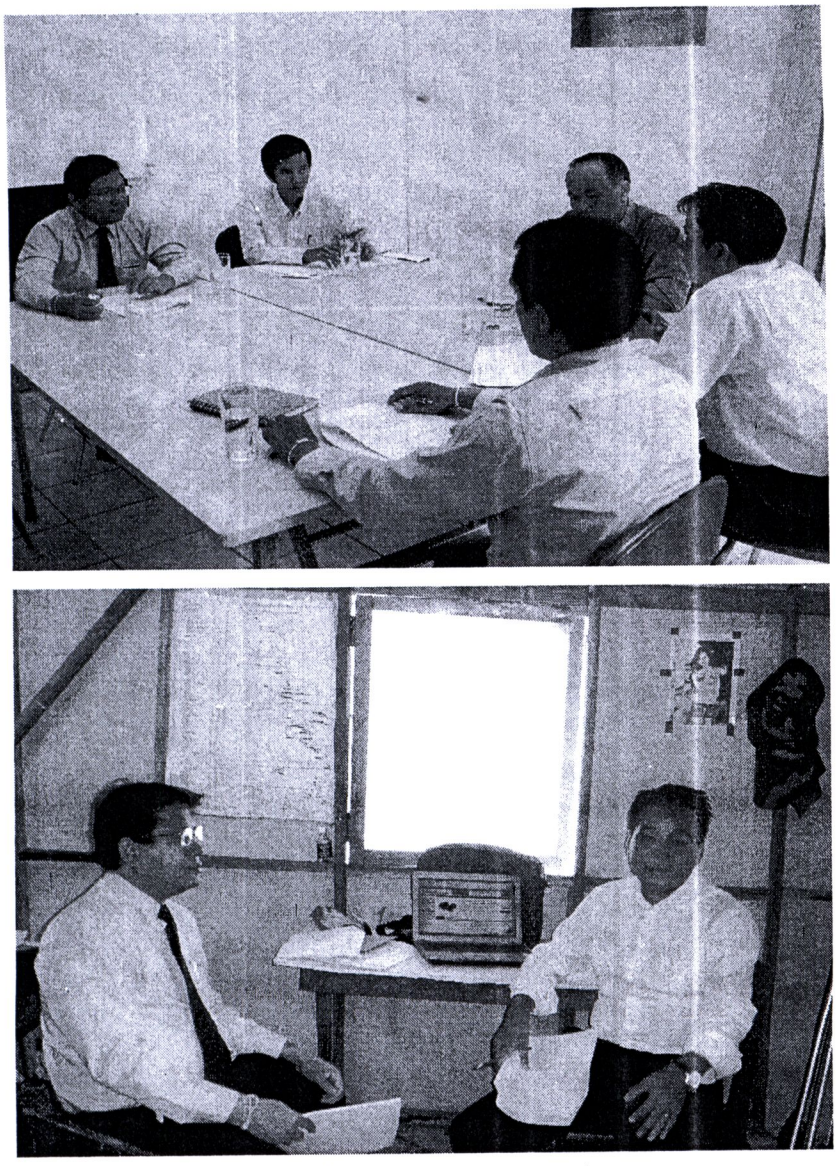

Figure 4.12 Interviewing contractors, consultants, and owners in Vientaine

4.4.2 Construction Project Surveys in Luang Phrabang

Luang Phrabang was formerly the capital of a kingdom of the same name. it is also notable as a UNESCO World Heritage Site. It is a province located in north central Lao PDR, where the Nam Khan river meets the Mekong River about 425 kilometers north of Vientiane. The main part of the city consists of four main roads located between the Nam Khan and Mekong rivers. The city is well known for its numerous temples and monasteries. The current population of the province was about 103,000 in 2009. Luang Prabang features a rich local heritage which combines traditional architecture and urbanism with French colonial influences. The city is famous for its scores of Buddhist temple complexes, some dating from as early as the

15th century, which display the highest refinements in decorative arts and building crafts. The traditional system of crafts training and consequently temple maintenance and building was traditionally located within the monkhood.

Luang Phrabang has both natural and historical sites. At the end of the main street is a night market where stalls sell shirts, bracelets, tea-suitable souvenirs. A long with the magnificent pagodas, a significant part of the old towns' appeal are the many French provincial style houses. The number of tourists in the area is expected to increase rapidly, thus creating pressure to modernize the tourist infrastructure is very important to particularly cater to package tourism. (UNDP, 2009)

The data collection was conducted by interviewing some contractors, consultants, and owners, as shown in figure below:

Figure 4.13 Interviewing three parties in Luang Phrabang

There are some construction projects in Luang Phrabang province such as infrastructure projects, and housing projects. It is noticed that housing projects are allowed to construct with maximum 2 floors as authorized limitation because they want to keep the province natural. Therefore, the data collected from this province was not analyzed due to unacceptable scale of projects.

4.4.3 Knowledge of Project Managers in Lao PDR

From the surveys, construction field is not absolutely booming in Lao PDR. Nowadays, it is just starting to increase development in terms of construction projects. That is why the knowledge level of local project managers of contractors is still

limited based on the current situation. Of course, knowledge of senior project managers is derived from their work experiences when they work with foreign partners or organizations. They learn a lot of useful work techniques from external firms. In contrast, some young project managers possess knowledge obtained from a public university which has construction project management courses from Bachelor's degree to Master's degree. However, many Thai instructors cooperatively come to provide some lectures to Lao master students since the university partly lacks human resources in term of lecturers.

4.4.4 Competencies of Project Managers in Lao PDR

❖ ***Cost management***

The first thing of cost management that project manager of contractor must perform is cost estimating which is the process of collecting, analyzing, and summarizing data in order to prepare an educated projection of the anticipated cost of a project for the competitive bidding. Owing to the surveys, cost estimating has been done by Lao project managers of contractors themselves, not by the estimating department; regarding the size of company. They practically use past experiences and historical data for approximating the cost of project. They also check the market price and historical information for material cost and labor cost. However, the greatest risk for Lao project manager in developing a cost estimate is predicting the cost of material and the productivity of the craft workers. The fluctuation of material and labor cost are the most difficult items for Lao project managers to estimate and are therefore the most risk because they do not have proper factor in estimating the cost for reserving the cost variation in the future.

❖ ***Time management***

Schedules are important tools of all members for the owner, design, and construction team. On all the sites surveyed, Lao contractors used the bar chart for planning and monitoring. Some of the plans are decorative and lacking in sufficient detail as the project managers lacked the experience to prepare good plans. Unavoidably, the construction projects in Lao PDR mostly suffer delays because of many unforeseen causes. From the interviews, Lao project managers sometime develop the project schedules without going into the detail of general site conditions

such as site location, and site access, which are significant impacts on delays of projects during construction operation. In addition, schedule development of Lao project managers do not firstly begin to consider many variables such as material deliveries and manpower which are the most risky in construction field. That is to say, material deliveries from other countries are mostly late to supply on sites since local project managers do not mention in detail the duration of material purchase orders in the main schedule. Similarly, they do not put the period of manpower shortage in the developed schedule during long holiday or national festivals, which makes the construction works encounter delay problem.

It is very hard for Lao project managers to monitor the progress of each activity in the construction schedule and to determine the impact of any delayed activities on the overall completion of the projects since regular updating of plans is not done well. Lao contractors argued that since clients are in the habit of changing their minds very often, detailed short term planning is unnecessary. Consequently, without updates, the schedule loses its accuracy. The owners, designers, and subcontractors would stop relying on the schedule, and the contractor would lose a valuable project control tool which the schedule was intended to provide.

❖ ***Quality management***

The project quality management is a detailed planning explaining how the contractor company will assure that the construction work will be made to the client's requirements. According to the surveys, the quality of work is one of main concerns in construction projects for Lao contractors since local project managers possess limited capability to effective quality planning for the entire project. Although they perform construction works following all specification and scope of contract, the problems of work quality always occur due to skill of laborers. The level of skill of Lao workers is relatively low, which leads the quality of work falling. Thus, Lao project managers should better consider this issue because it is also a critical factor that impinges on the client's satisfaction. On the other hand, quality assurance and quality control (QA & QC) are not widely applied in construction projects in Lao PDR regarding the size of projects. This quality management system is not used in some surveyed construction projects, which causes a lot of troubles among all parties in the projects related to the outcome quality.

However, some project owners and consultants cited that Lao project managers are mostly able to control the quality of construction materials including structure and finishing materials, because the specifications of those materials are clearly mentioned in contract documents.

❖ ***Contract management***

The contract documents describe the completed project and the terms and conditions of the contractual relationship between the owner and the contractor. All surveyed projects in Lao PDR preferred to use unit-price contract because it allows some flexibility in meeting variations in the amount and quantity of work encountered during construction. The various contract formats are individually used in construction projects in Lao PDR in accordance with types of project and the clients such as governmental contract, ADB, and World Bank.

The main problem of Lao project managers involving the contract management is the poor understanding of contract because of lack of attentiveness. In other words, they do not clearly read all complex contract documents comprising general agreements and conditions, special conditions, and technical specifications. Unless they unexpectedly encounter serious problems in construction projects, they immediately check and verify in detail everything in the contract but it seems to be too late to deal with such problems.

❖ ***Material management***

Most of main construction materials are accordingly imported from other countries, especially, Thailand and Vietnam, although there are a few corporation factories in Lao PDR such as cement plant and steel plant. Construction productivity is greatly influenced by the organization of the project site and the flow of material through the site in Lao PDR. Supply of major construction materials is less than demand. Continued expansion in the construction sector of the economy creates supply problems which drive up the prices of materials in this country. Local manufacturers can not expand production facilities fast enough to meet demand. Therefore, material suppliers can afford to charge high prices for poor services.

In addition, as can be seen from the structural system, cement is used extensively in the Lao construction industry both for in situ construction and for pre-

casting. Cement shortages also mean that ready mixed concrete is also in short supply. Shortage of other construction materials such as reinforcing steel is also experienced. The government intervenes from time to time to ease the shortage by giving permission for the import of materials to supplement local production, but such importation is often too late for many projects because Lao project managers of contractor do not prepare well the schedule of material orders and deliveries. That is to say, they do not put or mention the material scheduling in master project schedule, which causes reduction of profits from clients when the construction projects experience delays.

❖ ***Labor management***

The construction manpower working in Lao PDR is not only local, but also foreigners consisting of Thai and Vietnamese laborers because not enough local workers are available enough to support the demand of construction field. Combining multi-nation workers together often causes labor conflicts in construction sites due to their poor communication. The critical problem of labor found in nearly all surveyed construction sites is the lack of locally skillful workers and low productivity. According to the surveys, Lao laborers have low skills to implement their works because most of them are farmers coming from remote areas, are have never learnt the basic skills of construction work before. Relatively, the productivity of work also depends on the skill of labor. For instance, the skillful manpower could yield more productivity than those who have low skills.

Manpower is by far the most variable and unpredictable factor. Seasonality of employment in construction is another problem which may lead the project delays because of shortage of labor. Many local workers do not take construction work as all year round work. They usually go back to their village at harvest and planting times. The local manpower problems have created serious quality control difficulties for project management since they possess very low responsibility for their work performance whereas the only thing they think about day by day is money. It is accepted that the often low quality standards of the buildings is due to the quality and supply of construction manpower.

❖ ***Equipment management***

Equipment resources play a major role in any construction activity. Decisions regarding equipment type and combination can have a major impact on the profit-ability of a job of project managers of contractors. The construction equipment used in sites is mostly imported from China and Japan based on the surveys in Lao PDR. Starting with equipment planning, Lao project managers possess some problems to select the equipment combination that yields the maximum production at the best or most reasonable price because they do not have a basic understanding of the exact costs to buy or rent the particular piece of equipment. From the interviews, disputes with neighbors are also cited as being responsible for work stoppages in Lao PDR. This often creates severe restrictions of working space for equipment such as tower cranes and sometimes imposes restrictions on working times such as no over time at night. This is a common problem with projects in all urban centers and is not considered to be a special problem in case of this country. However, this problem might cause construction projects delay or the projects cannot be accelerated to finish on the determined schedule. Furthermore, the equipment operators do not have enough experiences to direct or handle the equipment such as tower cranes, which causes accidents on sites and low productivity as well.

❖ ***Safety management***

The construction industry has many special features which adversely influence the safety and health of those who work in it as compared with workers in manufacturing industries. These influences are felt in all countries; they are especially serious in developing countries. By the observation, safety strategy implementation in construction sites is not good enough for workers because personal protective equipments is not widely used in some surveyed sites in Lao PDR. It is the contractor's responsibility to see that everything possible is done to provide a safe working environment for the work force and the public in general. The local project managers do not take any serious action involving the safety to prevent the site accidents. However, some construction sites still conduct some meetings mentioning about the site safety such as daily, weekly, and monthly meetings.

On the other hand, there is no safety standard for construction sites in Lao PDR because the safety regulations have not yet been issued for execution. That is

why the risk of accidents occurring in construction sites is very high both for the workers and for the public.

❖ ***Subcontractor management***

Generally contractors typically use subcontractors to execute most of the construction tasks involved in a project. From the interviews, there are many problems with subcontractors in construction projects operating in Lao PDR because of many factors. First of all, regarding the subcontractors' experiences, some of them have low qualification based on experiences, technical skills, and safety performance, to carry out the construction work with absolutely satisfactory standard. The next issue is work quality; Lao subcontractors perform their jobs with low responsibility because they are not seriously penalized by the clients directly when the time schedule and project quality are not sufficiently satisfied. Another matter is lack of relationship between main contractors and subcontractors. The project managers and superintendent do not seriously establish a cooperative relationship with the subcontractors and their foremen by conducting regular coordination meetings to discuss their concerns.

Since most of the construction work is performed by subcontractors, efficient management of their works is critical to the project manager's ability to control cost and complete the project on time.

❖ ***Documental management***

Document submittals allow the project manager to identify some of the hidden errors because it is a key part of the overall quality management program for the project. As stated by the interviews, the poor document systems were found in some construction sites in Lao PDR because some project managers do not particularly look at submittals as the first step in quality control, and as a tool to complete a successful project.

Furthermore, late submittals often occur in all surveyed projects because some Lao project managers do not primarily create the effectively managed submittal program which is a necessary tool to achieve the successful construction projects. In summary, late submittals is a major problem of documental management for Lao project managers, which definitely impinges on the project schedule. Certainly, the

submittal is essential because it is a document or product turned in by the construction team to verify what they plan to purchase, deliver, and ultimately install, in fact what the design team intended by their drawings and specifications.

❖ ***Communication management***

A good project manager who knows how to estimate, plan, schedule, and execute most likely will fail unless he also has good communication skills. By the surveys, most Lao project managers of contractors are able to use foreign languages; especially English, to communicate and distribute information with international owners or consultants. They also use both electronic mail and hard-copy to transfer important information to each other from planning process to construction process. Particularly, E-mail is widely used in construction communication in Lao PDR because it is an excellent substitute for telephonic communication and provides a written record of each communication, substituting for the telephone memorandum. Moreover, regular meetings; especially international projects, always hold to provide a forum for direct communication and timely and efficient information exchange, and also allow the parties involved to take appropriate action and make the decisions necessary to maintain the scheduled flow of work.

Unlike international projects, however, local projects still have limited communication system for sharing information because some Lao project managers possess inadequate education on communication management.

❖ ***Human Resource management***

Human resource management activities play a vital role in ensuring that an organization will survive and prosper. Organizational design involves identification of the specific responsibilities of each position. As cited by the interviews, the staff organization is not properly done in some construction projects in Lao PDR because there are some shortages of teams of contractors to work in one construction project. For instance, one engineer is accordingly assigned by project manager to excessively handle or manage many works beyond his or her influenced domain. Furthermore, the main problem related to the human resource is the lack of professional personnel or skillful staff or engineers to work in construction field because the demand increases while supply from educational institutes and training centers is relatively constant.

❖ ***Risk management***

Construction risk is the most hazardous factor which influences the project's delay. Many project managers have not yet realized that there is a need to include project risk as a management issue. From the surveys, there are many consequences of risk during construction operation because Lao project managers do not survey in detail about the project risk before the projects start. For instance, regarding estimated cost for bidding, some contractors provide very low quotation to the bid in order to competitively obtain the project works. Hence, the contractors would encounter high risk of benefit loss after they get the construction works. Moreover, another kind of risk is material supply, late material deliveries often occur in sites in Lao PDR during construction process because local project managers do not prepare well the material procurement scheduling; especially orders from other countries.

Using the old equipments is also one construction risk which can causes delay to the construction projects in Lao PDR. That is to say, the second-hand equipment is not reliable and often breaks down, which leads to some accidents on sites, and needs repairing repeatedly. Sometime it requires quite long time to import some spare-parts of broken equipment from neighboring countries. On the other hand, in terms of labor risk, most Lao project managers develop the project schedule without reserving the time for absence or shortage of workers in big festival or long holiday, which is one of impacts on the delay of project schedule.

4.5 Data Collection in Thailand

The survey was made on building projects, mostly large projects, only located in Bangkok city which is the biggest city in Thailand; therefore it would seem inappropriate to generalize for the whole of Thailand on the basis of the data. However, a large proportion of the high-rise building construction works in Thailand (over 80%) are located in Bangkok. Sampling in this case study, due to some unexpected constraints, covers only 12 construction sites which were surveyed and also 31 respondents were interviewed based on the formal questionnaire, including 12 contractors, 10 consultants, and 9 owners, to obtain their thoughts in terms of the current situation of construction projects, and their knowledge and competencies.

Table 4.4 Number of surveyed construction projects and respondents in Thailand

Number of Construction Projects	Number of Respondents			
12	*Contractors*	*Consultants*	*Owners*	*Total*
	12	10	9	**31**

4.5.1 Construction Project Surveys in Bangkok

Bangkok, the capital of Thailand is situated on the low flat plain of Chao Phraya River which extends to the Gulf of Thailand. The total area of Bangkok is about 1,500 square kilometers, while it has a population of approximately 12 million. Formally, as now, it is the country's spiritual, cultural, diplomatic, commercial and educational hub. This great city has had astounding success in combining the ancient and modern world. Bangkok is the economic center of Thailand, dominating the country's economy and dwarfing any other urban centers, also with one official international airport called Sovarnaphumi.

Economically, Bangkok City has been undergoing rapid urbanization and industrialization since 1960. The provision of well-developed infrastructures has enabled development of Bangkok as the focal center for economic, culture and administrative activities. Consequently, the increasing population is due to the development of infrastructures such as highway networks, sky trains, subway systems, real estate developments, land value, public policy as well as advancing economy which resulted in expansion into the surrounding areas. In addition, the city has a registered 1,000 skyscrapers and ranks 17th as the world's tallest city. This does not include hundreds of new buildings predicted as part of the construction boom in the coming years.

Most of surveyed sites under construction in Bangkok are large and high buildings including office buildings, multi-purpose buildings, and tall condominiums, as shown in Figure 4.13. They are being constructed with high management performances in accordance with the surveys. For instance, there are sufficient facilities on sites and office sites as well such as proper protection fences and

conscientious security guards, sufficient major equipment, internet access, and various safety accessories.

Figure 4.14 Pictures of surveyed construction sites in Thailand

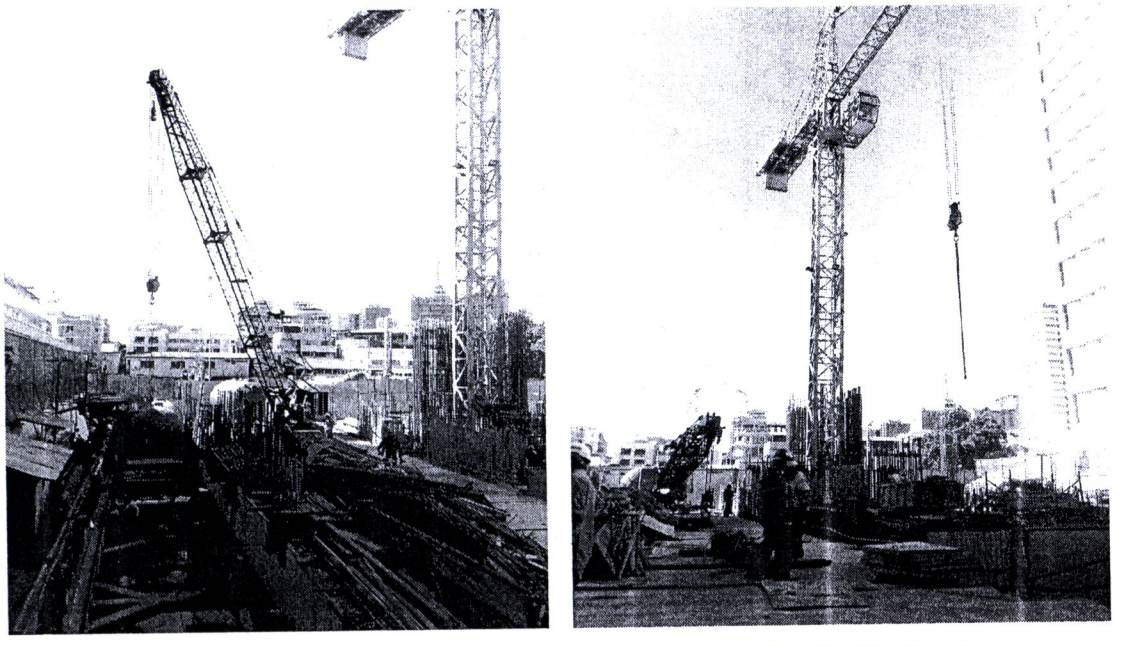

Figure 4.14 Pictures of surveyed construction sites in Thailand

4.5.2 Knowledge of Project Managers in Thailand

Successful construction projects are delivered by knowledgeable project managers. According to the surveys, the construction project management is available in undergraduate courses in almost every university in Thailand. That is why all local

project managers have a basic understanding of the construction process, the construction methods used in the industry, cost estimating, and project planning and scheduling. In addition, some of local project managers are sent abroad by their own construction companies for training in order to expand and gain new knowledge.

4.5.3 Competencies of Project Managers in Thailand

Current features and problems in construction projects caused by project managers are mentioned in this study based on the surveys in order to roughly reveal their competencies to apply the knowledge of management in controlling the whole projects.

❖ ***Cost management***

Building construction estimating is the determination of probable construction cost of any given project. Many items influence and contribute to the cost of a project; each item must be compiled, analyzed, quantified, and priced. By the interviews in Thailand, some consultants complained that cost estimates were prepared by the estimating office of the construction firms, not project managers. Thus, some project managers who must directly build the projects within the budget developed from the estimate do not understand well how it was prepared, which leads the project to troubles related to the cost control. Additionally, the obvious sources for estimating project costs are past experiences of individual project manager and historical information. The knowledge of the procedures for estimating is required by almost everyone involved in or associated with the field of construction such as construction teams, designers, drafters, subcontractors, and material suppliers.

It is similar to Cambodia engaging with cost control; to control cost is an obvious objective of most project managers, but it should be recognized that no amount of project managers' works in Thailand achieves this cost control in accordance with the surveys. Most especially, it is more difficult to control material cost variances than anything else.

❖ ***Time management***

Thai project managers estimate an activity's duration by collecting the information available from previous projects. If an activity has been performed

before, its duration should be accurately predicted, whereas activities with a new scope of work for project managers are difficult to measure or dependent on other uncertain variables. In addition, they stated that skilled laborers are also one effect on project's schedule. If most of workers were full of specialized skills in construction process, the project schedule would be pushed forward to reach the requirement. In contrast, construction operation would be slower than the developed schedule because of lack of skilled laborers to perform such work.

Most Thai project managers normally use computers to develop the project schedule. Computer-generated schedules allow the project managers to determine quickly the effects of changes in schedule logic, delays in delivery of critical materials, or adjustments to resource requirements.

❖ ***Quality management***

Total quality management is a management philosophy that focuses on continuous process improvement and customer satisfaction. Owing to the interviews in Thailand, the contractors have a policy to do construction tasks following the identified project standards or specifications mentioned in contracts. The performances or quality of construction works would be done based on all specifications in every dimension. They also opined that with the attention to conformance as the measure of quality during the construction process, the specification of quality requirements in the design and contract documentation becomes extremely important. However, the work quality might depend on the skill or specialty of laborers, especially workers of subcontractors. That is to say, some of Thai project managers seem to have difficulty in selecting subcontractors with skillful laborers since they do not have past relations from previous construction projects. They also stated that the work quality would be accordingly in low level if they definitely chose unreliable subcontractors with low skill of laborers.

Another issue from some construction projects in Thailand is related to the shop drawing combination among structural, architectural, and M & E drawings. Those drawings are sometime not compatible or relative to each other because of lack of strong coordination. This might lead to some problems occurring involving the quality of work after some work components is completed.

❖ ***Contract management***

The general contractor is responsible for completing the entire project in strict accordance with the plans, specifications, terms and conditions of construction contract. After doing surveys, it is noticed that a number of Thai project managers encounter some problems with complicated or large construction contracts. Some of them misunderstand construction scopes declared in contracts because they read the complex contracts carelessly. Another matter from the surveys is obviously the ignorance of project managers to contract documents. Some Thai project managers let head offices manage and control the construction contracts. They do not see any contract in detail by themselves. Eventually; unexpected problems arise over job sites such as out of scope of contract, risky construction process.

Moreover, a number of Thai project managers complained that some contract documents are not well-defined and detailed with adequate information which leads to some difficulty for them in terms of scope and specification of work.

❖ ***Material management***

The successful operation of materials in buildings requires an understanding of their characteristics as they affect the building at all stages of its lifetime. In fact, construction materials used in construction projects in Thailand are mostly local products because there are many factories and plants operating intensively in this country such as steel, cement, finishing materials. Regarding to construction projects, first of all, material procurement for most of the sites surveyed is made by the head office though few sites can purchase materials directly in emergencies. Blame for materials shortages on sites are placed on unreliable supply from materials suppliers and also there are specific instances in which there is poor communication between project managers at sites and head offices and material suppliers. Likewise, material procurement sometime takes quite a long time to delivery on site in term of size of company, which certainly affects the construction period because the project managers do not set up effective material scheduling.

Concerning material stock management, in terms of size of company, most of Thai project managers always complained that it is very hard to monitor the material stocks at construction sites.

❖ ***Labor management***

The quality and quantity of labor supply is one of major impacts in construction projects. It is found that low productivity and shortage of laborers are the critical impacts on construction performances in Thailand. From the survey, construction sites in Thailand mostly contain not only local workers, but also foreign workers, especially from Laos, Burma, and Cambodia, because of high work demand in construction field. The difficulty of communication among foreign and local workers is one main problem influencing the quality of construction works. The low productivity and quality of foreign workers are also one of main factors affecting the efficiency of project progress.

Additionally, most Thai project managers complained about variation in number of workers that is short of skillful laborers in construction sites when urgently required during big festivals or long holidays in the country. Additionally, it is considered as a simple problem in Thailand that construction workers return to their home town in the rainy season to do farm field work because most of them are originally farmers who did not have any skill of construction before.

❖ ***Equipment management***

Equipment used in construction project in Thailand is mostly imported from other countries such as Europe, Japan, China, and the like. Equipment related significant problems do not feature prominently on the construction sites in Thailand. However, some construction sites have problems of insufficient numbers or improper types of equipment and breakdowns. Furthermore, the second-hand or old equipment is partly used in construction sites since the price of new equipment is very high. Old equipment definitely slows construction progress because it sometimes mal-functions and breaks. Time is spent out of the construction schedule to repair such equipments frequently.

What is more, equipment planning is also one factor contributing to delay cause of the project progress. A number of Thai construction sites often encounter equipment usage problem because they are not ready to use when the sites requires them to perform the works. This shows that some Thai project managers do not pay much attention to setting up the equipment planning to facilitate the construction process.

❖ ***Safety management***

The construction industry continues to be the industrial sector responsible for the most occupational accidents, injuries, and fatalities. Many reasons have been postulated for the poor safety record of construction. Like other countries, Thailand unavoidably faces such problems of safety in construction sites due to inadequacy of safety planning and regular inspection although many projects have similar repeat requirements, such as hard hats and personal equipment for preventing job site accidents during construction process. A number of surveyed Thai project managers sometime do not strictly consider about safety matters in construction sites based on opinions of consultants. In other words, they are not that concerned about unforeseen job site accidents, and they also fail to yield effective regulations and practices for alleviating such safety problems in construction sites.

Another difficulty to control is workers' activities which are done without careful performances to safety of each job on construction sites. Most construction laborers possess low knowledge related to safety, which can frequently cause them to fall easily in job site accident aspects. This is because some Thai project managers are not willing to convincingly motivate workers to not only properly use personal protection equipments but also to show considerably concern to construction safety.

❖ ***Subcontractor management***

Subcontractors are essential members of the project manager's team; typically, they perform most of the work on a construction project. According to the interviews, some contractors in Thailand have limited competent subcontractors to support the construction projects, especially in terms of quality, safety, and environment. Moreover, some Thai project managers cannot control subcontractors' works effectively because of incomprehensive subcontracts which cause the delay schedules and low quality of works.

The shortage of laborers of subcontractor also influences the construction progress of contractors' projects. The total number of subcontractors' workers is not clearly specified because of the uncontrollable variation of worker quantities.

❖ ***Documental management***

Document submittal is one part of the main process in yielding construction projects operating smoothly without any misunderstanding. Some interviewed Thai consultants cited that project managers possess inappropriate accountability in managing critical documents by letting project engineers handle those papers. The submittal problems sometime occur by some misunderstandings of project engineers since some of them are short of experiences of document management. In addition, Thai owners and consultants complained that there have often been late submittals in processing construction projects. This is because project managers do not appropriately have effective submittal scheduling at the starting of projects.

❖ ***Communication management***

Construction communications involve exchanging information regarding a project. They may be written, oral, or electronic. Transmittals are used to transmit documents and provide a written record. Regarding the communication language, interviewed Thai project managers mostly use English for communicating and sharing information with each other in case of foreign projects. There are also several formats and techniques that have been developed to expedite the flow of information among members of the project team. Thus, there is no significant problem related to communication management.

❖ ***Human Resource management***

Human resource involves the design of the project management organization, recruitment and selection of new employees, management of subordinates' work performance, and professional development of subordinates. As stated by the surveys, there are many highly skilled engineers, project managers, technicians and foremen, though the major problem is that there is also an extremely high demand for those skilled individuals. This frequently results in trained personnel being heavily overloaded and forced to undertake tasks for which their training and experience is inadequate.

Sometime, the conflict among teams, such as young engineers and senior foremen, occurs in sites since senior foremen do not pay respect to engineers whereas the engineers deem foremen are not working by following the engineering principles.

❖ ***Risk management***

Risk is a permanent element of each decision making process, including design and planning decision. Risk management on the other hand is defined as a set of methods and activities designed to reduce the disturbances occurring during the realization of the project. Even though Thai project managers have learned and been aware of construction project risk, they still confront complicated problems with unanticipated risks because the risk identification is not properly set up in planning phase. In other words, they do not mainly identify and analyze all risk events which may occur during the realization of the project and subsequently allow undertaking of appropriate mitigating actions. They rely on their experience and judgment and rarely believe in systematic risk assessment which is widely used in commerce and economics.