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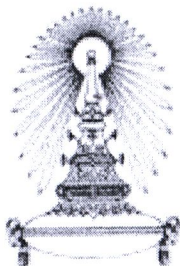
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APPENDICES

APPENDIX A
Questionnaire for Data Collection



CHULALONGKORN UNIVERSITY

FACULTY OF CIVIL ENGINEERING

QUESTIONNAIRE FORM

**SURVEY ON THE PROJECT MANAGER OF CONSTRUCTION
INDUSTRY FROM THE PERSPECTIVE OF KNOWLEDGE AND
COMPETENCIES**

PREPARED BY:

**SEREYRASETH HANG
MASTER OF ENGINEERING
(CIVIL – CONSTRUCTION AND MANAGEMENT)**

.....

Company Name : _____

Respondent Name : _____

Position : _____

Date : _____

Project Name : _____

I. Please tick (✓) one of the choices shown below:

1. Which of the following **Functions** most accurately describes your organization?

☐ Contractor

☐ Consultant

☐ Owner

2. How long have you been involved with construction industry and how many projects have you done so far?

1. Experience:

☐

Years

☐

Months

2. Number of Projects:

☐

Projects

3. Which of the following **Age Categories** most suitable describes yourself?

☐ 18 – 24 years old

☐ 40 – 44 years old

☐ 25 – 29 years old

☐ 45 – 50 years old

☐ 30 – 34 years old

☐ > 50 years old

☐ 35 – 39 years old

II. Please circle one of the choices shown below:

- List of knowledge area of construction project manager
 - A. Cost Management
 - B. Time Management
 - C. Quality Management
 - D. Contract Management
 - E. Material Management
 - F. Labor Management
 - G. Safety Management
 - H. Equipment Management
 - I. Subcontractor Management
 - J. Documental Management
 - K. Communication Management
 - L. Human Resource Management
 - M. Risk Management

Instruction of Analytic Hierarchy Process

Intensity of Importance	Definition	Explanation
1	Equal importance	Two activities are equally important
3	Weak importance	One activity is more important than another weakly
5	Strong importance	One activity is more important than another strongly
7	Very strong importance	One activity is more important than another very strongly
9	Absolutely importance	One activity is more important than another absolutely

- Example: If **A** is more important than **B** weakly, please choose Number 3 at **A**.

A

9

7

5

3

1

3

5

7

9

B

But if **B** is more important than **A** strongly, please choose Number 5 at **B**-side.

A

9

7

5

3

1

3

5

7

9

B

But if **A** and **B** has the equal importance, please choose Number 1.

A

9

7

5

3

1

3

5

7

9

B

How do you think that one knowledge area of **Construction Project Manager** is more important than another one in construction project?

A: Cost Management

A	9	7	5	3	1	3	5	7	9	Time management
A	9	7	5	3	1	3	5	7	9	Quality management
A	9	7	5	3	1	3	5	7	9	Contract management
A	9	7	5	3	1	3	5	7	9	Material management
A	9	7	5	3	1	3	5	7	9	Labor management
A	9	7	5	3	1	3	5	7	9	Equipment management
A	9	7	5	3	1	3	5	7	9	Safety management
A	9	7	5	3	1	3	5	7	9	Subcontractor management
A	9	7	5	3	1	3	5	7	9	Documental management
A	9	7	5	3	1	3	5	7	9	Communication management
A	9	7	5	3	1	3	5	7	9	Human Resource management
A	9	7	5	3	1	3	5	7	9	Risk management

B: Time Management

B	9	7	5	3	1	3	5	7	9	Quality management
B	9	7	5	3	1	3	5	7	9	Contract management
B	9	7	5	3	1	3	5	7	9	Material management
B	9	7	5	3	1	3	5	7	9	Labor management
B	9	7	5	3	1	3	5	7	9	Equipment management
B	9	7	5	3	1	3	5	7	9	Safety management
B	9	7	5	3	1	3	5	7	9	Subcontractor management
B	9	7	5	3	1	3	5	7	9	Documental management
B	9	7	5	3	1	3	5	7	9	Communication management
B	9	7	5	3	1	3	5	7	9	Human Resource management
B	9	7	5	3	1	3	5	7	9	Risk management

C: Quality Management

C	9	7	5	3	1	3	5	7	9	Contract management
C	9	7	5	3	1	3	5	7	9	Material management
C	9	7	5	3	1	3	5	7	9	Labor management
C	9	7	5	3	1	3	5	7	9	Equipment management
C	9	7	5	3	1	3	5	7	9	Safety management
C	9	7	5	3	1	3	5	7	9	Subcontractor management
C	9	7	5	3	1	3	5	7	9	Documental management

C	9	7	5	3	1	3	5	7	9	Communication management
C	9	7	5	3	1	3	5	7	9	Human Resource management
C	9	7	5	3	1	3	5	7	9	Risk management

D: Contract Management

D	9	7	5	3	1	3	5	7	9	Material management
D	9	7	5	3	1	3	5	7	9	Labor management
D	9	7	5	3	1	3	5	7	9	Equipment management
D	9	7	5	3	1	3	5	7	9	Safety management
D	9	7	5	3	1	3	5	7	9	Subcontractor management
D	9	7	5	3	1	3	5	7	9	Documental management
D	9	7	5	3	1	3	5	7	9	Communication management
D	9	7	5	3	1	3	5	7	9	Human Resource management
D	9	7	5	3	1	3	5	7	9	Risk management

E: Material Management

E	9	7	5	3	1	3	5	7	9	Labor management
E	9	7	5	3	1	3	5	7	9	Equipment management
E	9	7	5	3	1	3	5	7	9	Safety management
E	9	7	5	3	1	3	5	7	9	Subcontractor management
E	9	7	5	3	1	3	5	7	9	Documental management
E	9	7	5	3	1	3	5	7	9	Communication management
E	9	7	5	3	1	3	5	7	9	Human Resource management
E	9	7	5	3	1	3	5	7	9	Risk management

F: Labor Management

F	9	7	5	3	1	3	5	7	9	Equipment management
F	9	7	5	3	1	3	5	7	9	Safety management
F	9	7	5	3	1	3	5	7	9	Subcontractor management
F	9	7	5	3	1	3	5	7	9	Documental management
F	9	7	5	3	1	3	5	7	9	Communication management
F	9	7	5	3	1	3	5	7	9	Human Resource management
F	9	7	5	3	1	3	5	7	9	Risk management

G: Equipment Management

G	9	7	5	3	1	3	5	7	9	Safety management
G	9	7	5	3	1	3	5	7	9	Subcontractor management
G	9	7	5	3	1	3	5	7	9	Documental management
G	9	7	5	3	1	3	5	7	9	Communication management

G	9	7	5	3	1	3	5	7	9	Human Resource management
G	9	7	5	3	1	3	5	7	9	Risk management

H: Safety Management

H	9	7	5	3	1	3	5	7	9	Subcontractor management
H	9	7	5	3	1	3	5	7	9	Documental management
H	9	7	5	3	1	3	5	7	9	Communication management
H	9	7	5	3	1	3	5	7	9	Human Resource management
H	9	7	5	3	1	3	5	7	9	Risk management

I: Subcontractor Management

I	9	7	5	3	1	3	5	7	9	Documental management
I	9	7	5	3	1	3	5	7	9	Communication management
I	9	7	5	3	1	3	5	7	9	Human Resource management
I	9	7	5	3	1	3	5	7	9	Risk management

J: Documental Management

J	9	7	5	3	1	3	5	7	9	Communication management
J	9	7	5	3	1	3	5	7	9	Human Resource management
J	9	7	5	3	1	3	5	7	9	Risk management

K: Communication Management

K	9	7	5	3	1	3	5	7	9	Human Resource management
K	9	7	5	3	1	3	5	7	9	Risk management

L: Human Resource Management

L	9	7	5	3	1	3	5	7	9	Risk management
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III. Please tick (√) one of the choices shown below:

III.1 According to your opinion, what is the *level of competency (ability)* of project manager to apply the knowledge of *cost management* in your current construction project?

[Cost Management merely focuses on:

Cost estimating: Spreadsheet, and Others (Timberline, WinEstimate...)

Cost control: S-Curve and Cost Coding System]

- ☐ Very High
- ☐ High
- ☐ Medium
- ☐ Low
- ☐ Very Low

➤ What are the problems of *cost management* occurring in your construction project involving *construction project manager's responsibilities*?

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.....
.....

➤ What are the expectations needed to improve the construction project managers based on their *cost management knowledge*?

.....
.....
.....

III.2 According to your opinion, what is the *level of competency (ability)* of project manager to apply the knowledge of *time management* in your current construction project?

[Time Management refers to:

Schedule development: *Bar Chart, CPM, and Others (PERT, Line of Balance...)*

Schedule software: *Spreadsheet, M. Project, and Others (Primavera...)*

Schedule control: *CPM and Delay control]*

- ☐ Very High
- ☐ High
- ☐ Medium
- ☐ Low
- ☐ Very Low

➤ What are the problems of *time management* occurring in your construction project involving *construction project manager’s responsibilities*?

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.....
.....

➤ What are the expectations needed to improve the construction project managers based on their *time management knowledge*?

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.....

III.3 According to your opinion, what is the *level of competency (ability)* of project manager to apply the knowledge of *quality management* in your current construction project?

[Quality Management concentrates on:

Quality control: Quality testing, quality inspection and quality document control

Quality improvement: *Quality problem and solution recording*]

- ☐ Very High
- ☐ High
- ☐ Medium
- ☐ Low
- ☐ Very Low

➤ What are the problems of *quality management* occurring in your construction project involving *construction project manager’s responsibilities*?

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.....

➤ What are the expectations needed to improve the construction project managers based on their *quality management knowledge*?

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III.4 According to your opinion, what is the *level of competency (ability)* of project manager to apply the knowledge of *contract management* in your current construction project?

[Contract Management focus on:

Contract comprehension: Contract requirement identification and contract risk identification

Contract control: Contract risk reduction and contract change control]

- ☐ Very High
- ☐ High
- ☐ Medium
- ☐ Low
- ☐ Very Low

➤ What are the problems of *contract management* occurring in your construction project involving *construction project manager’s responsibilities*?

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.....

➤ What are the expectations needed to improve the construction project managers based on their *contract management knowledge*?

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III.5 According to your opinion, what is the *level of competency (ability)* of project manager to apply the knowledge of *material management* in your current construction project?

[Material Management refers to:

Material procurement: Material delivery scheduling and purchase order preparation

Material storage: Proper location and reliable security system

Stock management software: Manual, Spreadsheet, and others (commercial software ...)]

- ☐ Very High
- ☐ High
- ☐ Medium
- ☐ Low
- ☐ Very Low

➤ What are the problems of *material management* occurring in your construction project involving *construction project manager's responsibilities*?

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.....

➤ What are the expectations needed to improve the construction project managers based on their *material management knowledge*?

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.....

III.7 According to your opinion, what is the *level of competency (ability)* of project manager to apply the knowledge of *equipment management* in your current construction project?

[Equipment Management focuses on:

Equipment planning: Right equipment identification and proper location determination

Equipment control: Equipment safety, noise impact control and maintenance program]

- ☐ Very High
- ☐ High
- ☐ Medium
- ☐ Low
- ☐ Very Low

➤ What are the problems of *equipment management* occurring in your construction project involving *construction project manager’s responsibilities*?

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➤ What are the expectations needed to improve the construction project managers based on their *equipment management knowledge*?

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III.8 According to your opinion, what is the *level of competency (ability)* of project manager to apply the knowledge of *safety management* in your current construction project?

[Safety Management concentrates on:

Safety strategy implementation: Protective equipment action, safety sign, safety meeting, and safety training program

Safety risk control: Accident investigation and accident recording]

- ☐ Very High
- ☐ High
- ☐ Medium
- ☐ Low
- ☐ Very Low

➤ What are the problems of *safety management* occurring in your construction project involving *construction project manager’s responsibilities*?

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.....

➤ What are the expectations needed to improve the construction project managers based on their *safety management knowledge*?

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.....

III.9 According to your opinion, what is the *level of competency (ability)* of project manager to apply the knowledge of *subcontractor management* in your current construction project?

(Subcontractor Management refers to:

Subcontractor selection: Quotation consideration, past project information, sufficiency of good equipment, and past safety performance

Subcontractor control: Subcontractor coordinating, scheduling, and work quality control]

- ☐ Very High
- ☐ High
- ☐ Medium
- ☐ Low
- ☐ Very Low

➤ What are the problems of *subcontractor management* occurring in your construction project involving *construction project manager’s responsibilities*?

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.....

.....

➤ What are the expectations needed to improve the construction project managers based on their *subcontractor management knowledge*?

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III.10 According to your opinion, what is the *level of competency (ability)* of project manager to apply the knowledge of *documental management* in your current construction project?

[Documental Management concentrates on:

Standard document: *Needed document identification*

Submittal planning: *Needed submittal identification and submittal scheduling*

Submittal control: *Late submittal control]*

- ☐ Very High
- ☐ High
- ☐ Medium
- ☐ Low
- ☐ Very Low



- What are the problems of *Documental management* occurring in your construction project involving *construction project manager's responsibilities*?

.....

.....

.....
- What are the expectations needed to improve the construction project managers based on their *Documental management knowledge*?

.....

.....

.....

III.11 According to your opinion, what is the *level of competency (ability)* of project manager to apply the knowledge of *communication management* in your current construction project?

[Communication Management refers to:

Communication language: *English speaking*

Information distribution: *Meeting and electronic mail]*

- ☐ Very High
- ☐ High
- ☐ Medium
- ☐ Low
- ☐ Very Low

➤ What are the problems of *communication management* occurring in your construction project involving *construction project manager's responsibilities*?

.....

.....

.....

➤ What are the expectations needed to improve the construction project managers based on their *communication management knowledge*?

.....

.....

.....

III.12 According to your opinion, what is the *level of competency (ability)* of project manager to apply the knowledge of *human resource management* in your current construction project?

[Human Resource Management concentrates on:

- Staff recruitment:*

Formal test action and formal interview conduction
- Staff control:*

Organizational chart establishing and staff reporting action
- Team development:*

Skill-enhancement training and development training]

- ☐

Very High
- ☐

High
- ☐

Medium
- ☐

Low
- ☐

Very Low

➤ What are the problems of *human resource management* occurring in your construction project involving *construction project manager’s responsibilities*?

.....

.....

.....

➤ What are the expectations needed to improve the construction project managers based on their *human resource management knowledge*?

.....

.....

.....

III.13 According to your opinion, what is the *level of competency (ability)* of project manager to apply the knowledge of *risk management* in your current construction project?

[Risk Management focuses on:

Risk identification: *Project risk identification and risk source determination*

Risk control: *Risk reduction measures, high project control]*

- ☐ Very High
- ☐ High
- ☐ Medium
- ☐ Low
- ☐ Very Low

➤ What are the problems of *risk management* occurring in your construction project involving *construction project manager's responsibilities*?

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.....
.....

➤ What are the expectations needed to improve the construction project managers based on their *risk management knowledge*?

.....
.....
.....

APPENDIX B
Example of Data Analysis by AHP

Table B.1 Raw data from one contractor by AHP questionnaire

Knowledge Areas		Contractor (Canada)												
		A	B	C	D	E	F	G	H	I	J	K	L	M
A	Cost management	1	3	3	5	3	3	5	3	5	5	5	3	3
B	Time management		1	1	3	1	1	3	1	3	3	3	1	1
C	Quality management			1	3	1	1	3	1	3	3	3	1	1
D	Contract management				1	1/3	1/3	1	1/3	1	1	1	3	3
E	Material management					1	1	3	1	3	3	3	1	1
F	Labor management						1	3	1	3	3	3	1	1
G	Equipment management							1	1/3	1	1	1	1/3	1/3
H	Safety management								1	3	3	3	1	1
I	Subcontractor management									1	1	1	3	3
J	Documental management										1	1	1/3	1/3
K	Communication management											1	1/3	1/3
L	Human resource management												1	1
M	Risk management													1

Table B.2 Pair wise comparison by AHP

Pairwise Comparison													
	A	B	C	D	E	F	G	H	I	J	K	L	M
A	1.00	3.00	3.00	5.00	3.00	3.00	5.00	3.00	5.00	5.00	5.00	3.00	3.00
B	0.33	1.00	1.00	3.00	1.00	1.00	3.00	1.00	3.00	3.00	3.00	1.00	1.00
C	0.33	1.00	1.00	3.00	1.00	1.00	3.00	1.00	3.00	3.00	3.00	1.00	1.00
D	0.20	0.33	0.33	1.00	0.33	0.33	1.00	0.33	1.00	1.00	1.00	3.00	3.00
E	0.33	1.00	1.00	3.00	1.00	1.00	3.00	1.00	3.00	3.00	3.00	1.00	1.00
F	0.33	1.00	1.00	3.00	1.00	1.00	3.00	1.00	3.00	3.00	3.00	1.00	1.00
G	0.20	0.33	0.33	1.00	0.33	0.33	1.00	0.33	1.00	1.00	1.00	0.33	0.33
H	0.33	1.00	1.00	3.00	1.00	1.00	3.00	1.00	3.00	3.00	3.00	1.00	1.00
I	0.20	0.33	0.33	1.00	0.33	0.33	1.00	0.33	1.00	1.00	1.00	3.00	3.00
J	0.20	0.33	0.33	1.00	0.33	0.33	1.00	0.33	1.00	1.00	1.00	0.33	0.33
K	0.20	0.33	0.33	1.00	0.33	0.33	1.00	0.33	1.00	1.00	1.00	0.33	0.33
L	0.33	1.00	1.00	0.33	1.00	1.00	3.00	1.00	0.33	3.00	3.00	1.00	1.00
M	0.33	1.00	1.00	0.33	1.00	1.00	3.00	1.00	0.33	3.00	3.00	1.00	1.00

Table B.3 Matrix square and analysis by AHP

Matrix Square														Analysis		
	A	B	C	D	E	F	G	H	I	J	K	L	M	Sum	Weight	Rank
A	13.00	32.33	32.33	77.00	32.33	32.33	93.00	32.33	77.00	93.00	93.00	59.00	59.00	725.67	0.2083	1
B	5.67	13.00	32.33	32.33	13.00	13.00	37.67	13.00	32.33	37.67	37.67	29.00	29.00	325.67	0.0935	2
C	5.67	13.00	13.00	32.33	13.00	32.33	37.67	13.00	32.33	37.67	37.67	29.00	29.00	325.67	0.0935	2
D	3.76	9.93	9.93	13.00	9.93	9.93	29.00	9.93	13.00	29.00	29.00	15.27	15.27	196.96	0.0565	9
E	5.67	13.00	13.00	32.33	13.00	13.00	37.67	13.00	32.33	37.67	37.67	29.00	29.00	306.33	0.0879	4
F	5.67	13.00	13.00	32.33	13.00	13.00	37.67	13.00	32.33	37.67	37.67	29.00	29.00	306.33	0.0879	4
G	1.98	4.60	4.60	11.22	4.60	4.60	13.00	4.60	11.22	13.00	13.00	9.93	9.93	106.29	0.0305	11
H	5.67	13.00	13.00	32.33	13.00	13.00	37.67	13.00	32.33	37.67	37.67	29.00	29.00	306.33	0.0879	4
I	3.76	9.93	9.93	13.00	9.93	9.93	29.00	9.93	13.00	29.00	29.00	15.27	15.27	196.96	0.0565	9
J	1.98	4.60	4.60	11.22	4.60	4.60	13.00	4.60	11.22	13.00	13.00	9.93	9.93	106.29	0.0305	11
K	1.98	4.60	4.60	11.22	4.60	4.60	13.00	4.60	11.22	13.00	13.00	9.93	9.93	106.29	0.0305	11
L	4.60	11.22	11.22	27.00	11.22	11.22	32.33	11.22	27.00	32.33	32.33	13.00	13.00	237.71	0.0682	7
M	4.60	11.22	11.22	27.00	11.22	11.22	32.33	11.22	27.00	32.33	32.33	13.00	13.00	237.71	0.0682	7
Sum	4.33	11.67	11.67	25.67	11.67	11.67	31.00	11.67	25.67	31.00	31.00	17.00	17.00	3484.20		

$\lambda_{\max} = 14.219$

CI = 0.1016

RI = 1.56

CR = 0.0651

APPENDIX C

Table of Full Results in Cambodia

Table C.1 Contractors’ perceptions in Cambodia for knowledge

Knowledge Area	Mean	Rank
Time management	0.2019	1
Cost management	0.1964	2
Quality management	0.0897	3
Safety management	0.0879	4
Labor management	0.0873	5
Risk management	0.0821	6
Material management	0.0774	7
Human resource management	0.0711	8
Subcontractor management	0.0418	9
Documental management	0.0416	10
Communication management	0.0376	11
Contract management	0.0334	12
Equipment management	0.0287	13

Table C.2 Consultants’ perceptions in Cambodia for knowledge

Knowledge Area	Mean	Rank
Time management	0.2173	1
Quality management	0.1991	2
Safety management	0.1173	3
Cost management	0.1103	4
Contract management	0.0580	5
Risk management	0.0560	6
Documental management	0.0265	7
Material management	0.0259	8
Communication management	0.0257	9
Subcontractor management	0.0249	10
Human resource management	0.0249	11
Labor management	0.0249	12
Equipment management	0.0122	13

Table C.3 Owners' perceptions in Cambodia for knowledge

Knowledge Area	Mean	Rank
Quality management	0.1894	1
Time management	0.1400	2
Cost management	0.0892	3
Safety management	0.0883	4
Contract management	0.0645	5
Risk management	0.0443	6
Documental management	0.0291	7
Subcontractor management	0.0265	8
Communication management	0.0265	8
Human resource management	0.0211	10
Material management	0.0196	11
Labor management	0.0169	12
Equipment management	0.0138	13

Table C.4 Overall perception in Cambodia knowledge

Knowledge Area	Mean	Rank
Time management	0.1864	1
Quality management	0.1594	2
Cost management	0.1320	3
Safety management	0.0978	4
Risk management	0.0608	5
Contract management	0.0520	6
Labor management	0.0430	7
Material management	0.0410	8
Human resource management	0.0390	9
Documental management	0.0324	10
Subcontractor management	0.0311	11
Communication management	0.0299	12
Equipment management	0.0182	13

Table C.5 Contractors' perceptions in Cambodia for competencies

	n1	n2	n3	n4	n5	Mean	Level
Time management	0	2	10	2	0	0.6000	Medium
Cost management	0	2	5	7	0	0.6714	High
Quality management	0	2	4	8	0	0.6857	High
Safety management	0	3	5	6	0	0.6429	High
Labor management	0	3	10	1	0	0.5714	Medium
Risk management	0	3	8	3	0	0.6000	Medium
Material management	0	4	8	2	0	0.5714	Medium
Human resource management	0	0	5	8	1	0.7429	High
Subcontractor management	0	4	9	1	0	0.5571	Medium
Documental management	0	1	6	7	0	0.6857	High
Communication management	0	3	4	6	1	0.6714	High
Contract management	0	4	7	3	0	0.5857	Medium
Equipment management	0	3	9	2	0	0.5857	Medium

Table C.6 Consultants' perceptions in Cambodia for competencies

	n1	n2	n3	n4	n5	Mean	Level
Time management	4	5	3	0	0	0.3833	Low
Quality management	3	6	3	0	0	0.4000	Low
Safety management	4	6	2	0	0	0.3667	Low
Cost management	0	5	6	1	0	0.5333	Medium
Contract management	0	2	8	2	0	0.6000	Medium
Risk management	5	6	1	0	0	0.3333	Low
Documental management	0	1	11	0	0	0.5833	Medium
Material management	3	7	2	0	0	0.3833	Low
Communication management	0	4	7	1	0	0.5500	Medium
Subcontractor management	0	1	10	1	0	0.6000	Medium
Human resource management	0	3	6	3	0	0.6000	Medium
Labor management	2	8	2	0	0	0.4000	Low
Equipment management	0	3	7	2	0	0.5833	Medium

Table C.7 Owners' perceptions in Cambodia for competencies

	n1	n2	n3	n4	n5	Mean	Level
Quality management	2	6	2	0	0	0.4000	Low
Time management	3	4	3	0	0	0.4000	Low
Cost management	0	3	7	0	0	0.5400	Medium
Safety management	4	5	1	0	0	0.3400	Low
Contract management	0	3	6	1	0	0.5600	Medium
Risk management	1	9	0	0	0	0.3800	Low
Documental management	0	1	8	1	0	0.6000	Medium
Subcontractor management	1	8	1	0	0	0.4000	Low
Communication management	0	3	5	1	1	0.6000	Medium
Human resource management	3	5	2	0	0	0.3800	Low
Material management	3	5	2	0	0	0.3800	Low
Labor management	2	7	1	0	0	0.3800	Low
Equipment management	0	3	5	2	0	0.5800	Medium

Table C.8 Overall perception in Cambodia for competencies

	n1	n2	n3	n4	n5	Mean	Level
Time management	7	11	16	2	0	0.4722	Medium
Quality management	5	14	9	8	0	0.5111	Medium
Cost management	0	10	18	8	0	0.5889	Medium
Safety management	8	14	8	6	0	0.4667	Medium
Risk management	6	18	9	3	0	0.4500	Medium
Contract management	0	9	21	6	0	0.5833	Medium
Labor management	4	18	13	1	0	0.4611	Medium
Material management	6	16	12	2	0	0.4556	Medium
Human resource management	3	8	13	11	1	0.5944	Medium
Documental management	0	3	25	8	0	0.6278	High
Subcontractor management	1	13	20	2	0	0.5278	Medium
Communication management	0	10	16	8	2	0.6111	High
Equipment management	0	11	12	9	1	0.5500	Medium

APPENDIX D

Table of Full Results in Lao PDR

Table D.1 Contractors' perceptions in Lao PDR for knowledge

Knowledge Area	Mean	Rank
Cost management	0.2304	1
Time management	0.1112	2
Quality management	0.1038	3
Risk management	0.0971	4
Material management	0.0809	5
Human resource management	0.0735	6
Labor management	0.0670	7
Contract management	0.0638	8
Safety management	0.0547	9
Subcontractor management	0.0391	10
Communication management	0.0306	11
Documental management	0.0251	12
Equipment management	0.0228	13

Table D.2 Consultants' perceptions in Lao PDR for knowledge

Knowledge Area	Mean	Rank
Time management	0.2150	1
Quality management	0.1688	2
Safety management	0.1260	3
Cost management	0.0779	4
Subcontractor management	0.0522	5
Contract management	0.0496	6
Risk management	0.0433	7
Documental management	0.0355	8
Communication management	0.0246	9
Labor management	0.0245	10
Material management	0.0237	11
Human resource management	0.0222	12
Equipment management	0.0118	13

Table D.3 Owners' perceptions in Lao PDR for knowledge

Knowledge Area	Mean	Rank
Time management	0.2684	1
Quality management	0.1734	2
Contract management	0.1328	3
Safety management	0.0925	4
Cost management	0.0880	5
Communication management	0.0479	6
Subcontractor management	0.0381	7
Documental management	0.0381	7
Material management	0.0302	9
Risk management	0.2880	10
Human resource management	0.0260	11
Equipment management	0.0179	12
Labor management	0.0179	13

Table D.4 Overall perceptions in Lao PDR for knowledge

Knowledge Area	Mean	Rank
Time management	0.1982	1
Quality management	0.1487	2
Cost management	0.1321	3
Safety management	0.0911	4
Contract management	0.0821	5
Risk management	0.0564	6
Material management	0.0449	7
Subcontractor management	0.0431	8
Human resource management	0.0406	9
Labor management	0.0365	10
Communication management	0.0343	11
Documental management	0.0329	12
Equipment management	0.0175	13

Table D.5 Contractors' perceptions in Lao PDR for competencies

	n1	n2	n3	n4	n5	Mean	Level
Cost management	0	1	7	1	0	0.6000	Medium
Time management	0	0	2	7	0	0.7556	High
Quality management	0	1	8	0	0	0.5778	Medium
Risk management	2	6	1	0	0	0.3778	Low
Material management	0	1	2	6	0	0.7111	High
Human resource management	0	2	3	4	0	0.6444	High
Labor management	0	2	6	1	0	0.5778	Medium
Contract management	0	3	5	1	0	0.5556	Medium
Safety management	1	7	0	0	0	0.3333	Low
Subcontractor management	0	2	7	0	0	0.5556	Medium
Communication management	0	3	6	0	0	0.5333	Medium
Documental management	0	2	6	1	0	0.5778	Medium
Equipment management	0	2	2	5	0	0.6667	High

Table D.6 Consultants' perceptions in Lao PDR for competencies

	n1	n2	n3	n4	n5	Mean	Level
Time management	3	5	0	0	0	0.3250	Low
Quality management	1	1	6	0	0	0.5250	Medium
Safety management	1	6	1	0	0	0.4000	Low
Cost management	2	5	1	0	0	0.3750	Low
Subcontractor management	1	1	5	1	0	0.5500	Medium
Contract management	0	2	6	0	0	0.5500	Medium
Risk management	1	6	1	0	0	0.4000	Low
Documental management	2	6	0	0	0	0.3500	Low
Communication management	2	5	1	0	0	0.3750	Low
Labor management	0	3	4	1	0	0.5500	Medium
Material management	2	4	2	0	0	0.4000	Low
Human resource management	0	2	6	0	0	0.5500	Medium
Equipment management	0	2	5	1	0	0.5750	Medium

APPENDIX E
Table of Full Results in THAILAND

Table E.1 Contractors' perceptions in Thailand for knowledge

Knowledge Area	Mean	Rank
Cost management	0.1928	1
Time management	0.1807	2
Quality management	0.0916	3
Safety management	0.0763	4
Material management	0.0728	5
Labor management	0.0712	6
Risk management	0.0671	7
Human resource management	0.0668	8
Communication management	0.0406	9
Subcontractor management	0.0382	10
Documental management	0.0363	11
Equipment management	0.0342	12
Contract management	0.0313	13

Table E.2 Consultants' perceptions in Thailand for knowledge

Knowledge Area	Mean	Rank
Time management	0.2167	1
Quality management	0.1970	2
Cost management	0.1150	3
Safety management	0.1121	4
Contract management	0.0654	5
Risk management	0.0588	6
Labor management	0.0381	7
Material management	0.0380	8
Documental management	0.0355	9
Human resource management	0.0354	10
Communication management	0.0353	11
Subcontractor management	0.0317	12
Equipment management	0.0210	13

Table E.3 Owners' perceptions in Thailand for knowledge

Knowledge Area	Mean	Rank
Quality management	0.2298	1
Time management	0.1737	2
Cost management	0.1112	3
Safety management	0.0787	4
Contract management	0.0685	5
Labor management	0.0570	6
Subcontractor management	0.0548	7
Material management	0.0493	8
Communication management	0.0430	9
Risk management	0.0394	10
Documental management	0.0394	11
Human resource management	0.0280	12
Equipment management	0.0271	13

Table E.4 Overall perception in Thailand for knowledge

Knowledge Area	Mean	Rank
Time management	0.1904	1
Quality management	0.1728	2
Cost management	0.1397	3
Safety management	0.0890	4
Labor management	0.0554	5
Risk management	0.0551	6
Contract management	0.0551	7
Material management	0.0534	8
Human resource management	0.0434	9
Subcontractor management	0.0416	10
Communication management	0.0396	11
Documental management	0.0371	12
Equipment management	0.0274	13

Table E.5 Contractors' perceptions in Thailand for competencies

	n1	n2	n3	n4	n5	Mean	Level
Cost management	0	0	3	6	3	0.8000	High
Time management	0	0	4	5	3	0.7833	High
Quality management	0	0	4	7	1	0.7500	High
Safety management	0	0	3	7	2	0.7833	High
Material management	0	3	3	6	0	0.6500	High
Labor management	0	0	3	9	0	0.7500	High
Risk management	1	3	6	2	0	0.5500	Medium
Human resource management	0	3	7	2	0	0.5833	Medium
Communication management	0	0	2	8	2	0.8000	High
Subcontractor management	0	3	6	3	0	0.6000	Medium
Documental management	0	3	3	6	0	0.6500	High
Equipment management	0	0	3	8	1	0.7667	High
Contract management	0	2	4	6	0	0.6667	High

Table E.6 Consultants' perceptions in Thailand for Competencies

	n1	n2	n3	n4	n5	Mean	Level
Time management	0	1	3	5	1	0.7200	High
Quality management	0	0	3	7	0	0.7400	High
Cost management	0	0	3	6	1	0.7600	High
Safety management	0	0	2	8	0	0.7600	High
Contract management	0	0	2	7	1	0.7800	High
Risk management	0	1	8	1	0	0.6000	Medium
Labor management	0	2	5	3	0	0.6200	High
Material management	0	3	5	2	0	0.5800 ^a	Medium
Documental management	1	3	5	1	0	0.5200	Medium
Human resource management	0	3	6	1	1	0.6600	High
Communication management	0	2	6	2	0	0.6000	Medium
Subcontractor management	0	4	5	1	0	0.5400	Medium
Equipment management	0	1	2	6	1	0.7400	High

Table E.7 Owners' perceptions in Thailand for Competencies

	n1	n2	n3	n4	n5	Mean	Level
Quality management	0	0	3	6	0	0.7333	High
Time management	0	0	2	6	1	0.7778	High
Cost management	0	0	3	5	1	0.7556	High
Safety management	0	0	2	7	0	0.7556	High
Contract management	0	1	3	5	0	0.6889	High
Labor management	0	2	6	1	0	0.5778	Medium
Subcontractor management	0	1	2	5	1	0.7333	High
Material management	0	2	5	2	0	0.6000	Medium
Communication management	0	3	5	1	0	0.5556	Medium
Risk management	0	1	7	1	0	0.6000	Medium
Documental management	0	0	3	4	2	0.7778	High
Human resource management	0	0	2	6	1	0.7778	High
Equipment management	0	2	3	4	0	0.6444	High

Table E.8 Overall perception in Thailand for Competencies

	n1	n2	n3	n4	n5	Mean	Level
Time management	0	1	9	16	5	0.7613	High
Quality management	0	0	10	20	1	0.7419	High
Cost management	0	0	9	17	5	0.7742	High
Safety management	0	0	7	22	2	0.7677	High
Labor management	0	4	14	13	0	0.6581	High
Risk management	1	5	21	4	0	0.5806	Medium
Contract management	0	3	9	18	1	0.7097	High
Material management	0	8	13	10	0	0.6129	High
Human resource management	0	6	15	9	2	0.6645	High
Subcontractor management	0	8	13	9	1	0.6194	High
Communication management	0	5	13	11	2	0.6645	High
Documental management	1	6	11	11	2	0.6452	High
Equipment management	0	3	8	18	2	0.7226	High

APPENDIX F
Respondents' Expectations in Each Country

Table F.1 Respondents' Expectations in Cambodia

Knowledge Area of Project Manager		Percentage of Interviewed Respondents for Expectations		
		Contractors (14)	Consultants (12)	Owners (10)
Time Management	Providing new scheduling techniques	50%	92%	90%
	Providing new scheduling software	43%	100%	70%
Quality Management	Improving quality control system	43%	100%	100%
	Promoting quality improvement	36%	75%	80%
Cost Management	Providing new Estimating Software	57%	50%	30%
	Improving cost control system	36%	50%	50%
Safety Management	Improving safety strategy implementation	29%	100%	80%
	Upgrading Safety Risk Control	0%	100%	70%
Risk Management	Upgrading risk identification system	71%	67%	50%
	Improving risk control system	64%	50%	40%
Contract Management	Improving contract comprehension	7%	42%	70%
	Improving contract control system	36%	58%	60%
Labor Management	Strengthening labor selection	0%	50%	40%
	Upgrading labor control system	21%	50%	40%
	Providing labor development system	29%	42%	30%
Material Management	Developing material procurement planning	14%	58%	60%
	Providing new stock management software	57%	17%	0%
Human Resource Management	Improving staff recruitment system	7%	50%	40%
	Reinforcing staff control system	14%	58%	40%

Table F.1 Respondents' Expectations in Cambodia

	Setting up team development system	0%	25%	20%
Documental Management	Developing submittal planning	0%	42%	40%
	Improving submittal control system	21%	33%	20%
Subcontractor Management	Strengthening subcontractor selection	0%	42%	30%
	Improving subcontractor control	7%	83%	50%
Communication Management	Improving communication language	7%	25%	30%
	Improving information distribution system	7%	33%	30%
Equipment Management	Setting up equipment planning	14%	42%	20%
	Improving equipment control system	21%	50%	40%

Table F.2 Respondents' Expectations in Lao PDR

Knowledge Area of Project Manager		Percentage of Interviewed Respondents for Expectations		
		Contractors (9)	Consultants (8)	Owners (7)
Time Management	Providing new scheduling techniques	56%	75%	71%
	Providing new scheduling software	44%	88%	86%
Quality Management	Improving quality control system	44%	75%	71%
	Promoting quality improvement	33%	100%	100%
Cost Management	Providing new Estimating Software	56%	50%	43%
	Improving cost control system	33%	38%	43%
Safety Management	Improving safety strategy implementation	44%	88%	100%
	Upgrading Safety Risk Control	11%	100%	70%

Table F.2 Respondents' Expectations in Lao PDR

Contract Management	Improving contract comprehension	11%	50%	71%
	Improving contract control system	44%	63%	57%
Risk Management	Upgrading risk identification system	78%	75%	71%
	Improving risk control system	67%	50%	43%
Material Management	Developing material procurement planning	22%	63%	57%
	Providing new stock management software	56%	25%	0%
Subcontractor Management	Strengthening subcontractor selection	0%	38%	29%
	Improving subcontractor control	11%	63%	43%
Human Resource Management	Improving staff recruitment system	11%	50%	43%
	Reinforcing staff control system	22%	63%	57%
	Setting up team development system	0%	38%	14%
Labor Management	Strengthening labor selection	0%	50%	43%
	Upgrading labor control system	22%	75%	57%
	Providing labor development system	33%	38%	29%
Communication Management	Improving communication language	11%	25%	29%
	Improving information distribution system	11%	25%	43%
Documental Management	Developing submittal planning	0%	38%	43%
	Improving submittal control system	33%	50%	29%
Equipment Management	Setting up equipment planning	22%	38%	29%
	Improving equipment control system	22%	50%	43%

Table F.3 Respondents’ Expectations in Thailand

Knowledge Area of Project Manager		Percentage of Interviewed Respondents for Expectations		
		Contractors (12)	Consultants (10)	Owners (9)
Time Management	Providing new scheduling techniques	50%	60%	56%
	Providing new scheduling software	33%	70%	67%
Quality Management	Improving quality control system	33%	60%	78%
	Promoting quality improvement	25%	60%	78%
Cost Management	Providing new Estimating Software	42%	40%	33%
	Improving cost control system	25%	30%	33%
Safety Management	Improving safety strategy implementation	33%	70%	78%
	Upgrading Safety Risk Control	8%	90%	78%
Labor Management	Strengthening labor selection	0%	40%	33%
	Upgrading labor control system	17%	60%	44%
	Providing labor development system	25%	30%	22%
Risk Management	Upgrading risk identification system	58%	60%	56%
	Improving risk control system	50%	40%	33%
Contract Management	Improving contract comprehension	8%	40%	63%
	Improving contract control system	33%	50%	44%
Material Management	Developing material procurement planning	17%	50%	44%
	Providing new stock management software	42%	20%	0%
Human Resource Management	Improving staff recruitment system	8%	40%	33%
	Reinforcing staff control system	17%	50%	44%

Table F.3 Respondents' Expectations in Thailand

	Setting up team development system	0%	30%	11%
Subcontractor Management	Strengthening subcontractor selection	0%	30%	22%
	Improving subcontractor control	8%	50%	33%
Communication Management	Improving communication language	8%	20%	22%
	Improving information distribution system	8%	20%	33%
Documental Management	Developing submittal planning	0%	30%	33%
	Improving submittal control system	25%	40%	22%
Equipment Management	Setting up equipment planning	17%	30%	22%
	Improving equipment control system	17%	40%	33%

APPENDIX G

Evidence of Competencies of Local Project Managers

Table G Evidence of competencies of each knowledge area

Knowledge Area of Project Manager		Evidence of Competency	Percentage of competency of Interviewed Contractor		
			Cambodia (14)	Lao PDR (9)	Thailand (12)
Cost Management	Estimating Software	<i>Spreadsheet</i>	100%	100%	100%
		<i>Others (Timberline,...)</i>	0%	0%	0%
	Cost Control	<i>S-Curve</i>	43%	33%	83%
		<i>Cost Coding System</i>	14%	11%	25%
Time Management	Schedule Technique	<i>Bar Chart</i>	100%	100%	100%
		<i>CPM</i>	0%	0%	25%
		<i>Others (PERT, Line of Balance...)</i>	0%	0%	0%
	Scheduling Software	<i>Spreadsheet</i>	7%	44%	0%
		<i>M. Project</i>	100%	56%	100%
		<i>Others (Primavera,...)</i>	0%	0%	0%
	Time Control	<i>CPM</i>	0%	0%	25%
		<i>Delay Control</i>	29%	33%	58%
Quality Management	Quality Control	<i>Quality Testing</i>	100%	100%	100%
		<i>Quality Inspection</i>	57%	56%	75%
		<i>Quality Checklist</i>	71%	67%	100%
	Quality Improvement	<i>Quality Problem Record</i>	64%	56%	67%
Contract Management	Contract Comprehension	<i>Full Requirement Identification</i>	57%	56%	75%
		<i>Contract Risk Identification</i>	29%	33%	50%
	Contract Control	<i>Contract Risk Reduction</i>	21%	22%	42%
		<i>Contract Change Control</i>	50%	44%	67%

Table G Evidence of competencies of each knowledge area

Material Management	Material Procurement	<i>Material Delivery Scheduling</i>	50%	44%	58%
		<i>Purchase Order Preparation</i>	64%	56%	83%
	Material Storage	<i>Proper Location</i>	79%	78%	83%
		<i>Reliable Security System</i>	86%	78%	92%
	Stock Management Software	<i>Manuals</i>	100%	100%	67%
		<i>Spreadsheet</i>	0%	0%	33%
		<i>Others(Commercial Software,...)</i>	0%	0%	0%
Labor Management	Labor Selection	<i>Formal Skill Test Action</i>	0%	0%	0%
		<i>Formal Interview Conduction</i>	0%	0%	0%
	Labor Control	<i>Work Quality Control</i>	64%	56%	67%
		<i>Labor Variation Control</i>	43%	44%	50%
		<i>Labor Safety Control</i>	64%	67%	75%
		<i>Conflict Control</i>	71%	78%	75%
	Labor Development	<i>Skill-Enhancement Training</i>	0%	0%	0%
		<i>Development Training</i>	0%	0%	0%
Equipment Management	Equipment Planning	<i>Right Equipment Identification</i>	64%	67%	83%
		<i>Proper Location Determination</i>	79%	78%	83%
	Equipment Control	<i>Equipment Safety Control</i>	36%	33%	42%
		<i>Noise Impact Control</i>	0%	0%	0%
		<i>Maintenance Program</i>	43%	44%	50%
Safety Management	Safety Strategy Implementation	<i>Protective Equipment Action</i>	79%	67%	100%
		<i>Safety Sign Implementation</i>	100%	89%	100%
		<i>Safety Inspection</i>	50%	44%	67%
		<i>Safety Meeting Conduction</i>	43%	44%	58%

Table G Evidence of competencies of each knowledge area

		<i>Safety Training Program</i>	0%	0%	0%
	Safety Risk Control	<i>Accident Investigation</i>	57%	56%	58%
		<i>Accident Recording</i>	36%	33%	42%
Subcontractor Management	Subcontractor Selection	<i>Quotation Consideration</i>	100%	100%	100%
		<i>Experienced Labor Consideration</i>	21%	22%	25%
		<i>Past Project Information</i>	50%	56%	50%
		<i>Adequacy of Good Equipment</i>	50%	44%	75%
		<i>Past Safety Performance</i>	14%	11%	17%
	Subcontractor Control	<i>Subcontractor Coordinating</i>	71%	67%	75%
		<i>Subcontractor Scheduling</i>	71%	67%	75%
		<i>Work Quality Control</i>	57%	56%	67%
Documental Management	Standard Document	<i>Needed Document Identification</i>	71%	67%	83%
	Submittal Planning	<i>Needed Submittal Determination</i>	64%	56%	75%
		<i>Submittal Scheduling</i>	50%	33%	50%
	Submittal Control	<i>Late Submittal Control</i>	50%	33%	50%
Communication Management	Communication Language	<i>English Speaking</i>	93%	89%	92%
	Information Distribution	<i>Meeting</i>	100%	100%	100%
		<i>Electronic Mail</i>	100%	100%	100%
Human Resource Management	Staff Recruitment	<i>Formal Test Action</i>	0%	0%	0%
		<i>Formal Interview Conduction</i>	100%	100%	100%
	Staff Control	<i>Organizational Chart Establishment</i>	93%	67%	100%
		<i>Staff Reporting Action</i>	36%	33%	50%
	Team Development	<i>Skill-Enhancement Training</i>	0%	0%	25%
		<i>Development Training</i>	0%	0%	25%

Table G Evidence of competencies of each knowledge area

Risk Management	Risk Identification	<i>Project Risk Determination</i>	21%	22%	33%
		<i>Risk Source Determination</i>	14%	11%	25%
	Risk Control	<i>High Project Risk Control</i>	21%	22%	25%
		<i>Risk Reduction Measure</i>	14%	11%	25%

BIOGRAPHY

Sereyraseth Hang was born on February 13, 1986 in Phnom Penh, the capital city of Cambodia, where he mostly spent his time for academic study from primary school until educational institution. He succeeded in obtaining a Bachelor Degree from Institute of Technology of Cambodia (ITC) in a major of Rural Engineering in 2008. He was promptly awarded AUN/SEED-Net JICA scholarship which formally admitted him to pursue his Master Degree in a field of Infrastructure Civil Engineering, Chulalongkorn University, Thailand.



