FACTORS INFLUENCING ON SAFETY MANAGEMENT STATUS AND EVALUATION OF SAFETY MANAGEMENT STATUS IN CONSTRUCTION PROJECTS IN CAMBODIA

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Abstract

The objectives of this paper are to present the factors influencing on safety management (SM) status and the evaluation of safety management status in construction projects in Cambodia. The probability of factors affected to safety management status were explored by interviewing both local and international contractors. The status of safety management in construction sites were evaluated by the probability of the factors used for the safety management that were obtained from construction the site observation and the interviews with evidences presented. The status of safety management was classified into five levels by ranges of the probability. The results of this research show that the probability of the factors influencing the safety management in construction sites of both local and international contractors were divided into two groups, including the high probability and low probability groups. The nine factors in high probability groups were accepted that they can influence on the safety management in construction site such as budget allocated for safety management, safety policy, awareness of project managers, safety training, safety organization, safety regulation, usage of personal protective equipments (PPE), site-accident investigation, and safety committee. The results were accepted based on the reliability of the data set from the respondents that were verified by *Cronbach's Alpha* ($\alpha \geq 0.6$). Moreover, the status of safety management in construction sites of the international contractors was better than the local contractors since the probability of all factors used for the safety management in construction sites of the international contractors were in medium level, high level, and very high level. On the other hand, for the local contractors, the probability of all factors used for the safety management in construction sites were in medium level, low level, and very low level that they have been required for improvement.

Keywords: Factors, Cambodia, Construction Projects, Safety Management Status

Introduction

Generally, construction sites are one of the most hazardous areas that there are high occurrence of accidents and injuries. The construction site is one of the most dangerous workplaces because of its unique nature and complexity of construction project [1]. Safety in construction site has usually been poor and it is one of the most dangerous factors at the construction project [2]. Construction industry has the highest rate of accidental occurrence compared among all industries [3, 4]. The accidents in construction projects are the causes of the workers' illness and injuries that normally occurred due to construction failure [5]. Hinze [6] had explored the root causes of accidents in construction projects. The major root causes of the accidents are related to the nature of construction industry, worker behaviors, difficulty of job conditions, and lack of safety management in construction site which affects to unsafe construction

methods, equipments and procedures. For safety improvement in construction industry, the training and the utilization of comprehensive safety program should be arranged [7].

Cambodia is one of developing country in the world, where the investment in construction industry has been increased in the whole country. The whole investment has been come from foreigners and local investors in many kinds of construction projects such as high-rise buildings, bridges, hotels, supermarkets, hospitals, apartments, and others infrastructure projects. In early of the year 2011, the government has attempted to attract foreign investors in many infrastructure construction projects. Thus, many construction projects in the capital city were constructed faster in order to complete following the project planning and schedule. According to the statistical data from the Department of Urban Planning and Construction, the Ministry of Land Management, the investment in the industry of Cambodia has been around 80 percentages, increasing in the construction sector during the first seven months of the year 2011 when compared with the same period.

Moreover, Hang [8] concluded that there are some problems of safety management in Cambodia such as poor competency of project managers. He also presented that safety management in Cambodia was still under-standard. It led to many problems which have been occurred in the many construction projects such as accidents, and injury of construction workers. In the past, safety management status in construction project in Cambodia is poor because of some factors such as unclear safety regulations, no safety standards and lack of knowledge of the application used for safety management in construction projects. From construction sites surveying and interviews, the awareness of safety management of the parties in construction projects in Cambodia is low, because the safety management topic has not been much focused by owners, contractors, consultants and public department. From literature reviews, there are many factors that influence on the safety management status in construction sites in many countries. However, those kinds of factors may be different in each country due to the difference of nature, location, and culture.

To solve the problems of safety management and improve the safety management status in construction projects in Cambodia, we should explore the important factors that affect safety management status in construction sites. Therefore, the major objectives of this research are to identify factors influencing on the safety management status and evaluate the status of safety management in the construction projects in Cambodia.

Safety Management (SM)

Safety management is a process of controlling safety policies, procedures and practices, relating to the project site safety as demonstrated by Wilson [9]. Ming [10] referred the safety management system as the policies, objectives, organization, management controls, and recourses, which are in place to manage safety, health and environment in all parts of the business. Safety management is the application of management system used to identify, understand, and control the process of hazards in order to prevent the process related to injuries and incidents [11]. By code of practice on safety management 2002 [12], safety management system means a system which provides safety management in an industrial undertaking and safety management means the management functions connected with carrying out of an industrial undertaking that relates to the safety personnel that include the planning, developing, organizing and implementing of safety policy, measuring, auditing or reviewing of the performance of those functions.

Jannadi [1] summarized the important level of factors that affect safety performance of contractor firm, based on 20 main factors. There are 6 major factors influencing the

safety of construction industries such as maintaining safe working condition, safety training, cultivating good safety habits, effective controlling of subcontractors, assignment of responsibility to all levels of management, and workers' awareness. All successful safety management schemes must be supported by the top management which the management commitment and the support are essential to bringing accident rates down [13]. Ahmed [14] has conducted the a research in Hong Kong on site safety management. The 6 main aspect elements of 14 elements of construction site safety management have been investigated such as safety policy, safety organization, safety training, program inspection of hazardous condition, personal protection equipment, and safety promotion. Tam [15] studied the attitude changes in people after the implementation of a new safety management system under supervision plan in order to evaluate on-site personals awareness of new regulation. In 2002, he studied to evaluate the safety management system and prioritized the measurement with the consideration of various decision criterias [16]. Tam [17] identified poor elements of construction safety management in China by studying the status of safety management and identifying factors affecting construction site safety. This research recommends that the government should play a more critical role in strict legal enforcement and organizing safety training programs.

Teo [18] had developed a model used to measure the effectiveness of safety management system in construction site. Chourdhy [4] has been conducted the questionnaires to explore the status of safety management in Hong Kong by investigating 8 aspect factors of construction safety management such as safety policy, safety organization, safety training, inspection of hazardous condition, personal protection equipment, plant and equipments, safety promotion, and management behaviors.

Research Methodologies

After literature reviews, the data of factors influencing on the safety management status was explored. Then, the other factors can be found by using the questionnaires and interviewing to the respondents in Cambodia. Those factors were analyzed to obtain the factors influencing on the safety management status in Cambodia. Finally, the status of safety management in Cambodia will be evaluated by using those obtained factors. The details of research methodologies can be described as follows:

Sample Sizes

According to Yamane [19], he provided a simplified formula to calculate sample sizes. The equation (1) was used to calculate the sample sizes for around 80% confidence level (20% of the error was acceptable) due to the result of data collection based on opinions of the respondents.

$$n = \frac{N}{1+Ne^2} \quad (1)$$

n = Sample size (The number of construction projects or respondents)
N= Population size (The whole construction projects or respondents)
e = Error of sampling (20%) for 80% confidence, approximately

Table 1. Sample Sizes of Determination

Contractor Firms	Construction Projects in Cambodia (Phnom Penh & Siem Reap)	Sample Sizes	Actual % of Error
Local	100	24	18
International	9	6	23
Total	109	30	-

This research is only focused on building construction projects that were built by both local and international construction companies in 2011-2012. From the results of the sample sizes determination by using equation (1) based on percentage of error in Table 1, the 30 construction projects of different construction companies in Cambodia in two main places, namely Phnom Penh city and Siem Reap province, were chosen to conduct data collection. The 24 construction projects of local contractors and 6 construction projects of international contractors were selected for data collection. Meanwhile, 30 project managers of those projects such as 24 project managers of local contractors and 6 project managers of international contractors were selected to be the respondents. They were interviewed by means of the face-to-face method to obtain the important data, respectively. However, for the sample size of international contractors is small size because of the difficulty of finding the international contractors in these cities.

Analysis of Factors Influencing on Safety Management Status

The factors influencing on safety management status in Cambodia were analyzed by using project managers' perceptions. In this research, the 30 project managers of both local and international construction companies were selected to be respondents. They were interviewed to obtain their perceptions which were divided as agree and disagree for each factor that influences on the safety management status in Cambodia.

The indicator used to identify factors influencing on the safety management is probability of respondents' perceptions which agreed that those factors influenced on the safety management status in Cambodia. The analysis of probability was separated for local and international companies by using equation (2), respectively. Then, the probability of each factor will be plotted in the scatter graph that can be presented the distribution of the probability. In scatter graph, the probability of factors will be classified into the high probability group and the low probability group by considering the distribution of the probability. The factors in the high probability group will be considered as factors influencing on the safety management status in construction sites in Cambodia.

Moreover, to ensure the results of data analysis, the reliability of data from the questionnaire that used for analyzing the probability of factors was verified by using *Cronbach's Alpha (α)* coefficient of the data set [20]. It can be determined by equation (3), (4), and (5) and presented in Table 2. If the *Cronbach's Alpha (α)* is equal to or greater than 0.6, not only the reliability of the data set will be accepted, but also the results of data analysis will be accepted [20].

$$P\ (F_j) \quad = \frac{(\sum_{i=1}^{n} x_{ij}) \times 100}{n} \tag{2}$$

$$\textit{Cronbach's Alpha } (\alpha) = \left(\frac{k}{k-1}\right)\left(1 - \frac{\sum_{j=1}^{k} S_j^2}{S_p^2}\right) \tag{3}$$

$$S_j^2 = \frac{n\ \sum_{i=1}^{n}(x_{ij})^2 - (\sum_{i=1}^{n} x_{ij})^2}{n^2} \quad (4)$$

$$S_p^2 = \frac{n\ \sum_{i=1}^{n}\left(\sum_{j=1}^{k} x_{ij}\right)_i^2 - (\sum_{i=1}^{n}(\sum_{j=1}^{k} x_{ij})_i)^2}{n^2} \quad (5)$$

$P\ (F_j)$ = Probability of factor j (j = 1, 2, 3,…., k) that influences on safety management status (0 - 100%)
S_j^2 = Variance of factor j from all respondents' perception
S_p^2 = Variance among respondents i (i = 1, 2, 3,…, n) for all factors
n = Total number of respondents
k = Total number of factors
x_{ij} = Score of each respondent' s perception for each factor (Agree = 1, Disagree = 0)

Table 2. An Example of Data Analysis to Obtain Probability of Factor And *Cronbach's Alpha of the Data Set*

Resp.	**Factor** j (F_j)					$\sum_{j=1}^{k} x_{ij}$
i	1	2	3	. . .	k	
1	x_{11}	x_{12}	x_{13}	. . .	x_{1k}	$\sum_{j=1}^{k} x_{1j}$
2	x_{21}	x_{22}	x_{23}	. . .	x_{2k}	$\sum_{j=1}^{k} x_{2j}$
3	x_{31}	x_{32}	x_{33}	. . .	x_{3k}	$\sum_{j=1}^{k} x_{3j}$
.	.	.	.	.	.	.
.	.	.	.	.	.	.
i	x_{i1}	x_{i2}	x_{i3}	x_{ij}	x_{ik}	$\sum_{j=1}^{k} x_{ij}$
.	.	.	.	.	.	.
.	.	.	.	.	.	.
n	x_{n1}	x_{n2}	x_{n3}	. . .	x_{nk}	$\sum_{j=1}^{k} x_{nj}$
	$\sum_{i=1}^{n} x_{i1}$	$\sum_{i=1}^{n} x_{i2}$	$\sum_{i=1}^{n} x_{i3}$	. . .	$\sum_{i=1}^{n} x_{ik}$	
	$P\ (F_1)$	$P\ (F_2)$	$P\ (F_3)$	$P\ (F_j)$	$P\ (F_k)$	
	S_1^2	S_2^2	S_3^2	S_j^2	S_k^2	

Evaluation of Safety Management Status in Cambodia

For evaluating the status of safety management in construction sites in Cambodia, the 2 ways were used for this evaluation, including construction site observation and interviews of project managers of contractors with their evidences showing. The methods of factors that were used to evaluate the status of safety management in Cambodia are shown in Table 3. The details of each way are presented as follows:

Table 3. The Methods Used For Evaluating Status of Safety Management in Cambodia

No.	Factors	Evaluating Methods	
		Observation	Interviews & Evidences Showing
1	Safety policy		X
2	Safety organization		X
3	Safety training		X
4	Safety program for inspection of hazardous		X
5	Safety committee		X
6	Personal protection equipment (PPE)	X	-
7	Site accidents/incident investigation		X
8	Job hazard analysis		X
9	Safety promotion		X
10	Health assurance program		X
11	Hazard control program		X
12	Emergency procedures		X
13	Safety regulation		X
14	Awareness of Project manager/Safety manager		X
15	Budget allocated for SM		X

Status of safety management evaluated by observing construction sites

The 30 building construction sites such as 24 construction sites of local contractors and 6 construction sites of international contractors were observed the probability of workers' PPE using. The PPE used for evaluating the status of safety management consists of 9 types such as falling protection from height, foot protection, respiration protection, ear protection, hand protection, body protection, eyes protection, face protection, and head protection. The probability of workers' PPE using in each type of PPE was analyzed by equation (6). Then, the 100 % of probability will be classified into 5 levels that means probability range of each level is 20% (100% / 5) such as very high ($P_{(PPE)_j} \geq 80\%$), high ($P_{(PPE)_j} \geq 60\%$), medium ($P_{(PPE)_j} \geq 40\%$), low ($P_{(PPE)_j} \geq 20\%$), very low ($P_{(PPE)_j} < 20\%$). It can be used as an indicator for evaluating the status of safety management in construction sites in Cambodia.

$$P_{(PPE)_j} = \frac{(\sum_{i=1}^{n} y_{ij}) \times 100}{N_j} \quad (6)$$

$P_{(PPE)_j}$ = Probability of PPE type j (j = 1, 2, 3,….., k) that used in construction sites

y_{ij} = Number of workers who use PPE type j in construction site i (i = 1, 2, 3,.., n)

N_j = Total number of workers who should use PPE type j in all construction sites

k = Number of PPE types

n = Number of construction sites

Status of Safety Management Evaluated by Interviews and Showing the Evidences

For evaluating status of safety management, the data of 8 remaining factors of safety management was analyzed in order to obtain the probability of each factor that was applied to safety management in construction sites of both local and international construction firms. In this research, the 24 project managers of local and 6 project managers of international contractor firms were interviewed, respectively.

However, for verifying the respondents' answers, those respondents should not only reply that they applied those factors to safety management in their construction sites, but also show the evidences in applying those factors. Those evidences are shown in Table 4. The probability of factors applied for safety management in construction sites was analyzed by equation (7). The probability will be divided into 5 levels, containing very high, high, medium, low, and very low levels.

$$P\ (AF_j) = \frac{(\sum_{i=1}^{n} z_{ij}) \times 100}{n} \quad (7)$$

$P\ (AF_j)$ = Probability (0-100) of factor j (j = 1, 2, 3,…, k) used for SM in construction site
n = Total number of respondents
k = Total number of factors
z_{ij} = Score of respondent i (i = 1, 2, 3,…., n) for factor j

The z_{ij} was defined as follows:

z_{ij} = 1; factor j was used for SM in project i and an evident can be presented
z_{ij} = 0; factor j was not used for SM in construction project i
z_{ij} = N/A; factor j was used for SM in construction project i, but the evidences of factor j using cannot be presented

Table 4. The Evidences Used for Verifying the Factors Applied to Safety Management

No.	Factors Used For Evaluating Safety Management Status	Evidences
1	Budget allocated for SM	- Report shows budget for safety management in construction site
2	Safety Policy	- Safety policy and standard - Safety manual and procedure
3	Awareness of project or safety manager	- Safety monitoring report - Safety problem solution report
4	Safety organization	- Organization charts for safety management in construction site
5	Safety training	- Safety plans and training programs
6	Safety program for inspection of hazardous	- Safety inspection checklist
7	Safety committee	- Safety committee chart
8	Safety regulation	- Safety regulation for safety management
9	Site accident investigation	- Report of accidents

Results and Discussion

Factors influencing on safety management in Cambodia

The fifteen factors affecting on safety management (SM), obtained from literature reviews and experts' opinions, have been used to identify the factors influencing on SM in the construction sites in Cambodia as shown in Table 5. The twelve factors (No. 1 – No. 12) were explored from literature reviews as shown in Table 3 and the three factors, including, awareness of project manager, safety regulation, and budget allocated for SM were explored from experts' opinions.

Table 5. Probability of Factors Influencing Safety Management Status in Cambodia

No. (j)	Factors (F_j)	Probability $P(F_j)$		Group of Probability		Accepted Factors	
		Local (%)	Int. (%)	Local	Int.	Local	Int.
1	Safety policy	50	67	High	High	Accept	Accept
2	Safety training	67	83	High	High	Accept	Accept
3	Safety committee	17	83	Low	High	Not	Accept
4	Job hazard analysis	0	0	Low	Low	Not	Not
5	Health assurance program	0	17	Low	Low	Not	Not
6	Awareness of Project manager/Safety manager	46	100	High	High	Accept	Accept
7	Safety program for inspection of hazardous	0	0	Low	Low	Not	Not
8	Safety regulation	50	83	High	High	Accept	Accept
9	Safety organization	54	83	High	High	Accept	Accept
10	Emergency procedures	4	0	Low	Low	Not	Not
11	PPE using	54	67	High	High	Accept	Accept
12	Site accident investigation	42	67	High	High	Accept	Accept
13	Hazard control program	0	0	Low	Low	Not	Not
14	Safety promotion	4	0	Low	Low	Not	Not
15	Budget allocated for SM	71	83	High	High	Accept	Accept

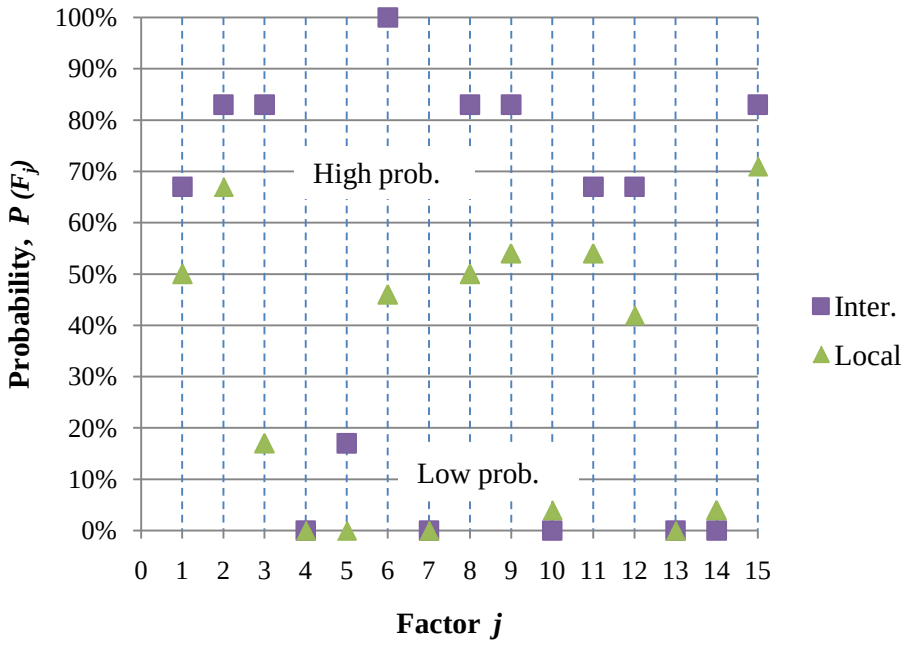

Figure 1 Scatter graph of probability of factors affecting safety management status in construction sites in Cambodia

The probability of 15 factors influencing on safety management in construction sites in Cambodia was presented in Table 5. The Figure 1 shows the scatter of probability of factors affecting safety management status in construction sites. From the scatter graph, the probability of factors was classified into 2 groups, including high probability and low probability. For local contractors, the probability of factor was classified as high probability when it was higher than 40 %. ($P(F_j) > 40\%$), whereas the probability of factors for international contractors was classified as high probability when it was higher than 60 %. ($P(F_j) > 60\%$). The factors that have high probability were accepted as the factors influencing on safety management status in construction sites in Cambodia. Those factors are shown in Table 5. The results of analysis presented that there are 8 and 9 factors influencing on safety management status in construction site in Cambodia from local and international contractors' perceptions, respectively. Finally, the results can be summarized that the factors influencing on safety management status in construction site in Cambodia are composed of budget allocated for SM, safety policy, awareness of project managers, safety training, safety organization, safety regulation, using of personal protective equipment (PPE), site accident investigation, and safety committee.

In this research, for verifying the reliability of the data set from the questionnaires and interviews, the Cronbach's Alpha of the data set from local contractors' perceptions is 0.7 and from international contractors' perceptions is 0.6, respectively. The results of Cronbach's Alpha analysis are both equal and higher than 0.6 as shown in Table 6 so that the results from those data set analyses can be accepted [20].

Table 6. Cronbach's Alpha (α) of Data Set for All Factors (k = 15)

Respondents	Number of Respondents (n)	*Cronbach's Alpha (α) of the Data Set*
Local contractors	24	0.7
International contractors	6	0.6

Status of Safety Management in Cambodia

In this research, the status of safety management in construction sites in Cambodia can be evaluated by 2 methods. The results of each methods can be presented as follows:

Status of Safety Management Evaluated by Observing PPE Using in Construction Sites

From construction site observation, the results of data analysis to obtain probability of PPE using by workers in construction sites indicated that both of local and international contractors have provided mostly common 9 types of PPE to the workers, such as safety helmet, face shield, glasses or goggles, long-sleeved jacket, gloves, dust mask, safety shoes, and safety belt as shown in Table 7.

Table 7. Probability of PPE Using In Construction Sites in Cambodia

PPE No. (j)	PPE Types	Items $(PPE)_j$	Probability of PPE Using: $P(PPE)_j$ (%)	
			Local	Inter.
1	Fall protection from height	Safety belt	18	61
2	Foot protection	Safety shoes	53	97
3	Respiration protection	Dust mask, respirator	12	45
4	Ear protection	Ear plugs	5	14
5	Hand protection	Gloves	28	82
6	Body protection	Long-sleeved jackets	4	17
7	Eyes protection	Glasses, goggles	12	60
8	Face protection	Face shields, welding masks	21	50
9	Head protection	Helmet	41	91

The status of safety management evaluated by probability of proper using of PPE by the workers in construction sites is mentioned in Figure 2.

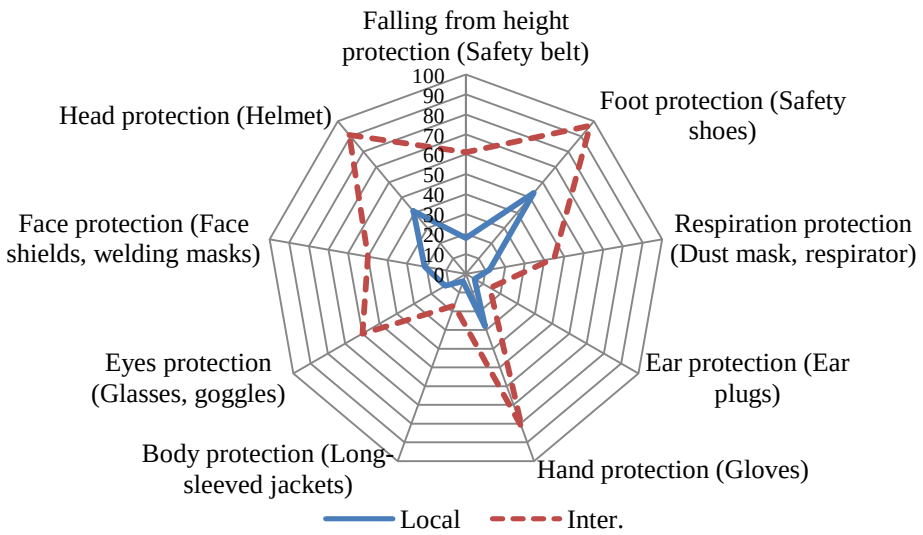

Figure 2. Probability of PPE using in construction sites of local and international contractor

The Figure 2 demonstrates that the probability of PPE using by the workers in construction sites or $P(PPE)_j$ of international contractors is mostly better than local contractors. Particularly, there are merely body protection, ear plugs, and dust mask whose $P(PPE)_j$ are lower than 50%, while others $P(PPE)_j$ are over than 50% so the proper using of workers for local contractors is worse than the ones for international contractors. The results of local contractors showed that many workers did not use some types of PPE during working process in construction sites. However, with 24 construction-sites observation, what many workers of local contractors used better contain only foot protection equipment as the $P(PPE)_j$ is 53% for safety shoes and $P(PPE)_j$ is 41% for head protection as helmet.

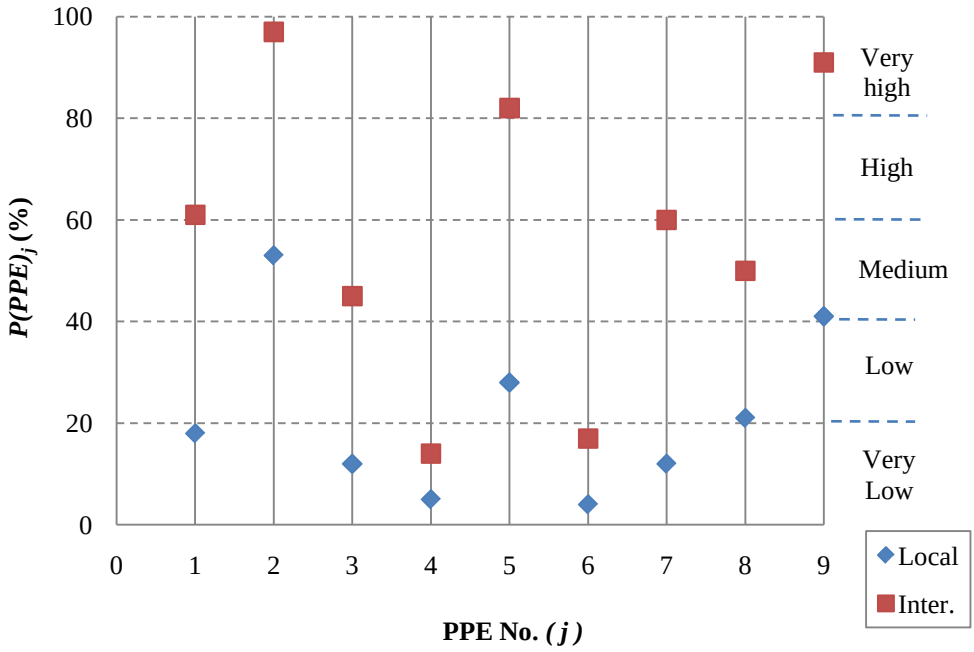

Figure 3. Scatter of probability of PPE using in construction sites in Cambodia

Figure 3 presents the scatter and the 5 levels of probability of PPE using or $P(PPE)_j$ in construction sites of local and international contractors. The results show that $P(PPE)_j$ in construction sites of local contractors are mostly in medium, low, and very low levels. On the other hand, $P(PPE)_j$ in construction sites of international contractors are mostly in medium, high, and very high levels.

Status of Safety Management in Construction Sites Evaluated by Interviewing and Evidences Presented

In this research, the status of safety management in construction site in Cambodia was also evaluated by interviewing the project managers of local and international contractors. Their answers show that they applied or did not apply the factors for safety management in construction sites. Moreover, those answers will be verified by the evidences presented.

The results show that some factors were applied to safety management and the respondents can present the evidences (z_{ij} = 1), and some factors were not applied for safety management (z_{ij} = 0). However, some respondents applied some factors to safety management but cannot present the evidences of applying (z_{ij} = N/A). The probability of factors $P(AF_j)$ that applied to safety management in construction site in Cambodia is presented in Table 8.

Table 8. Probability of Factors Applied To SM in Construction Sites in Cambodia by Interviews and Evidences Presented

Factor No. (j)	Factors (F_j) Used for SM in Construction Sites	Probability: $P(AF_j)$ Inter. (%)	Local (%)
1	Budget allocated for SM in construction sites	N/A	N/A
2	Safety Policy	88	44
3	Awareness of project managers or safety managers	N/A	N/A
4	Safety organization	78	25
5	Safety training	67	33
6	Safety committee	67	23
7	Safety regulation	63	49
8	Site accident investigation	75	46

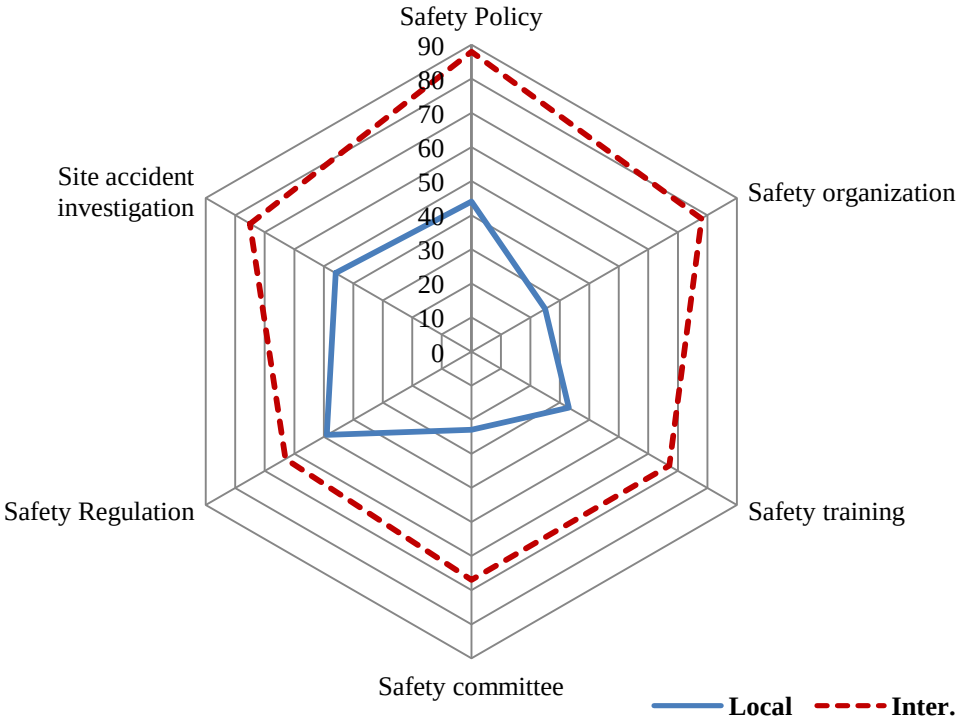

Figure 4. Probability of factors applied to SM in construction sites of local and international contractors in Cambodia

The Figure 4 presents that the probability of factors applied to SM in construction sites or $P(AF_j)$ of international contractors is mostly better than local contractors. The 6 factors of 8 factors can be evaluated, on the other hand, 2 factors, including budget allocated for SM in construction sites (Factor No.1) and awareness of project managers or safety managers (Factor No.3) cannot be evaluated (N/A), because the respondents cannot show the evidences of factors applying. The results show that the probability of 6 factors applied

to SM in construction sites of international contractors was equal or higher than 50 %. However, for construction sites of local contractors, the probability of most factors applied for SM were lower than 50 %.

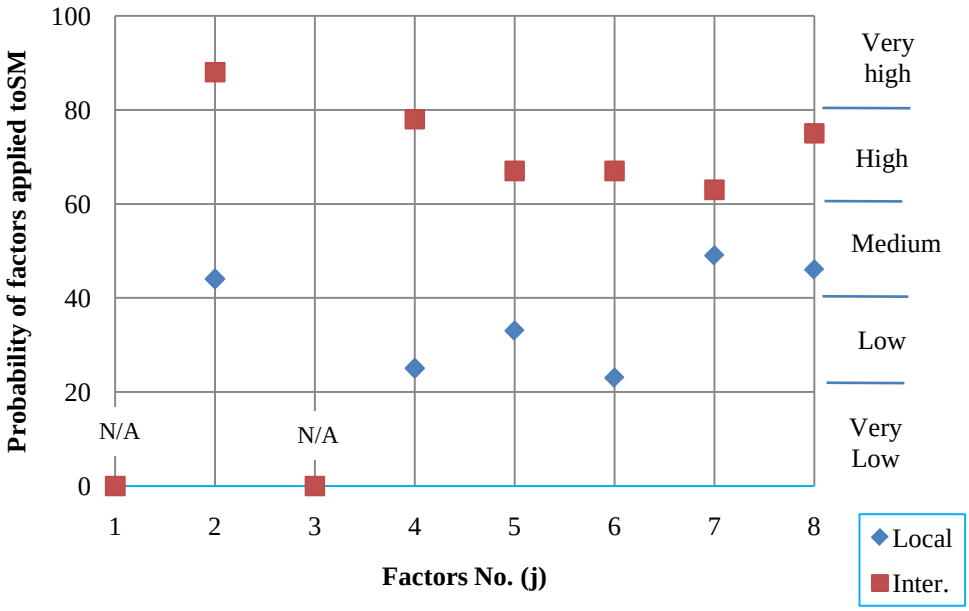

Figure 5. Scatter of probability of factors used to SM in construction sites in Cambodia

In Figure 5, the scatter graph presents the 5 levels of probability of factors used to SM or $P(AP_j)$ in construction sites of local and international contractors. The results show that $P(AP_j)$ in construction sites of local contractors are mostly in medium and low levels. On the other hand, $P(AP_j)$ in construction sites of international contractors are mostly in high and very high levels.

Thus, from the results of PPE using and factors used for safety management, the improvement of safety management in construction site will be required for local contractors.

Conclusions

In this research, the high probability of 8 and 9 factors influencing on the safety management status in construction sites in Cambodia were explored from perceptions of local and international contractors, respectively, such as budget allocated for SM, safety policy, awareness of project managers, safety training, safety organization, safety regulation, personal protective equipment (PPE) using, site accident investigation, and safety committee. For the result that is acceptable, the reliability of the data set from the questionnaires and interviews were verified by *Cronbach's Alpha (α),* that it is equal to or greater than 0.6. The results of evaluation of safety management status in construction sites in Cambodia by means of construction-sites observation and interviews indicated that the status of safety management in construction sites of international contractors was better than local contractors. The probability of all factors used for safety management in construction sites of international were in high and very high level, on the other hand, for local contractors, the probability of all factors used for safety management in construction sites were in medium and low level. Thus, for local contractors, the factors used for safety management in construction sites in medium and low level should be improved.

However, the safety management status in construction sites in Cambodia was evaluated by probability of factors that applying to safety management in construction sites. It cannot represent the levels of safety in construction sites in Cambodia.

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