KNOWLEDGE MANAGEMENT AND PROJECT PERFORMANCE IN MALAYSIAN CONSTRUCTION CONSULTING COMPANIES

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ABSTRACT

In recent years, organisational knowledge has become an important corporate asset and thus influence on project performance. Knowledge Management (KM) and project performance have become critical issue for construction consulting companies to create and sustain their competitive advantage. Therefore, there is a need to conduct a study on KM and project performance specifically focussing on the Malaysian construction consulting companies. In this study, KM and project performance framework has been developed using factor analysis to generate variables for KM areas and project performance components. The classification of the implementation of KM areas are further grouped into two categories, i.e., exploitive and explorative. This paper also presents the classification of project performance framework within the Malaysian construction consulting companies based on practitioners' perceptions to formulate two categories of project performance, i.e., normal and high project performance. Finally, a KM and project performance capability matrix is presented based on the consolidation of the prior findings.

KEYWORDS*:*

knowledge management, delphi study and factor analysis, project performance

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INTRODUCTION

The potential importance of sustainable competitive advantage in business community has received a phenomenal amount of attention in recent years. Sustainable competitive advantage allows the maintenance and improvement of a company's performance in the global market. It is an advantage that enables businesses to survive against its competitors over a long period of time. Sustainable competitive advantage is achieved by continuously developing existing and creating new resources and capabilities in response to rapidly changing market. Among these resources and capabilities, Knowledge Management (KM) is recognised as core business considerations to gain competitive advantage. If properly managed, KM can be converted into strategic intellectual assets of any knowledge-intensive organisation. It has been argued that new skills, mind-sets, models and commitment as well as new ways of interpreting the concept of effective management are needed to improve construction project performance (Rasli, Abd Majid and Asmi, 2004). Both practitioners and researchers have addressed the important issue of applying KM to support project performance (Gann, 2000; Mitev and Venter, 2004; Rezgui, 2001). Many construction industries employ KM programs in various ways to manage and share their knowledge, particularly in storing and transferring explicit forms of knowledge and capturing and storing tacit knowledge in repositories.

KNOWLEDGE MANAGEMENT

KM is concerned with the entire process of creating, organising, locating, distributing and sharing knowledge. Researchers have defined that there are two major approaches to KM, i.e., “exploitive” and “explorative” (Hansen, 1999; Jordan and Jones, 1997; March, 1991; Sarvary, 1999; Zack, 1999). The exploitive approach focuses on reusing existing knowledge, while the explorative approach centres on the creation of new knowledge. Furthermore, emphasising a wrong strategy or trying to pursue both of these KM approaches at the same time could without fully understanding the implications could lead to a loss of focus in business improvement efforts. Hence, there is a need to enquire into how each of the KM approaches can be applied within organisations (Hansen, 1999). Taking into consideration these views, the research framework for KM in this study is presented in Figure 1.

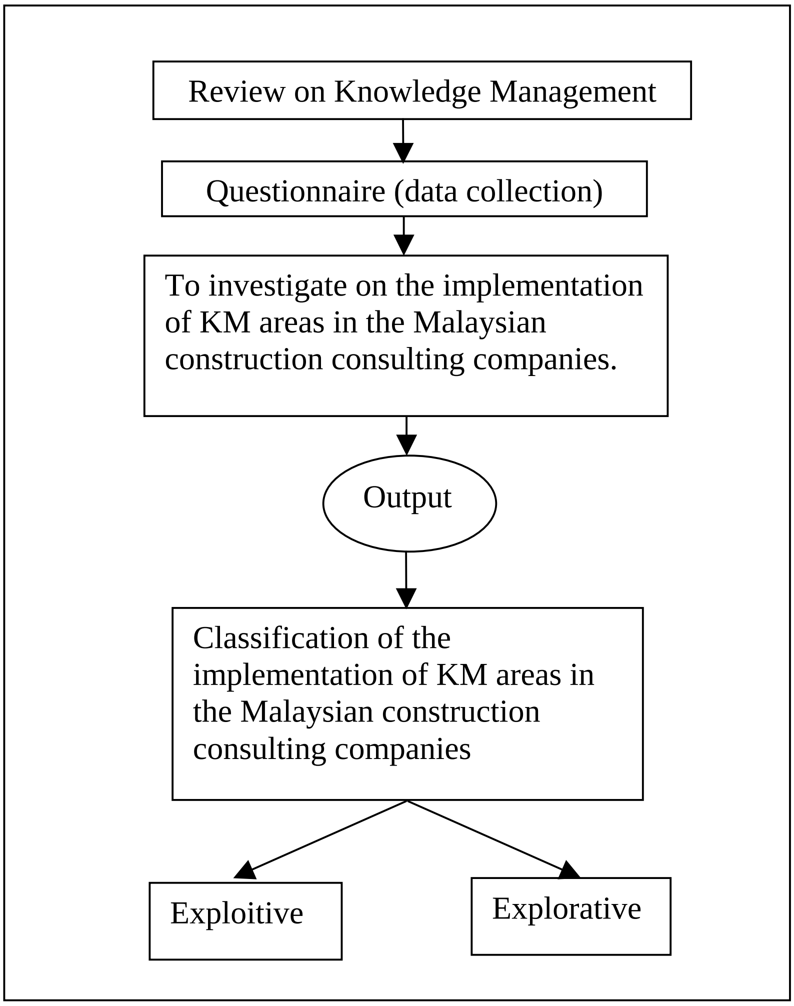

Figure 1: KM research framework

As shown in Figure 1, this exploratory research on KM is to investigate the implementation of KM areas in the construction consulting companies. This study used a questionnaire with a five-point Likert scale from “Very Effective” to “Very Ineffective”. Jordan and Jones (1997) describe two dominant KM types within an organisation. Even though they did not term the KM types, the two KM types represent exploitative approach and explorative approach. In this study, to assess the knowledge type in the second part of the study, the overall mean score of the items of the KM questionnaire is used. Respondents who score less than the overall mean score were classified as “exploitive” while those whose score are equal or greater than the overall mean scores were classified as “explorative” (Kim, 2001).

RESEARCH QUESTIONNAIRE FOR KM RESEARCH

A questionnaire was developed taking into consideration all of the KM components identified from the previous study by Rasli, Asmi and Abd Majid, 2005. Each item of the questionnaire was then anchored with a five-point Likert scale.

Results and Discussion for KM Research

One hundred and twenty two practitioners from the construction consulting companies were randomly selected to form the sampling frame. Table 1 presents the characteristics of the samples. Overall, slightly more than half (83) of the practitioners were working in civil engineering companies. The bulk of practitioners (96.7 %) were from the 100% Malaysian ownership company. However, 76 practitioners have position as civil engineers and 15 practitioners as quantity surveyors and architects. Furthermore, 55 practitioners have working experience more than 10 years, 40 practitioners have less than 5 years working experience and 27 practitioners have 5-10 years working experience. In terms of education level, most of the practitioners have a bachelor degree.

Table 1: Demographic background of the practitioners

	Frequency	**Percentage**
Type of company		
Quantity Surveyor	10	8.2
Civil Engineering	83	68.0
Architecture	10	8.2
Others	19	15.6
Company ownership		
100% Malaysian ownership	118	96.7
Joint venture with foreign company	3	2.5
100% Foreign ownership	1	.8
Position		
Quantity Surveyor	15	12.3
Civil Engineer	76	62.3
Architecture	15	12.3
Others	16	13.1

Table 1: Continued

	Frequency	Percentage
Working experience		
Less than 5 years	40	32.8
5-10 years	27	22.1
More than 10 years	55	45.1
Education level		
Diploma	9	7.4
Bachelor's degree	99	81.1
Others	14	11.5
Total	122	100.0

As shown in Table 2, the high value of 0.847 for the Kaiser-Meyer-Olkin Measure of Sampling Adequacy and the low p-value of 0.00 in Bartlett's test for sphericity indicate that the analysis is significant for subsequent factor analysis. The factor analysis using Varimax with Kaiser Normalisation method, was able to generate eight KM areas as shown in Table 3. Furthermore, in order to ensure that the data was statistically reliable and valid, the internal consistency method was employed using Cronbach alpha reliability coefficient. Based on Table 3, the Cronbach alpha values for the components range from 0.757 to 0.923 thus implying that the data is very statistically significant (Nunally, 1978).

Table 2: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.847
Bartlett's Test of Sphericity	Approx. Chi-Square	3256.991
	df	1081
	Sig.	.000

Table 3: KM areas, its components and reliability coefficients

No	KM Area	Component	Reliability Coefficient
I	Organisation and People	1. Availability of design for mantainability to measure project performances. 2. Management of planning for startup to ease collaboration work of projects or teams that are physically separated (i.e., different work sites. 3. Availability of formal and informal training to keep employees' skills current. 4. Availability of appropriate tools to measure productivity measurement. 5. Sufficiency of resources to ensure multiskilling of employees at the project level. 6. Identification of barriers for implementation of project team. 7. Implementation of appropriate strategies for leader selection for every project. 8. Implementation of comprehensive partnership training program. 9. Management of the organisational work structure at the project level. 10. Implementation of quality management at the project level. 11. Identification of barriers to the implementation of products and services based on planning and design. 12. Utilisation of appropriate strategies and experiences to determine benchmark.	0.923
II	Construction	13. Implementation of cost effective engineering for every aspect in project design. 14. Implementation of material management at project level. 15. Comprehensive material management training program. 16. Measurement of material management cost and benefits. 17. Control of cost and schedule based on the master plan. 18. Appropriate actions taken based on the cost and schedule control for every project. 19. Implementation of risk management at the project level. 20. Regular updating of database of good work practices for risk management, lessons learned and listing of experts.	0.878

Table 3: Continued

No	KM Area	Component	Reliability Coefficient
III	Project Control	21. Use of modularization and pre-assembly as a tool at project level. 22. Management of workers' compensation based on regional standard. 23. Implementation of systems for change management. 24. Measurement of cost and benefits of work packaging. 25. There is a written process for work packaging implementation within the project.	0.826
IV	Operation Managemen t	26. Implementation of zero accident techniques at the project level. 27. Implementation of design for safety for every project. 28. Automatic identification of barriers/problems for project processes (design, control, crash program, etc.) using information technology (software application: Primavera, Microsoft project, ETABS, SAP2000, etc). 29. Utilisation of electronic commerce is used to increase number of markets (e.g., website, E-mail, etc). 30. Management of fully integrated and automated project using information technology (i.e., database, filing system, sharing data, etc).	0.862
V	Globalisatio n Issues	31. Utilisation of wireless technology for project processes. Wireless technology is implemented for project processes. 32. Implementation of international standards to improve the competitive advantage. 33. Ability to capture employees' knowledge from other sources (i.e., other business enterprises, industrial associations, technical literature, public research institutions including universities and government laboratories). 34. Ability to protect from loss of knowledge due to worker's departures.	0.849
VI	Front-end Planning	35. Implementation of pre-project planning at the corporate and project level. 36. Implementation of early estimating in project planning and risk management.	0.849
VII	Contract	36. Availability of written process for project delivery and contract strategies within the project. 38. Usage of project incentive is implemented at the project level.	0.757

Table 3: Continued

No	KM Area	Component	Reliability Coefficient
VIII	Design and Procurement	39. Availability of design standard for every project. 40. Implementation of design effectiveness at the project level. 41. Availability of computer-aided to design every project. 42. Resources are sufficient to implement material management (e.g. time, computer and people). 43. Availability of specific documentation to support the implementation of material management (e.g. file documents, database, etc.). 44. Resources are sufficient to implement change management (e.g. time, computers, and people). 45. Management of supplier relationship. 46. Sharing and transferring knowledge with clients, customers and suppliers. 47. Ability to adapt products and services to client requirements.	0.780

Subsequently, to enable the KM areas to be ranked in terms of priority, mean and group rank for all areas were calculated whereby each raw score was converted to an index using Terrell's (Terrell, 2000) transformation techniques as follows:

Transformed Score = [(actual raw score – lowest possible raw score)/possible raw score range] x 100

Table 4: Mean and group rank for KM areas

KM Area	N	Transformed Score	Rank
Design and Procurement	122	70.81	1
Construction	122	64.68	2
Front-end Planning	122	62.40	3
Organisation and People	122	61.89	4
Operation Management	122	61.31	5
Contract	122	60.86	6
Project Control	122	58.07	7
Globalisation Issues	122	57.89	8

Based on the data in Table 4, the Malaysian construction consultants tend to use eight KM areas as the tools in construction process and operation. It can be argued that the cultural and behavioral difference can possibly influence the mechanism process and operation in the construction industry. According to Hofstede (1991), there is no such thing as a universal management method or management theory across the globe. Even the word management has different origins and meanings in countries through out the world. Management is not a phenomenon that can be isolated from other processes taking place in the society. In this case, in order to understanding KM areas in Malaysia, there is a need to make construction industry aware that Malaysian construction consulting companies may need to focus on these eight KM areas.

CLASSIFICATION OF KM

To assess the KM types, the overall mean score of the KM questionnaire was used. The respondents whose scores are less than the overall mean score are classified as "exploitive" while those whose scores are equal or greater than the overall mean score are classified as "explorative". Table 5 shows the descriptive statistic for this study.

Table 5: Descriptive statistics

No	KM component	N	Mean
1	Implementation of pre-project planning at the corporate and project level.	122	3.95
2	Implementation of early estimating in project planning and risk management.	122	3.89
3	Use of modularization and pre-assembly as a tool at project level.	122	3.30
4	Availability of design standard for every project.	122	4.07
5	Implementation of design effectiveness at the project level.	122	3.95
6	Implementation of cost effective engineering for every aspect in project design.	122	3.83
7	Availability of computer-aided to design every project.	122	4.20
8	Management of supplier relationship.	122	3.69
9	Sharing and transferring knowledge with clients, customers and suppliers.	122	3.85
10	Implementation of material management at project level.	122	3.63
11	Comprehensive material management training program.	122	3.20
12	Resources are sufficient to implement material management (e.g. time, computer and people).	122	3.59
13	Availability of specific documentation to support the implementation of material management (e.g. file documents, database, etc.).	122	3.80
14	Measurement of material management cost and benefits.	122	3.72
15	Control of cost and schedule based on the master plan.	122	3.76
16	Appropriate actions taken based on the cost and schedule control for every project.	122	3.80
17	Implementation of risk management at the project level.	122	3.36

Table 5: Continued

No	KM component	N	Mean
18	Regular updating of database of good work practices for risk management, lessons learned and listing of experts.	122	3.39
19	Management of workers' compensation based on regional standard.	122	3.29
20	Availability of design for maintainability to measure project performances.	122	3.39
21	Management of planning for startup to ease collaboration work of projects or teams that are physically separated (i.e., different work sites).	122	3.31
22	Availability of formal and informal training to keep employees' skills current.	122	3.55
23	Availability of appropriate tools to measure productivity measurement.	122	3.32
24	Sufficiency of resources to ensure multiskilling of employees at the project level.	122	3.59
25	Identification of barriers for implementation of project team.	122	3.57
26	Implementation of appropriate strategies for leader selection for every project.	122	3.58
27	Implementation of comprehensive partnership training program.	122	3.10
28	Management of the organisational work structure at the project level.	122	3.58
29	Implementation of quality management at the project level.	122	3.64
30	Identification of barriers to the implementation of products and services based on planning and design.	122	3.53
31	Ability to adapt products and services to client requirements.	122	3.71
32	Utilisation of appropriate strategies and experiences to determine benchmark.	122	3.53
33	Implementation of systems for change management.	122	3.38
34	Resources are sufficient to implement change management (e.g. time, computers, and people).	122	3.63
35	Measurement of cost and benefits of work packaging.	122	3.36
36	There is a written process for work packaging implementation within the project.	122	3.29
37	Availability of written process for project delivery and contract strategies within the project.	122	3.58
38	Usage of project incentive is implemented at the project level.	122	3.38
39	Implementation of zero accident techniques at the project level.	122	3.51
40	Implementation of design for safety for every project.	122	3.62
41	Automatic identification of barriers/problems for project processes (design, control, crash program, etc.) using information technology (software application: Primavera, Microsoft project, ETABS, SAP2000, etc).	122	3.48
42	Utilisation of electronic commerce is used to increase number of markets (e.g., website, E-mail, etc).	122	3.21
43	Management of fully integrated and automated project using information technology (i.e., database, filing system, sharing data, etc).	122	3.44
44	Utilisation of wireless technology for project processes. Wireless technology is implemented for project processes.	122	3.04
45	Implementation of international standards to improve the competitive advantage.	122	3.43

Table 5: Continued

No	KM component	N	Mean
46	Ability to capture employees' knowledge from other sources (i.e., other business enterprises, industrial associations, technical literature, public research institutions including universities and government laboratories).	122	3.40
47	Ability to protect from loss of knowledge due to worker's departures.	122	3.39
Overall mean			3.55
Standard deviation			0.25

As illustrated in Table 5, the overall mean and standard deviation of the 47 KM attributes are 3.55 and 0.25 respectively. Upon further analysis, a total of 55 practitioners were classified as "exploitive" and 67 practitioners were classified as "explorative". The results are illustrated as shown in Table 6.

Table 6: KM classification

Exploitive (< 3.55)	Explorative (≥ 3.55)
55 practitioners	67 practitioners
Mean: 3.08	Mean: 3.94
Standard Deviation: 0.39	Standard Deviation: 0.30

Test Between Overall KM Program and KM Types

A one sample T-test was used to determine whether there are differences between overall KM program and KM types (i.e., exploitive and explorative). The one-sample T-test results are presented in Table 6. Based on the mean differences, it is apparent that KM exploitive has a mean below the overall mean of 3.55 as indicated by a mean difference of -0.47327. KM explorative has higher mean than the overall mean as shown by a mean difference of 0.38776. What is more important is that both of exploitive KM and exploitive KM recorded p-values at 0.000 implying that there are significant differences between exploitive KM as well as exploitive KM based on the overall mean. Thus, the null hypothesis that there are no differences between KM types (i.e., exploitive and explorative) and overall KM program is rejected at the 0.05 level of significance.

Table 7: One-sample T-test

KM type	Test Value = 3.55					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Exploitive	-9.104	54	.000	-.47327	-.5775	-.3690
Explorative	10.683	66	.000	.38776	.3153	.4602

RESEARCH QUESTIONNAIRE FOR PROJECT PERFORMANCE

A questionnaire for project performance was developed by considering three aspects i.e., time, cost and quality. These variables are the most commonly used performance indicators in construction industry (Yates, 1993). This study considers how project performance is integrated from three variables thus impact project performance. These three variables have an integrative approach combining KM program. Several authors including Yates (1993); Barrie et al., (1992); Harris and McCaffer, (1995) have discussed the use of time variable to monitor and measure the current progress of construction work. These conclude that measuring time variable can be used to determine the project performance. In addition to time variable, cost variable was citied by several authors as another variable to measure project performance (Barrie et al., 1992; Haris and McCaffer, 1995). The measure of cost variable, as explained by several authors is comparing the actual and budgeted cost and also earlier method of computing can be used. In actual practice this is not easy computed since a lot of data is needed before it can be finally established (Abd Majid, 1997). Any deviation from the budgeted cost can influence the project performance but it must be carefully computed where actual expenditure was more than budget. The result from this computation needs careful examination before arriving at a conclusion. Nevertheless, from the review, cost variable was often used to measure the project performance. Apart from the above, quality variable was also cited from the discussion with the professionals of industry and they believed that this variable can also be used to measure the project performance (Abd Majid, 1997). To investigate project performance, a research framework is presented in Figure 3.

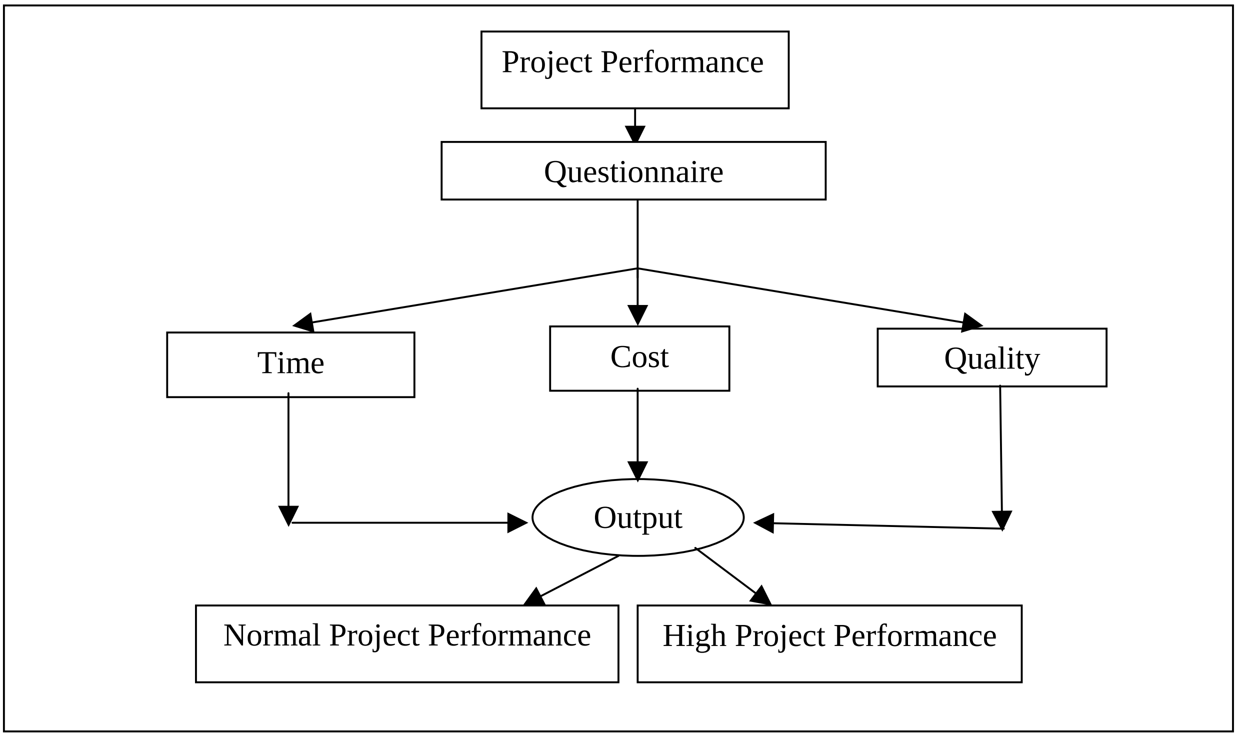

Figure 3: Project performance research framework

As shown in Figure 3, project performance's questionnaire consists of three variables (i.e., time, cost and quality). The results from this questionnaire are then classified into two categories (i.e., "Normal Project Performance" and "High Project Performance").

RESULTS AND DISCUSSION FOR PROJECT PERFORMANCE

Similar to the KM, the project performance questionnaire was conducted to 122 practitioners as a sampling frame (see Table 1). Each item of the questionnaire was then anchored with a five-point Likert scale. As shown in Table 8, the high value of 0.930 for the Kaiser-Meyer-Olkin Measure of Sampling Adequacy and the low p-value of 0.00 in Bartlett's test for sphericity indicate that the analysis is significant for subsequent factor analysis. The factor analysis using Varimax with Kaiser Normalisation method was used to determine statistical validity and was able to generate three Project Performance components as shown in Table 9. Further to this, in order to ensure that the data was statistically reliable and valid, the internal consistency method was employed using reliability coefficient known as the Cronbach's alpha. Based on Table 9, the Cronbach alpha values for the components range from 0.888 to 0.927 implied that the data is very statistically significant (Nunally, 1978).

Table 8: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.930
Bartlett's Test of Sphericity	Approx. Chi-Square	2189.204
	df	253
	Sig.	.000

Table 9: Project performance factors, its components and reliability coefficients

Project Performance component	Cronbach's Alpha
I. Project Organisation 1. Project executors conform to the planned cost schedule for all activities. 2. Project executor maintains all activities within quality parameters. 3. The master plan is regarded as mandatory for all project participants (e.g., contractor, supplier, etc). 4. The master plan clearly indicates who will be responsibility for the various activities in the project. 5. All key participants were involved in the detailed project planning. 6. Project superiors (Top management, Steering Committee, etc) are accessible to the key executors whatever necessary. 7. The project has met its planned quality standard. 8. All experiences gained through this project have been discussed in a special meeting and/or in a final evaluation report. 9. All report documents from this project are or will be compiled in a separate end-of-project report or file.	0.927
II. Project Mission 10. The project has clear and exact goals. 11. The project missions are clearly stated. 12. The goal of the project is accepted by those involved in the project. 13. The project that fulfils its goals, the results will benefit for the end users. 14. Project quality is well defined during its execution. 15. The quality parameters for the project are clearly stated.	0.923

Table 9: Continued

Project Performance component	Cronbach's Alpha
III. Project Estimation 16. The time limit for the project is clearly stated. 17. Project activities are executed in accordance to the time schedule. 18. Project activities are carried out exactly as planned. 19. The financial limit for the project is clearly stated. 20. The project is normally finished on time. 21. The project meetings have well-planned agenda. 22. The final date of project completion is clearly defined. 23. The project is normally completed within budget.	0.888

CLASSIFICATION OF PROJECT PERFORMANCE

To assess the project performance types, the overall mean of the project performance questionnaire is used. The respondents whose scores are less than the mean total score are classified as "Normal Project Performance" and the respondents whose scores are equal or greater than the total mean score are classified as "High Project Performance". Table 10 shows descriptive statistic for this study.

Table 10: Descriptive statistics

No	Project Performance component	N	Mean
1	The time limit for the project is clearly stated.	122	4.16
2	Project activities are executed in accordance to the time schedule.	122	4.03
3	Project activities are carried out exactly as planned.	122	3.78
4	The project is normally finished on time.	122	3.57
5	The project meetings have well-planned agenda.	122	3.83
6	The final date of project completion is clearly defined.	122	4.04
7	The financial limit for the project is clearly stated.	122	3.90
8	Project executors conform to the planned cost schedule for all activities.	122	3.74
9	The project is normally completed within budget.	122	3.52
10	The project has clear and exact goals	122	4.03
11	The project missions are clearly stated.	122	3.92
12	The goal of the project is accepted by those involved in the project.	122	3.75
13	The project that fulfils its goals, the results will benefit for the end users.	122	3.93
14	Project executor maintains all activities within quality parameters.	122	3.76

Table 10: Continued

No	Project Performance component	N	Mean
15	The master plan is regarded as mandatory for all project participants (e.g., contractor, supplier, etc).	122	3.90
16	The master plan clearly indicates who will be responsibility for the various activities in the project.	122	3.84
17	All key participants were involved in the detailed project planning.	122	3.69
18	Project superiors (Top management, Steering Committee, etc) are accessible to the key executors whatever necessary.	122	3.80
19	Project quality is well defined during its execution.	122	3.83
20	The project has met its planned quality standard.	122	3.78
21	The quality parameters for the project are clearly stated.	122	3.84
22	All experiences gained through this project have been discussed in a special meeting and/or in a final evaluation report.	122	3.72
23	All report documents from this project are or will be compiled in a separate end-of-project report or file.	122	3.72
Overall Mean			3.83
Standard Deviation			0.15

As shown in Table 10, the overall mean of the twenty-three project performance attributes is 3.83. Upon further analysis, a total of 55 practitioners were classified as “Normal Project Performance” and 67 practitioners were classified as “High Project Performance”. The results are illustrated as shown in Table 11.

Table 11: Project Performance classification

Normal project performance	High project performance
Total: 55 company	Total: 67 company
Mean: 3.27	Mean: 4.29

Test Between Overall Project Performance and Project Performance Types

A one sample T-test was used to determine whether there is difference between overall project performance program and project performance types (i.e., normal and high). The one-sample T-test results are presented in Table 12. Based on the mean differences, it is apparent that normal project performance has a mean below the overall mean of 3.83 as indicated by a mean difference of -0.56182. High project performance has higher mean than the overall mean as shown by a mean difference of 0.46224. What is more important is that both p-values of normal project performance and high project performance are 0.000 implying there are significant differences between normal project performance as well as high project performance and the overall mean. Thus, the null hypothesis that there is no difference between project performance types (i.e., normal and high) and project performance overall program is rejected at the 0.05 level of significance.

Table 12: One sample T-test for Project Performance

Project Performance Type	**Test Value = 3.83**					
	t	**df**	**Sig. (2-tailed)**	**Mean Difference**	**95% Confidence Interval of the Difference**	
					Lower	**Upper**
Normal	-8.933	54	.000	-.56182	-.6879	-.4357
High	9.914	66	.000	.46224	.3692	.5553

KM AND PROJECT PERFORMANCE MATRIX MODEL

Based on Figure 4, a combination matrix model was developed taking into consideration the classifications of KM and project performance. Upon further scrutiny, the following demarcations were identified:

- Model 1 has 39 practitioners and can be categorised as exploitive KM type and also normal project performance type.
- Model 2 has 16 practitioners and can be classified as explorative KM type and normal project performance type.
- Model 3 can be categorised as explorative KM type and high project performance type and it has 51 practitioners.
- Model 4 has 16 practitioners and it can be categorised as exploitive KM type and also normal project performance type.

Project Performance		
High	**Model 4** • 16 practitioners - *High Project Performance*	**Model 3** • 51 practitioners - *High Project Performance*
Normal	**Model 1** • 39 practitioners - *Normal Project Performance*	**Model 2** • 16 practitioners - *Normal Project Performance*
	Exploitive	***Explorative***

Knowledge Management

Figure 4: KM and Performance matrix model

It is apparent that the perceptions among the practitioners tend to be biased towards Model 1 and Model 3 and only few practitioners to fall into Model 2 and Model 4. Based on this framework, it is concluded that the Malaysian construction consultants prefer to deploy normal project performance to complement exploitative KM type. It means that they prefer to use the general system and normal project performance achievement due to lack of specialised knowledge. In contrast, those who are categorised in Model 3 means that if they want to employ explorative KM type are practitioners who prefer to use specialised knowledge to support their highly technical skills to achieve high project performance.

CONCLUSIONS

This research was able to develop a matrix which identifies significant differences among the two types of KM (exploitive and explorative), the two types of project performance (normal project performance and high project performance) among participants in the Malaysian construction consulting companies. Based on the KM and project performance models, the practitioner's perception tend to be favor Model 1 (exploitive KM type and normal project performance type) and Model 3 (explorative KM type and high project performance type). However, careful interpretation is needed as to whether exploitive or explorative for KM and normal or high project performance are better or not. A company can take these approaches simultaneously but successful companies do not use them to an equal degree, they tend to employ one dominant KM or project performance approach based on the situation they face.

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