Pertanika J. Soc. Sci. & Hum. 25 (S): 341 - 356 (2017)

PERTANIKA JOURNALS

SOCIAL SCIENCES & HUMANITIES

Journal homepage: http://www.pertanika.upm.edu.my/

A Qualitative Content Analysis on Technical Competency for Malaysian Construction Managers

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ABSTRACT

Technical competency of the Construction Manager (TCCM) is paramount for the accomplishment of the Malaysian construction project. Therefore, the authors embarked on a pragmatic research approach to establish the aforementioned competency for various benefits. In this paper, the research investigates the corroborative level of TCCM towards relatively similar competency provision by several indigenous organisations. A qualitative method of content analysis was conducted towards counterpart competency documents by using NVivo V.8 software. Throughout the analysis, the manifested frequency of words coded was recorded, and comprehensive results were gathered and visualised through appropriate tables and figures. In a nutshell, the provision in TCCM has almost exceeded all other relevant technical competency documents, except for document from Organisation B (Project Manager). Validation from industry-academia is needed to highlight this study's contribution to the Malaysian construction project.

Keywords: Construction manager, document analysis, NVivo, technical competency

ARTICLE INFO

Article history:
Received: 15 September 2016
Accepted: 30 January 2017

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INTRODUCTION

Technical competency comprises knowledge and skills relevant for the job (Mansfield, 1996; Yaman, Abdullah, Mohammad, & Hassan, 2015; Mohammad, Hassan, Abd Rashid, & Yaman, 2016a). In order to establish technical competency, a an empirical research was conducted focusing on the job of a construction manager. This is gap in research of this type especially

ISSN: 0128-7702

in reference to the construction manager's technical competency (Yaman et al., 2015; Mohammad et al., 2016a). Issues such as delays, wastages, cost overrun, and subpar quality are common themes in the Malaysian setting. Identifying competency via training and education design is fundamental in producing qualified and well trained construction managers (Yaman et al., 2015; Bakar, 2009; Hassan, Maisham, Khan, Alwi & Ramli, 2010; and Ibrahim, Roy, Ahmed & Imtiaz, 2010).

This study first reviews all relevant literature on construction manager's technical competency (in Mohammad et al., 2016a). Subsequently, a series of semi-structured interviews were conducted to validate all the items in the questionnaire (in Yaman et al., 2015; Mohammad et al., 2016b, 2017). An analysis was conducted based on outliers, normality, dimensionality was directed to ensure data coherences, before a full-fledged statistical analysis.

There were 271 micro items, 33 meso items, and 16 interconnected macro items. Findings from previous researches confirmed the relevance of the items. Construction manager's technical competency (TCCM) covers management aspects, materials, labour, plant/machine, and sub-contractor in addition to ensuring safety, money, quality, time, and environment as well as , administration, pre-construction activities, closeout and handover, and responsibilities to third parties, the main contractor, client, clerk of work, and the design team. Computer and Information Technology are regarded as associated technical competencies for the construction manager. Following this, Figure 1 shows construction manager's technical competency. Hence, this paper will adopt a qualitative approach to analyse qualitative relevant documents related to technical competency (Bowen, 2009).

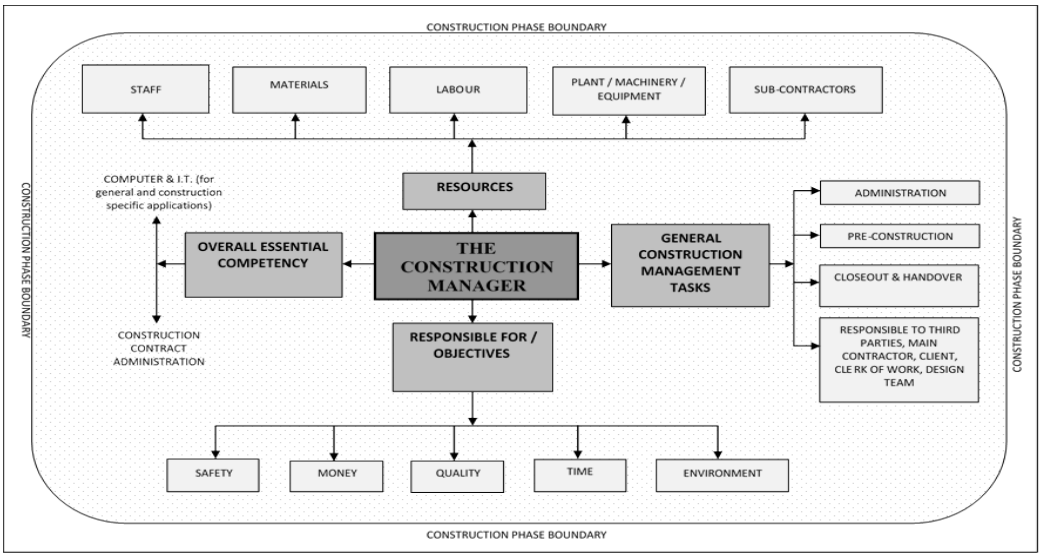

Figure 1. The proposed conceptual framework for Malaysia's construction manager's technical competency (TCCM)

METHODS

The research question for this study is: "What are the corroboration level of research's technical competency of construction manager towards local offerings?" Currently, there are several organisations that have exclusive competency models related to construction project. Most of the models have a complete learning package, either for continuous professional development (CPD), tertiary education, or certification (all with different level of learning outcomes).

Through a qualitative content analysis, both manifest and latent values of texts were scrutinised (Khamis, Suratkon, Mohammad, & Yaman, 2017). Manifest is related to similar texts, while latent is commonly associated with dissimilar texts but with similar meanings. This research shows both values and presents the corroboration outcomes through text coding frequencies. The higher coding frequency demonstrates the concentration of each document.

Critical observation shows human errors on large datasets which is a major hindrance for credible results, especially if using manual analysis (Leech & Onwuegbuzie, 2011). Inconsistency can lead to unreliable outcomes with biased results. Hence, the research tries to minimise potential errors by using software-led approach, through a software called NVivo Ver.8. This particular software gains its reputation as a tool for analysing data which is qualitative in nature, e.g. interviews, photos, documents/texts, and voices (Gibbs, 2002). Further, guided by a series of screening routines (Figure 2), the outcomes are deemed to be exhaustive and produce a less biased analysis. It is expected that the outcomes will present a summary of corroboration levels between

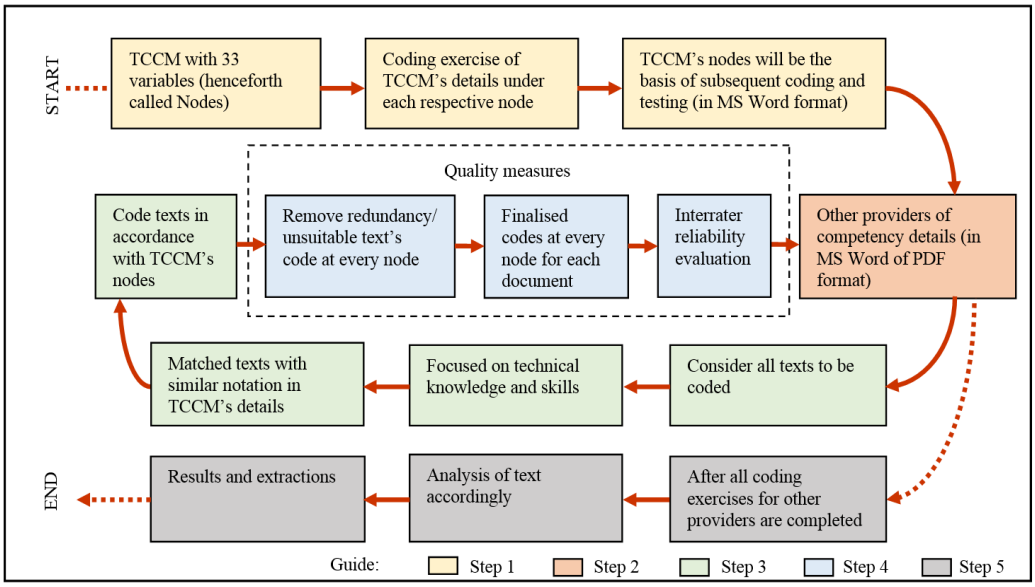

Figure 2. Overall screening processes through NVivo Ver.8

documents and ensure the higher credibility of prior research findings. On the other hand, the results might present useful insights on weaknesses of each document (i.e. through the frequency of coding exercises) (Bowen, 2009; Leech & Onwuegbuzie, 2011; Hsieh & Shannon, 2005).

DATA COLLECTION AND ANALYSIS

This reasearch reviewed works by Gibbs (2002), Richards (2005), Welsh (2002), Grbich (2007), Wiltshier (2011), Leech and Onwuegbuzie (2011), Kariya et al.. (2016), Ariffin, Sulaiman, Mohammad, Yaman, and Yunus (2016), and Khamis. (2017). Therefore, several steps were taken based on the findings: Step 1-TCCM as a baseline document, Step 2-Evaluating other competency documents, Step 3-Screening and coding exercises for other competency documents, Step 4-Quality measures, and Step 5-NVivo analysis and extractions.

Data Collection and Analysis: Step 1-TCCM as a baseline document

Throughout the entire analysis, TCCM is selected as a baseline document. Meso level variables in TCCM (33 items) were designated as nodes in NVivo (Figure 3). This can accommodate any variability. Additionally, nodes will produce more information to corroborate the outcomes. Consequently, nodes are treated as priori themes (Cho & Lee, 2014). Coding exercises on entire texts of TCCM (originally in MS Word format and imported into NVivo) were conducted, where texts (including the 271 micro level items) were coded according to their respective nodes. Since the frequency of texts' coded is paramount, careful consideration is taken where unsuitable texts/words are not coded. Therefore, the amount of suitable texts/words that is being coded for certain nodes will reflect their final percentage (Figure 4). As shown in Figure 4, three nodes of technical competency have more than 5% of words coded (i.e. coverage), namely site management, construction administration, and construction contract, which indirectly highlight the focus of TCCM. Meanwhile, the rest of nodes were recorded having less than 5% of coverage. Afterwards, the predetermined nodes from the TCCM will become a baseline for the successive coding exercises, and their coding frequency will be corroborated with another document's coding frequency.

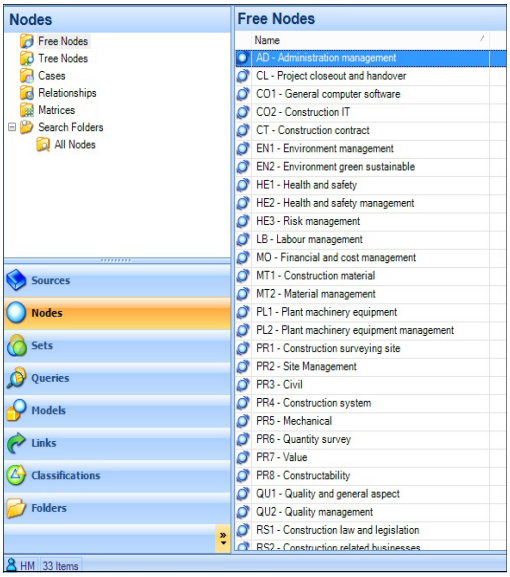

Figure 3. Snapshot of TCCM nodes created into NVivo

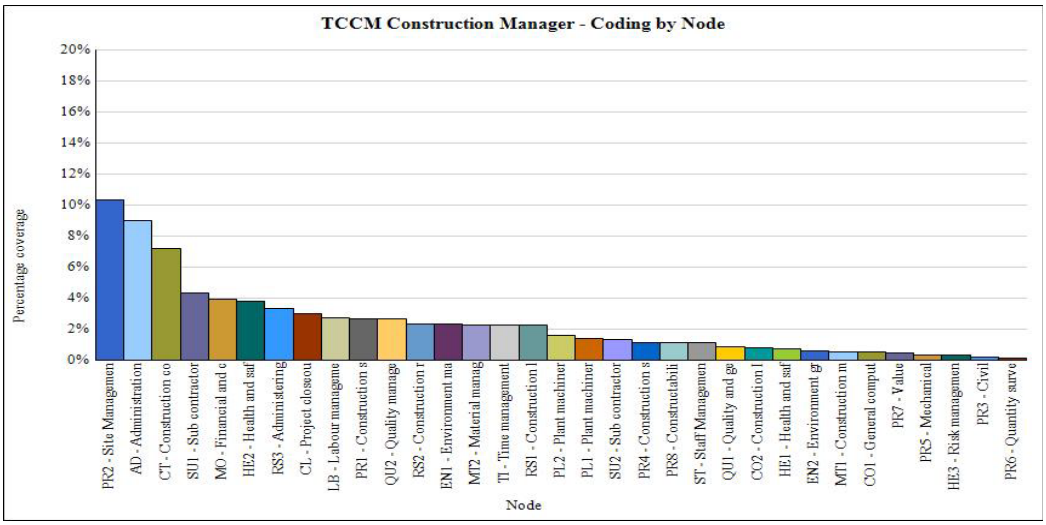

Figure 4. Percentage coverage of TCCM for each node

Data Collection and Analysis: Step 2 - Evaluating other competency documents

First and foremost, the particular documents must be from Malaysia. It is in accordance with the nature of the TCCM which is based on the environment. Then, provisions within the realm of construction project management were taken into account, such as education (e.g. diploma, bachelor degree, CPD, etc.). This is important to show how different levels of education or training influence TCMM.

The next process was to evaluate the document. Unfortunately, based on an understanding, some of these documents were considered private and treated as organisations' undisclosed document. Therefore, the research relied on the positive response from the potential organisations through formal acquirements (e.g. formal letters, formal visits, etc.). Fortuitously, several organisations responded positively and provided their competency documents for educational purposes, which (most of them) in return insisted on having the final findings. A total of four organisations provided their documents: Organisation

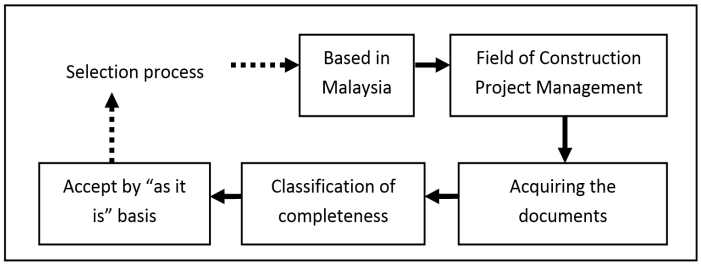

Figure 5. Selection process for other competency documents

A, Organisation B, Organisation C, and Organisation D (names changed). The following table (Table 1) shows their details along with the levels of learnings and the name of the courses.

After that, all documents were categorised according to their completeness. It was observed that only documents from Organisation B and Organisation C were highly comprehensive since differentiation of knowledge and skills was clearly stated (as key elements for competency). Additionally, two documents with similar learning level from Organisation C were taken into account to improve analysis (i.e. Manager (Architectural & Building) and Manager (Civil & Structure)). However, the rest of the documents (which are moderately comprehensive) were still considered in the analysis in order to ensure manifest incongruity and corroborate the test findings. Subsequently, all documents were accepted "as it is" basis without any modifications to preserve their original information.

Table 1
List of participation details

Organisation	Types of Organisation	Level of Learning	Name of Course
A	Vocational institution	Diploma	Construction Manager
B	Construction institution	Continuous Professional Development (CPD)	Project Manager
C	Skills institution	Certification Level 4	Manager (Architectural & Building)
C	Skills institution	Certification Level 4	Manager (Civil & Structure)
D	Higher learning institution	Bachelor Degree	Construction Technology Manager

Data Collection and Analysis: Step 3 - Screening and coding exercises for other competency documents

First, counterpart documents were imported into NVivo in either MS Word or PDF format. It became the internal sources in NVivo and visually screened for their completeness. After that, coding exercises were conducted for each document in sequence by considering all texts and focusing on their technical knowledge and skills. Guided by the predetermined nodes from the TCCM, texts in each document was coded into respective TCCM nodes. The previous coding details of TCCM document were referred to extensively to help and support the new documents' coding activities. Therefore, coding was undertaken for texts that match TCCM's coding details underneath the particular TCCM's nodes.

Data Collection and Analysis: Step 4 - Quality measures

As part of ensuring quality and in order to have clean and concise codes, redundant and unsuitable texts which do not

contribute to meaningful interpretation for each predetermined node was discarded (Research Support Group, Social Science Research Lab, 2011). The move was partly to preserve the latent values within the documents (Cho & Lee, 2014). Each code in every node for all documents was inspected carefully before subsequent analysing processes. At the end of this step, interrater reliability assessment was conducted to identify the reliability of inner coding processes that is either two or more coder will code in a consistent manner (Gwet, 2008; Graham, Milanowski & Miller, 2012; Hallgren, 2012). It is a crucial evaluation in order to verify the reproducibility of coding through previously identified coding steps (Figure 2). Therefore, based on the works of Iacobucci (2001), Gwet (2008), Graham et al. (2012), Freelon (2010), and Hallgren (2012), the research selected a second coder. A senior lecturer in construction was appointed and recruited as a judge's coder. The judge was briefed, familiarised with coding steps towards one document (i.e. Organisation A: Construction Manager) as a sample. The results were in the form of nominal coding presence (i.e. 1 for Yes and 0 for No) in all predetermined nodes between the two coders (i.e. the authors and the judge's coder) (Table 2).

Given the fact that the two coders worked on a single unit of analysis (i.e. coding presence for 33 variables), a classic percentage agreement and Cohen's Kappa were calculated. Percentage agreement between the two coders is defined as consensus estimates towards nominal data to evaluate the agreement of construct's interpretation (Stemler, 2004; Graham , 2012; Freelon, 2010). Meanwhile, Cohen's Kappa is more computationally robust due to the inclusion of mathematical improvements for chance agreement between coders (Freelon, 2010; Stemler, 2004; Iacobucci, 2001; Gwet, 2008; Graham, 2012). The analysis was conducted by using web-based software supplied by Freelon (2010) and was benchmarked through the rule of thumb (Table 3) set by Graham . (2012). The result (Table 4) shows that both interrater reliability assessments surpassed the benchmark. Therefore, it is evident that the coding steps in the research are somewhat reproducible, and thus, the piloted interrater reliability assessment is sufficient without having to assess all documents (Stemler, 2004).

Table 2

Results for coding presence of two coders for Organisation A: Construction Manager

TCCM's nodes	The authors	The judge's coder
1 : AD - Administration management	Yes	Yes
2 : CL - Project closeout and handover	Yes	Yes
3 : CO1 - General computer software	No	No
4 : CO2 - Construction IT	No	No

Table 2 *(continue)*

TCCM's nodes	The authors	The judge's coder
5 : CT - Construction contract	Yes	Yes
6 : EN1 - Environment management	Yes	Yes
7 : EN2 - Environment green sustainable	No	No
8 : HE1 - Health and safety	Yes	Yes
9 : HE2 - Health and safety management	Yes	Yes
10 : HE3 - Risk management	No	No
11 : LB - Labour management	Yes	Yes
12 : MO - Financial and cost management	Yes	Yes
13 : MT1 - Construction material	Yes	Yes
14 : MT2 - Material management	Yes	Yes
15 : PL1 - Plant machinery equipment	Yes	Yes
16 : PL2 - Plant machinery equipment management	Yes	Yes
17 : PR1 - Construction surveying site	Yes	Yes
18 : PR2 - Site Management	Yes	Yes
19 : PR3 – Civil	Yes	Yes
20 : PR4 - Construction system	No	Yes
21 : PR5 – Mechanical	No	No
22 : PR6 - Quantity survey	No	No
23 : PR7 – Value	No	No
24 : PR8 - Constructability	No	No
25 : QU1 - Quality and general aspect	Yes	Yes
26 : QU2 - Quality management	No	Yes
27 : RS1 - Construction law and legislation	No	No
28 : RS2 - Construction related businesses	No	No
29 : RS3 - Administering and assisting	Yes	Yes
30 : ST - Staff Management	Yes	Yes
31 : SU1 - Sub contractor management	Yes	No
32 : SU2 - Sub contractor tendering and bidding	No	No
33 : TI - Time management	Yes	Yes

Table 3

Rule of thumb for interpreting interrater result (Graham, Milanowski, & Miller, 2012)

Interrater agreement methods	Interpretation of results	
	High	Minimum
Percentage agreement	90%	75%
Cohen's Kappa	.81	.61

Table 4

Results from interrater reliability assessment

Assessment	Percent Agreement	Cohen's Kappa	N Agreements	N Disagreements	N Cases	N Decisions
Coders (the authors & the judge's coder)	90.91	0.81	30	3	33	66

Data Collection and Analysis: Step 5 - NVivo analysis and extractions

The last step is analyses the findings. Since the research's objective is to analyse the corroboration level of TCCM towards several competency documents, predetermined nodes from the TCCM becomes the yardstick. The study divides the analysis into several stages (as permitted by NVivo), namely the existence of codes and frequency of words in every node, and the percentage of codes for all nodes (with graphical presentation). The entire analysis was presented in MS Excel format. In Step 1 and Step 3, coding exercises had been undertaken vis a vis TCCM and five (5) other documents respectively. Given that TCCM's nodes encapsulated the coding activities, it is no surprise that TCCM recorded overall existence in the entire nodes (Table 5). On the other hand, dichotomously represented by "Yes" and "No", a clear discrepancy can be seen. Aside from the TCCM, none of the documents scored "Yes" for the entire node, where the closest is Org. B: Project Manager (for 29 nodes) and the least is 20 nodes which belong to Org. A: Construction Manager. Meanwhile, both Org. C documents scored similar frequency of existence (with 26 nodes) but with dissimilar coding frequencies on nodes.

The frequency of words coded for any node signifies its emphasis in a particular document. More words coded for a single node would literally mean more information is available that focus on a particular competency in a document (in this case, a node). For instance, in TCCM, more information for technical competency requirement is observed for Preconstruction – Site Management (PR2). Thus, it is expected that frequency of words coded for PR2 is higher than the other nodes. A complete listing of frequency of words coded for each node can be found in Table 5, where darker blue indicates higher frequency while lighter blue otherwise. As a preliminary observation, Org. A: Construction Manager is concentrated on Civil (PR3), while Org. B: Project Manager on Contract (CT) and Financial and Cost (MO). On the other hand, TCCM's Construction Manager is focused on Administration (AD) and Site Management (PR2), whereas Org. C1: Manager A&B on Administration (AD) and Contract (CT). Its sibling, Org. C2: Manager C&S focuses on Construction Survey (PR1), Site Management (PR2), and Civil (PR3).

Table 5

Existence of code(s) and frequency of words coded in every nodes

Documents / **Nodes**	Org. A: Construction Manager		Org. B: Project Manager		TCCM Construction Manager		Org. C1: Manager A&B		Org. C2: Manager C&S		Org. D: Construction Technology Manager	
1 : AD	Yes	7	Yes	100	Yes	145	Yes	67	Yes	57	Yes	33
2 : CL	Yes	5	Yes	91	Yes	49	Yes	17	Yes	19	No	0
3 : CO1	No	0	No	0	Yes	10	Yes	5	Yes	2	Yes	8
4 : CO2	No	0	Yes	43	Yes	11	Yes	3	No	0	Yes	54
5 : CT	Yes	7	Yes	180	Yes	119	Yes	57	Yes	40	Yes	41
6 : EN1	Yes	6	Yes	78	Yes	43	Yes	13	Yes	6	Yes	20
7 : EN2	No	0	Yes	2	Yes	10	No	0	No	0	Yes	4
8 : HE1	Yes	6	Yes	36	Yes	12	Yes	8	Yes	15	Yes	12
9 : HE2	Yes	6	Yes	75	Yes	71	Yes	28	Yes	14	No	0
10 : HE3	No	0	Yes	55	Yes	5	Yes	4	No	0	Yes	16
11 : LB	Yes	15	Yes	81	Yes	45	Yes	9	Yes	45	Yes	14
12 : MO	Yes	15	Yes	159	Yes	73	Yes	18	Yes	39	Yes	59
13 : MT1	Yes	7	No	0	Yes	10	Yes	23	Yes	1	Yes	22
14 : MT2	Yes	7	Yes	5	Yes	33	Yes	8	Yes	38	Yes	20
15 : PL1	Yes	8	No	0	Yes	20	No	0	Yes	12	Yes	13
16 : PL2	Yes	8	Yes	2	Yes	29	No	0	Yes	40	Yes	14
17 : PR1	Yes	12	Yes	13	Yes	44	Yes	4	Yes	70	Yes	48
18 : PR2	Yes	17	Yes	107	Yes	171	Yes	32	Yes	63	Yes	44
19 : PR3	Yes	148	Yes	4	Yes	4	No	0	Yes	62	Yes	66
20 : PR4	No	0	Yes	26	Yes	16	Yes	6	Yes	26	Yes	29
21 : PR5	No	0	No	0	Yes	6	No	0	No	0	No	0
22 : PR6	No	0	Yes	14	Yes	2	Yes	3	Yes	4	No	0
23 : PR7	No	0	Yes	13	Yes	8	No	0	No	0	No	0
24 : PR8	No	0	Yes	5	Yes	17	No	0	No	0	No	0
25 : QU1	Yes	6	Yes	38	Yes	14	Yes	4	Yes	9	No	0
26 : QU2	No	0	Yes	47	Yes	52	Yes	16	Yes	24	No	0
27 : RS1	No	0	Yes	75	Yes	39	Yes	15	Yes	32	Yes	38
28 : RS2	No	0	Yes	40	Yes	40	Yes	2	Yes	9	Yes	63
29 : RS3	Yes	3	Yes	64	Yes	64	Yes	11	Yes	21	No	0
30 : ST	Yes	15	Yes	65	Yes	17	Yes	9	Yes	44	Yes	14
31 : SU1	Yes	8	Yes	10	Yes	69	Yes	16	Yes	23	No	0
32 : SU2	No	0	Yes	22	Yes	24	Yes	28	No	0	No	0
33 : TI	Yes	9	Yes	39	Yes	39	Yes	13	Yes	12	No	0
Frequency of "Yes" out of 33 nodes	**20**		**29**		**33**		**26**		**26**		**21**	
Frequency of words coded	**315**		**1489**		**1311**		**419**		**727**		**632**	

Last but not least, Construction IT (CO2), Financial & Cost (MO), Civil (PR3), and Construction Businesses (RS2) are central for Org. D: Construction Technology Manager. Meanwhile, the highest total frequency of words coded is dominated by Org. B: Project Manager (1489 nos.), followed by TCCM's Construction Manager (1311 nos.). The least is Org. A: Construction Manager with only 315 nos.

Figure 6 shows the majority of the documents recorded different percentages on each node. However, the percentage for most of the nodes were concentrated within 0% to 10% (Figure 6). Only a handful of codes fell within 10% to 20%. However, an obvious outlier can be spotted under column number 1, which is from Org. A: Construction Manager for Civil (node: PR3). Recording 46.98%, it is the highest percentage among other codes' percentage for any given documents. On the other hand, when every percentage in each node was accumulated horizontally (by row) where its focus was on predetermined nodes, corroboration with TCCM can be made. Figure 7 highlights disparities. As the TCCM was the point of reference (through the black line), the only prominent document that frequently exceeded the TCCM (in term of nodes' percentage) is Org. B: Project Manager. Meanwhile, the rest of the documents generally showed lower percentages, with only a minority of nodes marginally surpassed TCCM's for several specific documents. Table 6 shows the accumulated percentages of horizontal nodes (each row of nodes' total percentage is 100%). It represents only the highest percentage of achievers for each node across all documents, where columns illustrate specific document's focus and total achievement for highest percentage. Org. B and TCCM show similar focus, albeit Org. B have an upper hand in the area of Safety and Health (i.e. HE1, HE2,

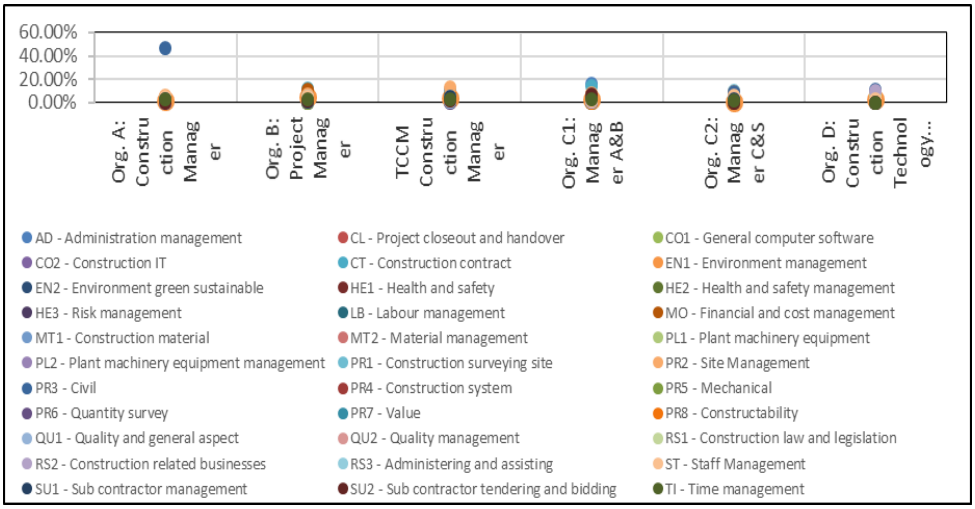

Figure 6. Vertical percentage intensities of codes on each node for every document

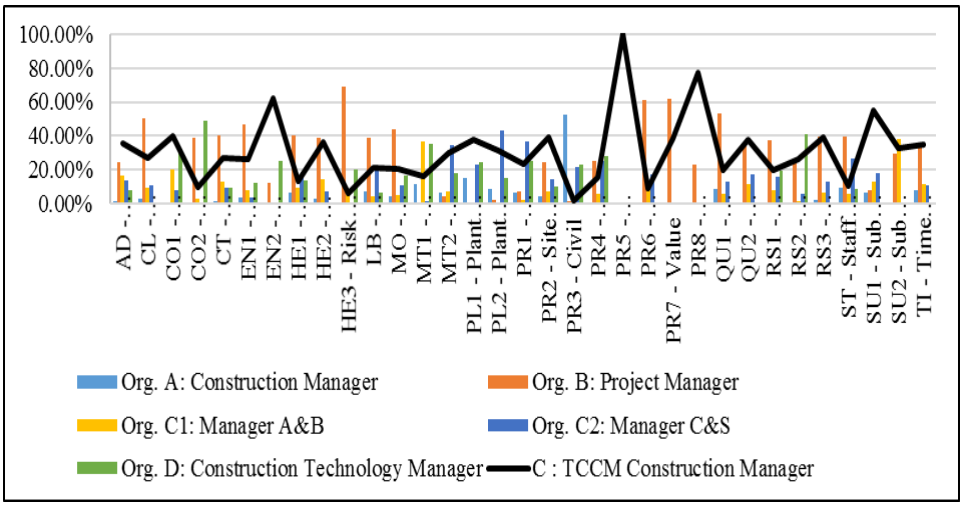

Figure 7. Horizontal percentage of each node for different document (benchmarking TCCM)

& HE3). Meanwhile, documents from Org. C and Org. D show focus in less than four nodes. The least is a document from Org. A, which exhibits the highest focus on a single node (i.e. PR3: Civil). On the other hand, a total achievement of 15 nodes from Org. B: Project Manager has taken the lead and followed closely by the TCCM. Other documents have no more than three nodes with different priorities of technical competency.

Table 6

Highest percentage achievers for each node

Documents / **Nodes**	Org. A: Construction Manager	Org. B: Project Manager	TCCM Construction Manager	Org. C1: Manager A&B	Org. C2: Manager C&S	Org. D: Construction Technology Manager
1 : AD			35.45%			
2 : CL		50.28%				
3 : CO1			40%			
4 : CO2						48.65%
5 : CT		40.54%				
6 : EN1		46.99%				
7 : EN2			62.50%			
8 : HE1		40.45%				
9 : HE2		38.66%				
10 : HE3		68.75%				

Table 6 *(continue)*

Documents / Nodes	Org. A: Construction Manager	Org. B: Project Manager	TCCM Construction Manager	Org. C1: Manager A&B	Org. C2: Manager C&S	Org. D: Construction Technology Manager
11 : LB		38.76%				
12 : MO		43.80%				
13 : MT1				36.51%		
14 : MT2					34.23%	
15 : PL1			37.74%			
16 : PL2					43.01%	
17 : PR1					36.65%	
18 : PR2			39.40%			
19 : PR3	52.11%					
20 : PR4						28.16%
21 : PR5			100%			
22 : PR6		60.87%				
23 : PR7		61.90%				
24 : PR8			77.27%			
25 : QU1		53.52%				
26 : QU2			37.41%			
27 : RS1		37.69%				
28 : RS2						40.91%
29 : RS3		39.26%	39.26%			
30 : ST		39.63%				
31 : SU1			54.76%			
32 : SU2				37.84%		
33 : TI		34.82%	34.82%			
Total achievement for highest percentage	**1**	**15**	**11**	**2**	**3**	**3**

CONCLUSION AND WAY FORWARD

The TCCM has been verified using several technical competencies obtained from construction companies. Documents pertaining to the competency with different levels of learning were analysed against the authors' TCCM (Table 1). Step 1 shows that Item PR2 (Site Management) had the highest concentration in TCCM (Figure 4), with slightly above than 10% of coverage. This circumstance is not unusual given that most of the activities in the construction sector take place at the construction site (Yaman et al., 2015;

Mohammad , 2016a). The rest of the items recorded lower than 10% coverage). In the second step, other competency documents from local organisations were obtained (Table 1). Although it showed different levels of learning, and some of it was not dedicated to construction manager's technical competency, they were regarded as valuable to the present research showing deeper appreciation of the issue being discussed. Subsequently, coding exercises relating to those documents were undertaken (as in Step 3). Step 4 shows the importance of quality undertaking to be embedded into the process. Interrater reliability assessments were conducted, which eventually gave satisfactory results (Table 4). Finally, the analysis concluded with Step 5 which outlined the corroborative result of TCCM against its counterparts. Detailed results are shown in Step 5.

Gaps can be found across other organisations' competency documents (Table 5). Some of the documents showed quite significant gaps especially for Org. A: Construction Manager and Org. D: Construction Technology Manager. Additionally, the frequency of "Yes" was detached from the frequency of words coded. For example, although TCCM reported the highest number of "Yes", their recorded number of words coded was less than Org B: Project Manager. The same goes for several other documents. Furthermore, throughout the particular subchapters (i.e. Step 5), a series of percentage analysis showed differences in gaps. In Figure 5, an obvious outlier can be seen for Org A: Construction Manager, specifically for civil engineering area. As opposed to the rest of documents, average intensities were recorded at lower than 20%. Meanwhile, as corroboration is concerned, Figure 6 visualised fluctuation of percentages which further emphasised each document's focus in Table 6. In a nutshell, the test concluded that the TCCM exceeded almost all other technical competencies, except for Org. B: Project Manager's competency, where frequent gaps can be observed on TCCM as shown Figure 7 and Table 6.

As a context, levels of learning and courses played a role. For Diploma and Certification (Level 4), lower percentages of words coded were reported. It was perhaps due to the learning time frame which was translated into lesser words in their respective documents. Document completeness was conceivably transcended through Org. D: Construction Technology Manager. A Bachelor's Degree would take a considerably longer learning time frame, thus comprehensive competency document was expected. On the other hand, a document from Org. B: Project Manager scored much higher percentage among its counterparts. However, the authors agreed that the circumstance was fairly due to the scope of works on behalf of the Project Manager, where basically their involvement in construction project started earlier than the Construction Manager. Finally, the authors noted several documents such as from Org. A and Org. C showed little connection between their title and content.

As a conclusion, it is evident that TCCM corroborates positively with the research samples. This research filled the gap in literature on this topic. Nevertheless, the authors emphasise that overall results need to be further validated by industry and academic experts in order to appreciate its values and possible contribution to the Malaysian construction industry.

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