



Challenges in Education and Training to Develop Malaysian Construction Workforce

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Abstract: Education and training have been central to the development of the Malaysian construction workforce. Notwithstanding the various initiatives introduced to promote education and training, critics are arguing that these have been ineffective. This paper critically reviews the phenomenon and identifies the causal factors. Throughout three key areas; (i) the context of the industry, (ii) the education and training provisions offered, and (iii) the challenges, meta-data analysis of literature was undertaken grounded on the concepts of strategic management ecosystems. Since it is crucial to ties several variable clusters in order to reach a comprehensive finding, the analysis was helped by the multi-layered thematic processes. The findings show that nine key factors at the construction industry level (external ecosystem), and two key factors in the education and training provisions (internal ecosystem) that are interrelated to each other have significantly affected the effectiveness of the education and training to develop the Malaysian construction workforce. These factors need to be addressed in a holistic and integrated manner to improve the predicament which resides in a public strategic management field. Aside from the context-centric findings, the paper posits for subsequent empirical exploration as validation is of concerned. However, it may open up education and training literature to recognised possible multidisciplinary research, education, and practice while addressing challenges such as law, government policy, and standards' development.

Keywords: Construction, workforce, education and training, challenges, Malaysia

1. Introduction

Education and training have been recognised as key enablers for the Malaysian construction industry to improve the performance of the construction workforce. This has necessitated the industry's education and training providers to improve and expand the provisions. However, many of the education and training provisions mooted have fallen short of the expectation and have become a pressing challenge. This phenomenon has become prevalent when there is lacking in reference to discussing the issue from several perspectives.

Therefore, this paper reviews the development of the initiatives to improve the construction workforce through education and training, and synthesises the challenges that exist at the industry level (external ecosystem) and within the education and training provisions (internal ecosystem) to gain insights into the phenomenon. The findings identified

significant interrelated factors that have contributed to ineffective education and training. It is expected that the outcome of this review will shed light on the relevant understanding and pave a significant initiative on behalf of the construction industry players. Nevertheless, the immediate way forward to improve is to re-learn these factors holistically.

2. The Construction Industry Scenario

It is a common belief in the Malaysian construction industry that training is essential if the performance improvement of the construction workforce is to be achieved. This emanates from the conviction that training lies at the core of creating, maintaining, and developing the construction workforce, who contribute significantly to the achievement of construction projects. This is set within an industry that is challenged to change with the opening of the ASEAN construction market, and the introduction of new laws and standards (CIDB, 2007). This was exacerbated further by the growing trend to privatise public projects by the Malaysian government (UKAS, 2016). Collectively, these factors are influencing the choice of technologies and construction processes that have resulted in the increasing demand for faster construction time, better quality, within budget, and value for the projects. Human Resources (2016) reports that it has not been easy to provide effective training to the fragmented construction workforce, and this covers over 67,000 contractors, and a few thousand clients and consultant organisations (Construction Monitor, 2015). Together, they collectively undertake a multitude of construction projects, ranging from small repair and maintenance works to billion dollar specialist process plant and infrastructure projects.

At its best, the Malaysian construction industry has been successfully exemplified through several mega projects, amongst others were the Petronas Twin-Towers and Kuala Lumpur International Airport (KLIA) building, the North-South and East-West highways, the Mass Rapid Transit (MRT), and the Forest City projects. However, as a whole, the performance of the industry was found to be disappointing and under-achieving. It has consistently been one of the lowest productive sectors of the economy, contributing only an average of 3 - 4% of the Gross Domestic Product (GDP) (CIDB, 2014; MBAM, 2016). It has also been the industry that has the highest number of continuing complaints which span across a multitude of issues (Murali and Soon, 2007; MBAM, 2011; Hassan et al., 2011; CITP, 2015; Mohammad et al., 2016; Abdullah et al., 2018). This ranges from problems of quality, application of low technology, completion of the project on time, cost overruns, accidents and health issues, over-reliance on unskilled foreign labour, environmental problems, to problems of claims, payments, and disputes.

2.1 Reforming the Industry

The need to establish a central body to manage the industry saw the establishment of the Construction Industry Development Board (CIDB) in 1996. Tasked with the responsibility to lead the industry's reformation, the Construction Industry Master Plan (CIMP 2006-2015) was launched and led by the CIDB. Issues to address the problems of the poor performance of the construction workforce were the central agenda of the CIMP. This was emphasised in three (3) out of seven (7) CIMP's strategic thrusts; (1) Strategic Thrust 1: Integrate the construction industry value chain to enhance productivity and efficiency, (2) Strategic Thrust 3: Strive for the highest standard of quality, occupational safety and health, and environmental practices, and (3) Strategic Thrust 4: Develop human resources capabilities and capacities in the construction industry.

Notwithstanding, the poor performance of the construction workforce is unrelenting, and failings of the industry are repeatedly being reported. Recognising the need for the industry to continue to improve and reform, an extension of the CIMP named the Construction Industry Transformation Programme (CITP) 2016-2020 was launched in 2015 (CITP, 2015). Again, continued development of the construction workforce was re-emphasised in two (2) of the four (4) CITP's strategic thrusts; (1) Strategic Thrust 1: Quality, Safety and Professionalism, and (2) Strategic Thrust 3: Productivity.

3. The Construction Workforce

The Malaysian construction workforce can generally be grouped into three main levels. These are; (1) trade level - for construction operatives who carry out the work of trades at the construction site for the contractors, (2) supervisory level - for construction personnel who are tasked to supervise the construction works for contractors, consultants, and/or clients, and (3) managerial level - for construction personnel who are tasked to manage the construction work for contractors, consultants, and clients (Mohammad, 2018).

One of the Malaysian workforce's major issues is the reliance on the foreign workforce. It is real and serious, which repetitively highlighted in the Malaysian construction industry reform programs (CIDB, 2007; CIDB, 2015). Ismail and Yuliyusman (2014) report the construction industry will struggle if the government implement the policy of not to renew the existing construction workers' permits. Tee (2016) warns that the construction industry will be short of over 1.3 million construction workers if the government freezes the intake of foreign workers for the construction industry. Since the influx of foreign construction workers in early 1980s, the number of Malaysians working in the construction sector at the workers and craft/trade level have critically diminished and replaced with imported cheap and unskilled workers/tradesmen (Goh et al., 2015). CIDB (in Malaysiakini, 2016) reports that 93 per cent of registered

foreign workers in the construction sector is unskilled. They come from neighbouring countries such as Indonesia, Thailand, Philippines, Vietnam, Nepal, Pakistan, and Bangladesh. They possess very little construction training and can work only in traditional labour-intensive construction projects.

As a consequence, this has affected the project performance and productivity in construction projects (Umi Kalsom et al., 2010). Their readiness to accept work at low wages make them very attractive for contractors (MTUC, 2002). Construction employers prefer to hire the foreign workers because they are willing to work extra hours, obedient, and willing to accept low wages, but on the contrary requires close and costly supervision at work (Abdul-Aziz, 2001a).

3.1 Workforce Skills and Competency Issues

Hassan et al. (2010), Mohamad et al. (2012), Goh et al. (2015), MBAM (2016), and Abdullah et al. (2018) are consistent in reporting the problems of skill gap that spans across different professions of the workforce. They reported that most of the workforce operating at the workers/trade level lacks the basic trade skills, while the supervisory level lacks the technical and practical skills, and those at the managerial level lacks the management and team working skills. The gap between the skills of the workforce in Malaysia and those in developed Asian countries such as Japan, South Korea, and Singapore has become more obvious. In these countries, policies for the adoption of the only skilled workforce are more stringent with more pre-fabricated construction resulting in less demand for unskilled workforce.

Conversely, the Malaysian construction industry has continued to be dependent on cheap unskilled imported labour with very little formal qualifications and training. Most of the construction organisations are not keen to invest in developing their employees, for the fear they may leave for better offers after being trained. Their common response has been to increase the remuneration and poaching of workers/trade from others. This has invariably contributed to the rise in the cost of construction. In many instances, in the face of inadequate supply, projects have had to make do with the inferior workforce.

The culmination of the problems necessitates the industry to source from new recruitments and train them quickly to address the demand for more well-trained and skilled workers/trade, thus to overcome the over-reliance on foreign labour. The bulk of these recruits are critical at the craft and operative level, followed by supervisory and managerial personnel who are forming the top tier of the industry (Sarajul Fikri, 2012; Goh et al., 2015). To circumvent this problem, strategies have been undertaken to reduce the dependency on foreign workers. This includes, amongst others the initiative to promote the use of new technology and prefabrication, tightening the requirements for work permits, increased the levy on foreign workers according to their job sector, not extending the work permits for unskilled foreign labour that have been in the country for over five years, and granting amnesty to illegal foreign workers to return to their own countries without facing legal action (Affandi et al., 2012). However, the changes introduced have been very slow in taking positive effect.

4. The Construction Workforce

Education within the Malaysian construction industry is designed to complement the national education and training frameworks, which aims to provide academic and development opportunities for the benefit of individuals and the industry. Likewise, the training provisions offered to people in construction are designed to promote opportunities for competency on the job and continuing professional development (CPD) for personal development throughout one's career life (Mohamad et al., 2012). The education and training provisions offered to the construction workforce are embraced within these three structures; (1) vocational, (2) academic, and (3) professional education (Posiah, 2014). Vocational education and training are related to the development of the construction workforce at the workers/trade level, meanwhile the academic education and training are related to the development of the workforce at the supervisory and managerial level, and finally the professional education and training are targeted predominantly to the development of the workforce at the managerial level.

4.1 The Education Provision

Formal vocational education is provided by vocational colleges, technical institutes, and community colleges. Meanwhile, the managerial level construction workforce education is mostly provided by tertiary education provided by polytechnics and universities (Abdul Aziz et al., 2008). The vocational education structure was established through the National Vocational Training Council, NVTC (MLVK, 2005). Their training curriculums are developed in collaboration with the Department of Skills Development (DSD) along with a five-tier National Occupational Skills Standard (NOSS). NOSS specifies the stages of competencies expected of the skilled worker. Level 1 and 2 are focused on education at the operative level, Levels 3 at the supervisory level, Level 4 at the executive level, and Level 5 at the managerial level (DSD, 2012). CIDB also offers similar construction education courses based on NOSS through their training academy, Malaysian Construction Academy (ABM).

The academic structures within the Malaysian construction industry are related to entrants passing the pre-university or equivalent examinations, where they are recognised for entry into a construction-related degree programme offered by universities. The institutions of higher education such as polytechnics and universities primarily

offer the academic construction education at the upper supervisory and management levels (Affandi et al., 2012; Mustaffa Kamal et al., 2013). A wide range of built environment and construction-related programmes of study exists through accredited honours degree courses leading to corporate membership of professional industry bodies. The programmes include; architecture, interior design, town planning, landscape architecture, quantity surveying, surveying and geometric science, project management, construction management, park and amenities management, and estate and property management. Thus, to ensure their relevance, those programmes are designed based on the educational and professional frameworks suggested by the local and international professional institutions. It is also a standard of practice for the programmes to be reviewed by representatives of the professional institutions every 3 to 5 years, and accreditation will be given to a programme that satisfies the outlined quality standards.

4.2 The Training Provision

Training within the industry, which is mostly craft/trades training, are conducted through “informal apprentice training” where the trainee undergoes training while working under the supervision of a supervisor or foreman with no official certificate conferred. Whereby, formal construction training is training which confers certificates of participation. Some of the training certifications are recognised by academic institutions and professional organisations. A wide range of training is available at the craft, supervisory, and managerial level. These are offered through; (i) company in-house, and (ii) industry level training. Company in-house training varies from specially designed or bespoke construction training to generic industry-recognised training. A big spectrum of the training is available which ranges from awareness to competency training of trade/craft, supervisory or management training.

Formal professional education/training and CPD are also provided by the CIDB and other professional institutions. The professional institutions and associations include the Chartered Institute of Building (CIOB) and Association of Certified Project Managers (ACPM) which governs the construction and project management profession. Meanwhile, Board of Engineers (BOE) Malaysia, Malaysian Board of Architects (BOA), Malaysian Institute of Architects (PAM), and Malaysian Institute of Interior Designers (MSID) governs the architectural and interior design’s profession. On the other hand, the Malaysian Board of Quantity Surveying (BOQS) and the Royal Institution of Surveyors Malaysia (RISM) governs the quantity surveying’s profession. Apart, the Institute of Landscape Architects Malaysia (ILAM) governs the landscape architecture’s profession, and last but not least the Malaysian Institute of Planners (MIP) which governs the town and country planning’s profession. In addition, many construction companies through in-house structured programmes have provided job-related training and individual CPD, or in partnership with the training, education, and CPD providers.

4.3 Strengthening the Construction Workforce Education and Training Provision

To strengthen the provision of the construction workforce’s education and training, the CIDB Act (Amended 2011) has introduced the requirement for mandatory accreditation and certification of construction personnel, which covers semi-skilled and skilled workers/trade, site supervisors, and project managers (Sariah et al., 2014).

CIDB has remained the main provider of construction workforce training at trade, supervisory, and managerial levels. This has been operated through their six training centres known as the Malaysian Construction Academy (ABM) and supported by 40 private training centres which spread nationwide. The training at ABM is focused on producing well trained and skilled tradespeople, mapped against the National Occupational Skills Standards (NOSS). NOSS is defined as the specification of the competency expected of a skilled worker or professional who is gainfully employed in Malaysia for certain occupational area and competency level as required by the industries. The participant will be awarded the qualification certificate after their training. While most of the trades training, supervisory training, and some of the managerial training are provided by the CIDB, training at the managerial levels is evident through company in-house training and continuing professional development (CPD) training offered by professional institutions in the built environment.

To encourage more participation in the training offered, CIDB has introduced several strategies. This includes making attendance to training a requirement for contractors to renew their licence, providing more construction-related training courses, establishing partnership training arrangements with the industry stakeholders, encouraging training organisations to conduct their training, and the introduction of the Construction Continuing Development (CCD) scheme (Hassan et al., 2011).

4.4 National Dual Training System (NDTS)

A notable attempt made by the construction industry to integrate education and training was noted by the NDTS program (Zaki et al., 2012). Introduced with the aim to resolve issues of skill education and training that were not meeting the needs of the industry, NDTS was an integrated education cum apprentice scheme based on NOSS. The program involves the collaboration of the Department of Skills and Development (DSD), training institutes, and companies. It involves two years of training where 20-30 per cent of the learning was provided through a combination of lectures, tutorials, and work assignments, and mostly held at training institutes before progressing to on-the-job learning in the companies. An ambitious target to produce 31,500 skilled trainees in 2010 was set (Tomiran, 2010). The

program, however, lost momentum after running for a few years and needs pertinent restructuring because of poor response from the employers (among others) (Tomiran, 2010).

5. The Methodology of the Paper

As according to the previous discussions, it is observed that the construction industry's education and training in Malaysia are heavily dependent on the initiatives from the public sector. Therefore, the fundamental question of "what are the factors that challenge the effectiveness of the construction's education and training" is indeed needed to be conceptualised from those. Due to that, it is pertinent to encapsulate the perspective of public strategic management accordingly. Additionally, to aid the understanding of the relationships that exist between the challenges factors, the views of Freeman (1984), Porter (1990), and Moore (2006) suggest that public strategic management implementation can be conceived, where external and internal ecosystems models were adopted. Thus, the challenges found at the industry level were grouped as external ecosystem (macro) factors, and challenges that exist within the education and training provisions are grouped as the internal ecosystem (micro) factors. The move was inevitable due to education development globally is driven by public policy, especially in Malaysia. It has presented that external ecosystem and internal ecosystem were mutually exclusive, and is repeatedly occurs in literature alike - a cascaded move from top to bottom management (Bolotin, 1989).

Moreover, in the context of the market-driven construction industry, education is perceived to be very technical and managerial. While at the same time, demands for the socio-economic aspect to be emphasised, which regards to more economic principle (macro and micro) to influence the narrative of education development and its perceived challenges (Briscoe, 1988; Leibig, 2001; Myer, 2004; Osman, 2008). Furthermore, the New Public Management movement in government sector had influenced the paradigm in formulating and implementing governance within a particular mode, instrumentation, and tool in strategising educational policies, which indirectly affected the macro and micro factors (McLaughlin et al., 2002; Lynn, 2006; Howlet, 2011).

To aid the qualitative exploration, a multi-layered thematic (MLT) process is embedded and helped by the usage of ATLAS.ti software. In the MLT, several layers of themes were constructed, which happen to ease the analysis (Creswell, 2008, Kariya et al., 2016; Abdullah et al., 2018). From Figure 1, the first layer consists of the collection of past literature that is related to Malaysia's construction industry's education and training. The authors have collected the literature from established journals and proceedings, official reports, and others which are relevant. Then, in order to delve into the phenomenon, Layer 2 will perform as a screening net to reduce the number of literature and focus on several themes including the issues and challenges of the Malaysian construction workforce which has been discussed in topic 3 (the construction workforce) and topic 4 (construction workforce education and training). Afterwards, Layer 3 will be executed to group any similar keywords to form preliminary causes. This layer has its continuous loop to the start of the MLT process for sieving each literature. Subsequently, the outcome will be clustered according to their meanings and relevance to produce themes in Layer 4. Here, redundancy of causes for a theme is expected given their interrelated nature between each other.

Nevertheless, the research considers and maintains any previous authors' meaningful clustering efforts in order to streamline the process. Lastly, Layer 5 will determine the relevant ecosystems towards the themes and eventually established their final relationship. Aside from guidance from the previous literature, a determination will be based on its observable impacts either towards the industry or the education and training.

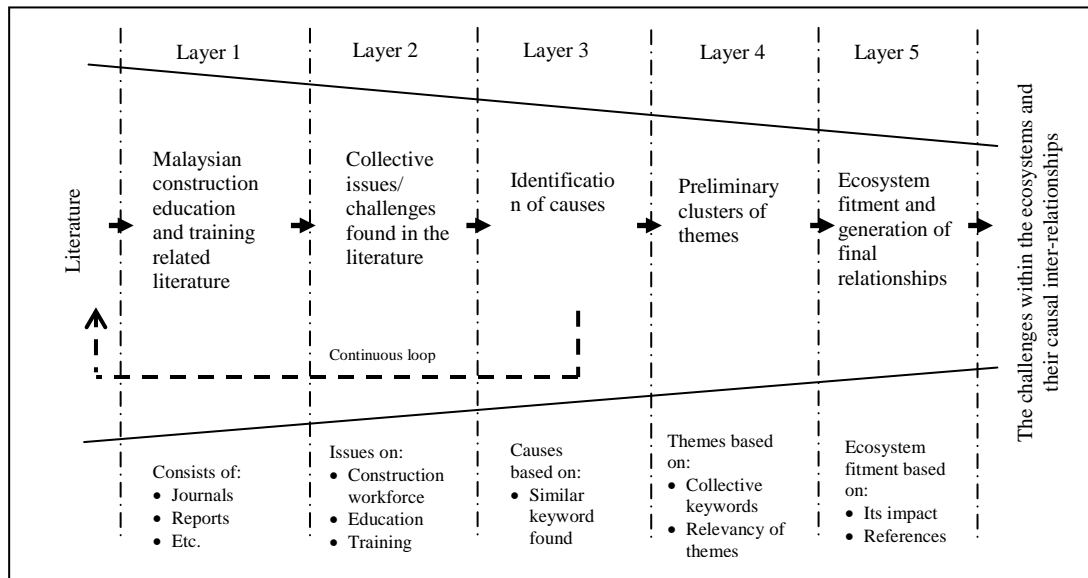


Fig. 1 - Multi-layered thematic (MLT) process with a continuous loop

6. The Results of Challenges

Results from the qualitative thematic analysis found that most of the external and internal ecosystem challenges' factors are mutually exclusive, but their causes were influencing each other, as observed in Table 1. Further, Figure 2 visualised the relationships more simply to ease understanding. It can be observed that themes from the external ecosystem were sharing similar causals (e.g. low wages and reluctance to educate were caused by cheap foreign labour in construction), and there are causes which being promoted as themes since their paramount meanings were detached from other designated themes. Meanwhile, Figure 3 summarises the overall findings of factors within both ecosystems. Nonetheless, discussions on all table and figures will be presented in the following topics.

Table 1 - Literature themes suggesting the challenges within the external and the internal ecosystems and their causal inter-relationships

Ecosystems	Themes and causals of the challenging factors	Authors
The External Ecosystem: The industry level factors	a. Continuing over-dependence on foreign workers: Labour intensive construction; low wages; and diminishing local workforce.	Abdul Rahman et al. (2012), Abdul Aziz (2001b), CIDB (2002), Subramaniam (2011)
	b. Low Wages: Availability of cheap foreign labour; labour intensive construction; and locals are shunning a career in construction (at the craft/trades level).	MTUC (2002), Abdul-Aziz (2001a), Razlina (2015), Sambasivan and Soon (2007), Malaysiakini (2016), Subramaniam (2011), Abd. Rahim et al. (2013), Ramesh Kumar et al. (2012)
	c. Continuing use of labour-intensive construction: Low wages; easy access to cheap foreign labour; widespread subcontracting practices; and availability of cheap foreign labour.	Jaafar et al. (2007), CIDB (2007), Kamarul Anuar et al. (2009), Mydin et al. (2014), CIDB (2006)
	d. Reluctance to educate and train: Too many contractors; easy access to cheap foreign labour; widespread subcontracting practices; and low wages.	Hassan (2009), Hassan et al. (2011), Salleh and Abdul Aziz (2001), Jaafar et al. (2007), Abdul Aziz (2001), Mat Salleh et al. (2016), Zaki et al. (2012)
	e. The 'Dirty, Dangerous, Difficult' image: Labour intensive construction; low wages; and easy access to cheap foreign labour.	The Malay Mail Online (2016), CIDB (2007), Shiadri (2008), Sashitharan et al. (2014), Kamarul Anuar et al. (2010)
	f. Continuous widespread of subcontracting practice: Labour intensive construction; locals are shunning a career in construction (at the craft/trades level); and reluctance to train.	Lew et al. (2012), Nasyrah (2013), Zaki, et al. (2012), Abu Bakar (2015)
	g. Too many contractors:	Department of Statistics (2016),

<p>The Internal Ecosystem: The education and training provisions</p>	<p>An increasing number of contractors.</p>	<p>Choon (2016), Yin (2016), Adnan (2016), Subramaniam (2011)</p>
	<p>h. Poor career opportunities in construction: Easy access to cheap foreign labour; low wages; too many contractors; and widespread subcontracting practice.</p>	<p>Nayaranan & Yew (2010), Hassan et al. (2011), Zaki et al. (2012), Abd. Razak et al. (2010), Mohamad et al. (2012), Mad Kaidi (2011), Abdul Aziz et al. (2008), Shaiadri (2008)</p>
	<p>i. Ageing workforce and disinterest of the younger generation to make construction their career: The local workforce is ageing; and this is worsened by lack of interest among the younger generation.</p>	<p>CIDB (2007, 2015), Norhidayah & Kassim (2012)</p>
	<p>a. Mismatches in the education provisions: Issues on the capabilities of Building Surveying graduates; the lack of project management learning in the architectural, interior design and engineering degree programmes; lack of ethic's learning; inadequacies in QS syllabus; lack of learning sustainability in learning delivery; universities not producing competent engineers; and needs for more trade schools.</p>	<p>Azlan Shah (2013), Mohamad et al. (2015), Hassan (2010), Wan Maimun (2016), Nazirah (2009), MBAM (2011), Yin (2016), Hassan (2013)</p>
	<p>b. Mismatches in the training provisions: Training is minimal or not linking to the job on site; too classroom-based; lack of hands-on training; inadequate project management learning; training disengaged from the actual work; mostly just an awareness training; and lack of practical learning.</p>	<p>Abdul Aziz (2011a), Zaki et al. (2012), Ghazali et al. (2014), Mohamad et al. (2012), Mad Kaidi (2014), Hassan (2011)</p>

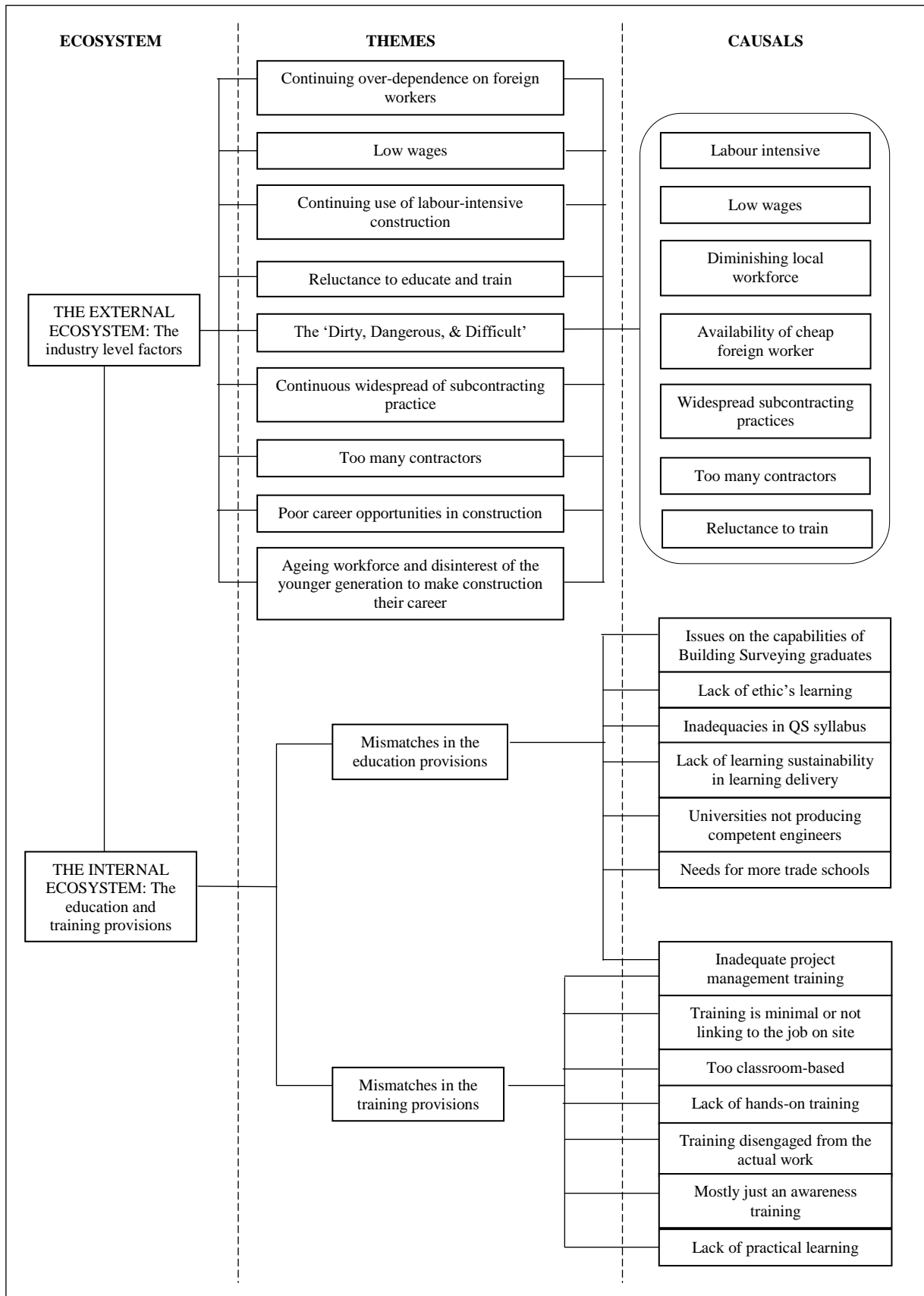


Fig. 2 - Visualisation of the relationships of the ecosystems, themes, and causals

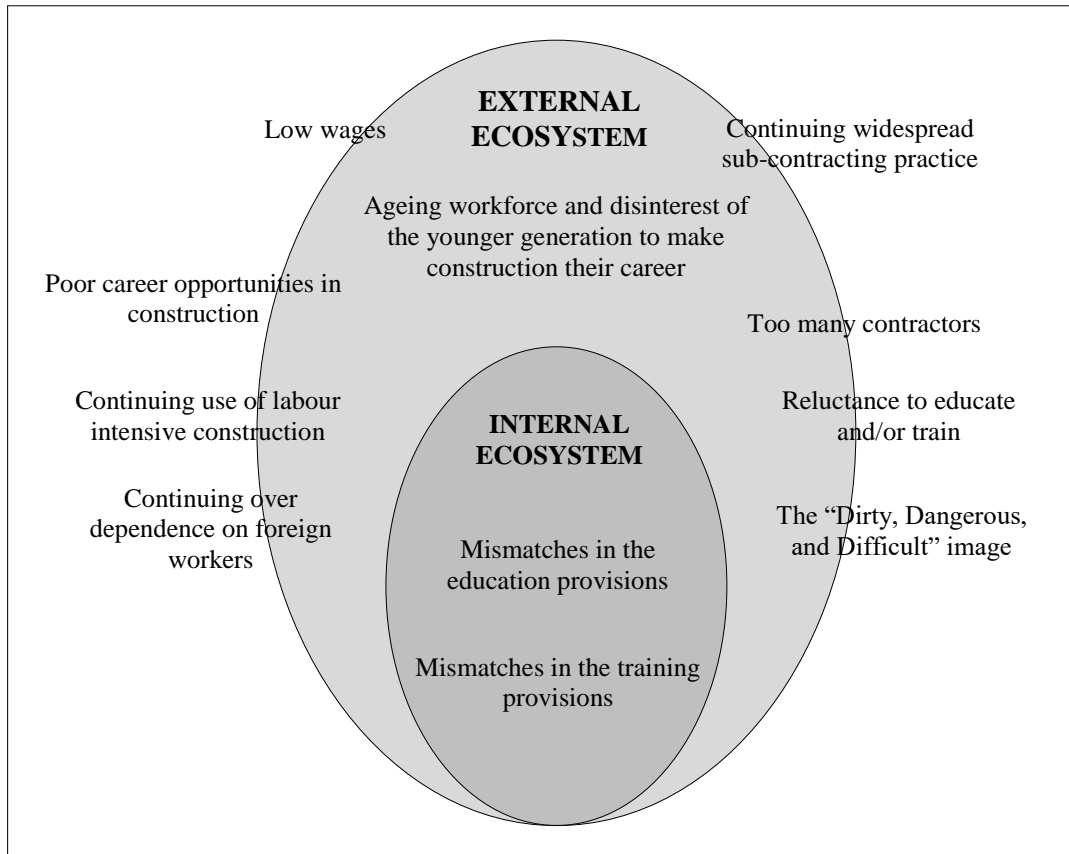


Fig. 3 - Culmination of factors within the external and internal ecosystems that challenge the education and training to develop the Malaysian construction workforce

7. Challenges in the External Ecosystem - at the Industry Level

The following subtopics outlines in detail regarding the challenges within the external factors which happened at the construction industry level. This includes the impacts of foreign workers, wages, construction method, education and training, construction image, subcontracting practices, contractor and career opportunities, and also current workforces.

7.1 Continuing Over-Dependence on Foreign Workers

Several factors suggest the continuing dependence on foreign workforces. In studying the phenomenon, Jamadi (2012) observes that construction employers prefer cheaper foreign workers because they are willing to comply with their working disciplines and rules. Additionally, Abdul Aziz (2001) reports that foreign workers with low skills and poor educational background are heavily engaged in the industry and thus making indigenous people think such work is not for them. These have led to locals shunning from the construction industry, whilst leading to further reliance on foreign workers. Apart, the CIDB (2002) reports that the accommodation provided for workers are temporary and uncomfortable. This has led to overcrowding, crude sanitation, uncontrolled surface water drainage, and typically poor rubbish disposal (Khamis et al., 2017). Eventually, the circumstance was seen as undignified for Malaysians, where hygienic and healthy accommodation were partly significant for employment consideration. Nonetheless, Subramaniam (2011) said that efforts by the government to reduce the numbers of foreign workers had been met with difficulties, including opposition from employers as the employers have been too dependent on foreign workers. Hence, the way forward is for employers to have a change in their mindsets.

7.2 Low Wages

MTUC (2002) and Abdul-Aziz (2001) reported that the current situation of the overwhelming number of foreign workers has kept construction wages consistently low and have shunned the local workforce (in Razlina, 2015). The reports were supported by a legitimate data from the Malaysiakini (2016) which highlighted that; a local general construction worker would earn an average of RM70/USD17 per day or RM1,750.00/USD429 for 25 days, but a foreign general construction worker would earn an average of RM57.50/USD14 per day or RM1,437.50/USD352 for 25 days. This is far too low compared to wages in other sectors. Subramaniam (2011) attributes this problem to the

influx of foreign workers coming into the industry that has suppressed wages and not because locals don't want to work. Additionally, Rahim et al. (2011) note that in some instances, companies purposely kept the salary at a low level to allow higher turnover of the local workforce. The uncontrolled presence of foreign workers have played a significant role in maintaining relatively low wages to avoid the participation of local labour, and at the end, very few numbers of local workers were manifested in the construction industry (Ramesh et al., 2012; Mohamed, 2015).

7.3 Continuing Use of Labour-Intensive Construction

Malaysia has remained trapped in a "low skills equilibrium" even though there is increasing recognition of the need to apply more advanced technology in construction. In contrast to the other developed countries such as Japan, Singapore, South Korea, Australia and China, there are signs of an alarming gap between the technologies used in construction in these countries, where more pre-fabricated construction is being practised. On the contrary, the Malaysian construction workforces tend to have very little skills, qualifications and training, and are only able to work on labour-intensive construction (Jaafar et al., 2007; CIDB, 2007). Although various campaigns to encourage the application of the Industrialised Building System (IBS) have been mooted since the launch of CIMP (2006-2015), Kamarul Anuar et al. (2009) note that contractors were not eager to embrace the IBS as an alternative. This was prevalent in Mydin et al. (2014), who asserted that the industry has failed to transform through the use of IBS.

In contending with the issue, CIDB (2006) expounds that the wide availability and low wages of foreign labour have a big impact on construction quality and productivity. As a consequence, contractors have little incentive to adopt and implement more productive, better quality, and safer technologies. The situation has also affected the contractors' interest in changing their traditional construction practice.

7.4 Reluctance to Educate and Train

In 2009, Hassan attributed the construction workforce problem as arising from the construction organisations that are unable or unwilling to invest in educating or training their workers. He notes that most contractors will subcontract most of their jobs, and this has led to neglecting the much-needed development and training of the workforce. Hassan et al. (2011) observe that prior to the launch of Construction Industry Master Plan (CIMP), several researchers have already highlighted the failings (Salleh and Abdul Aziz, 2001; and Jaafar et al., 2007). They were consistent in warning the low levels of knowledge and skills, and inadequate resources allocated to training. Abdul Aziz (2001a) reports that while employers demand on-the-job training and site-proven skills, many are reluctant to provide the required work experience for the trainees. Exaggerated by the low take-up of training organised by CIDB, research by Mohamad Kamar et al. (2010) found that the training offered is significantly short of meeting the industry's training needs, and thus resulting very poor involvement from the trades and specialist. Inline to reporting the NDTs training, Zaki et al. (2012) stated that by 2007, only 31 companies are sponsoring a mere 929 apprentices in the NDTs training scheme.

7.5 The 'Dirty, Dangerous, Difficult' Image

Malaysian Employers Federation (MEF) (in The Malay Mail Online, 2016) reports that Malaysians' turn down employment opportunities in 3D (Dangerous, Dirty and Difficult) industries such as construction was not just because of small salaries, but also because the jobs are often construed as lowly or demeaning. CIDB (2007) relates this as inhibiting the locals, especially youth, from making construction as their career.

Various propositions were suggested to circumvent the 3D image. Amongst others, Shiadri (2008) suggests the industry should consider providing better; (i) opportunities for training, skill, and career development, (ii) career pathway and opportunities to have better position, (iii) safety practice and procedure at construction site, (iv) image of construction workers, (v) communication between workers and employers, and (vi) site accommodations and services. Nevertheless, in relating the usage of IBS to improve the particular image, Kamarul Anuar et al. (2010), and Yahya and Shafie (2012) iterated that there was little evidence to suggest that significant improvements have been achieved by the adoption of the technology as outlined in the CIMP 2006-2016.

7.6 Continuing Widespread Subcontracting Practices

Lew et al. (2012) suggest that subcontracting has been common in the construction industry to overcome the demand for special expertise, advanced equipment, and huge investment cost. Additionally, Nasyrah (2013) observes the prevalent practice of multi-layered subcontracting, where subcontractors sublet their work to other subcontractors. Unfortunately, Zaki et al. (2012) relate these to the exponential increase in the number of contractors, which regrettably have not been corresponding with the increase in numbers of the trained construction workforce. After all, the practice has allowed the contractors to cope with fluctuations of demand for labour. This was supported by Lew et al. (2012), who maintains that the prevalent subcontracting practice within the industry has negatively impacted the construction workforce training. In lamenting the problem, Abu Bakar (2015) acknowledged that this practice is widespread and that this must be stopped.

7.7 Too Many Contractors

The Department of Statistics (2016) reports that there are 70,500 contractors in the Malaysian construction industry for nearly 32 million of the population. This contrasts sharply with the United Kingdom (UK) which have about 34,000 contractors serving a population of 64 million. In strengthening the data, Choon (2016) agrees that Malaysia has too many contractors, and Adnan et al. (2011) report that Malaysia has the highest ratio of contractor:population at 1:614, which is among the highest in the world. Yin (2016) attributes this to the leniency process and requirement of becoming a contractor where a person has only need to show that he has a nominal capital of RM5,000/USD1,228, besides does not require a pass in Lower Certificate of Education (LCE) to qualify as a contractor.

Eventually, the increasing number of contractors has not only resulted in the difficulty in educating and training the workforce but has also resulted in a market squeeze where contractors are facing difficulty in winning projects, let alone consideration for educating and training their workforce. This was noted by Subramaniam (2011) and Adnan (2016) who acknowledge the lack of jobs and many contractors was the reason why contractors are facing difficulties in getting projects.

7.8 Poor Career Opportunities in Construction

The Malaysian construction industry consists of many small firms who are unable or unwilling to invest in developing their workers (Narayanan and Yew, 2005). Larger firms increasingly subcontract much of their jobs (Hassan et al., 2011), and this has led to the neglect of the much-needed career development for the workforce. Zaki et al. (2012) observed poor career path and unattractive job prospects in construction. They add that people did not see many opportunities for training and skills formation, which, in a way, makes this job unattractive. Abd. Razak et al. (2010) found low assurance of salary and labour employment in the construction sector has forced many of the workforces to leave the construction sector. Meanwhile, observations from the studies by Abdul Aziz et al. (2008), Mohamad et al. (2012), and Mad Kaidi (2014) suggest that even when there are participants to the training offered, the trainees are reluctant to make construction as their career. In her study, Shiadri (2008) suggested that many youths are willing to be jobless rather than to be involved in the construction industry.

7.9 Ageing Workforce and Disinterest of the Younger Generation to make Construction as Their Career

The ageing construction workforce, which is replaced by foreign labour, has significantly impacted the construction workforce. It was reported that the average of the local construction workforce is between 50-60 years old, and young Malaysians are shying away from the industry (CIDB, 2007; CIDB, 2015). This is exacerbated by the continuing trend of foreign workers leaving the country after a few years (Norhidayah and Kassim, 2012). The likely impact is as clear as it is worrying; a great deal of knowledge and many vital skills are lost, and fewer trained replacements are in line to substitute.

8. Challenges Within the Internal Ecosystem - The Educational and Training Provisions

Key components with regard to challenges within the internal ecosystem are related to the education and training provision. Thus the following subtopics discusses mismatches in both paradigms.

8.1 Mismatches in the Education Provisions

While the challenge to align the education to the needs of the industry is on-going because of the changing construction industry, several issues have emerged to suggest that there have been gaps in the existing higher and vocational education.

Azlan Shah (2013) notes that there are issues on the capabilities of Building Surveying graduates which need to be clarified prior to the granting of government approval to the profession. Additionally, Hassan (2013) highlight the lack of project management learning in the architectural, interior design, and engineering degree programmes offered by Malaysian universities. Moreover, Mohamad et al. (2015) states that there is a need to address the increasing concern of ethical issues prevailing in the industry, and suggest a critical re-examining from the way education is provided to the construction professionals. In 2010, Hassan pointed out mismatches between what was delivered in the quantity surveying curriculum in the Malaysian universities against the knowledge and skills required by profession. Additionally, Wan Maimun (2016) questions if there was a wrong turn made by profession in changing the education curriculum. Meanwhile, Nazirah (2009) attributes the lack of awareness of sustainable development among developers as related to inadequate education.

Therefore, in urging the industry to improve the construction education, MBAM (2011) maintain that it is critical to provide quality construction industry-based training and up-skilling of the current local construction workforce quickly. In commenting on the education provision, Yin (2016) argues that while most of the universities are still producing more and more engineers every year, they are not producing graduates with the appropriate skills. In

conceiving the shortage of skilled tradespeople within the industry, he suggests that the industry needs more trade schools for learning construction skills like carpentry, welding, plumbing, bricklaying, etc.

8.2 Mismatches in the Training Provisions

Equally, there have been several reports that have pointed out the failure of the training offered. In the dialogue with the public works senior officers, Aziz (2001) pointed out that there are critical issues with the provision of training offered to the construction industry that is in urgent need of address, where changes should be made to ensure trainees will acquire adequate and comprehensive expertise in their trade, including the site experience. Hassan (2013) clarified the key areas of construction project management that is lacking in the project management training offered by the Project Management Institute (PMI) and the CIDB. Meanwhile, Zaki et al. (2012) report on the failure of the NDTTS training scheme. In 2007, only 31 companies sponsoring 929 apprentices in 2007, and the program were consequently discontinued. On the other hand, a study on the CIDB's training offered to the industry, Zuhairi et al. (2014) have identified significant gaps between the training offered and the skills required by the industry. The study has found; (i) while the industry needs more competent and hands-on trained workforce, most of the training offered are classroom-based, (ii) most of the training offered are disengaged with the real tasks and lacks practical application on site, (iii) the trainings offered lacks consideration on the variability nature of construction job carried out by different classes of contractors, (iv) most contractors are attending the training because it is a requirement to renew their contracting license, and (v) there is little value in the training certificates attained.

Apart, Mohamad et al. (2012) propounded that participation in the training of the local workforce is not very encouraging and that workers progressing from vocational training were not meeting the industry's needs. Separately, Mad Kaidi (2014) studied the training offered by the ABMs. Her study found that (except the trainees engaged in electrical, plumbing, and air-conditioning training), most of the youth taking part in the training do not intend to make construction as their career. Most have joined the training offered just to fill in their time and because of the allowance was given.

9. Conclusion

The foregoing discussions have presented the context for the need to develop the Malaysian construction workforce, the initiatives mooted, and the education and training provisions offered. Significant insights into the factors that suggest the weaknesses, and conceived emanating from the factors at the industry level (the external ecosystem), and in the internal education and training provisions (the internal ecosystem) has been culminated in Figure 3.

Although the findings in this paper are focusing on the Malaysian construction industry and require further exploration, however, the authors posit the necessity for the industry to review and re-learn these factors. This must also be underpinned by the appreciation of the mutual causal relationships that exist between the factors within the external ecosystem and in the internal ecosystem as a whole. Additionally, a holistic and integrated approach to address the challenges is imperative if significant improvements to the construction workforce development through education and training are to be achieved.

Furthermore, reconceiving the challenges at both ecosystems, an immense thought at all levels is needed. The challenges at the external ecosystem were not a merely financial aspect but expended into aspects of ethical and sustainability challenges which need a medium and long-term solution. These challenges are mutually exclusive to the internal ecosystem, which impaired the training provisions for professional workforces. It had cascaded down to the competency framework of construction project management, failure of training providers in developing a competent workforce, and further corrupted the intention of trainees who undertake the training provided. These challenges will diminish the learning capability and professionalism in delivering optimum service quality for the future of the built environment.

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