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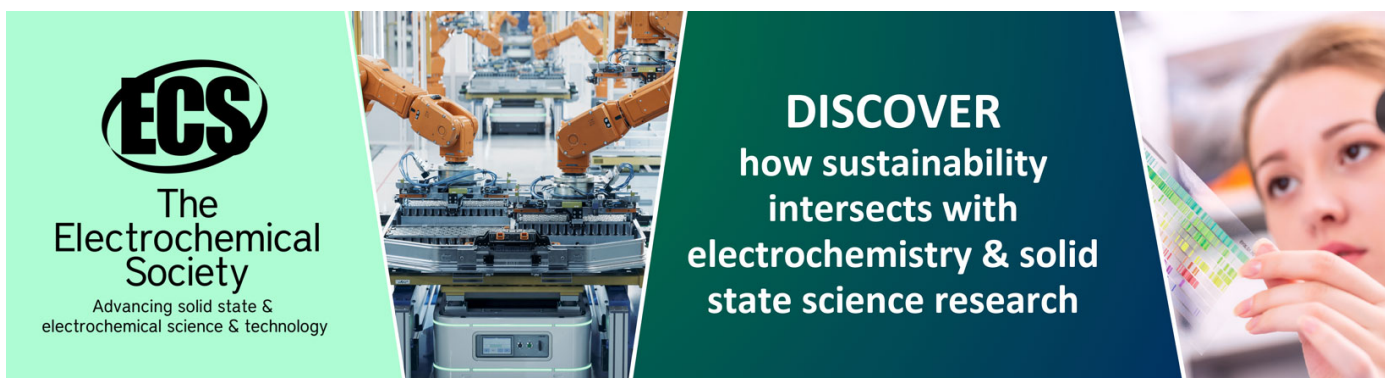
Development of Safety and Health Culture of Construction Project Through Academic Institution and Industry Linkages on TVET Platform: A Proposed Study

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Development of Safety and Health Culture of Construction Project Through Academic Institution and Industry Linkages on TVET Platform: A Proposed Study

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Abstract. The increasing trend of occupational accident due to unsafe behavior and unsafe act especially in construction site suggests the need for more effective assessment model or framework towards a more proactive measure. The objective of this study is to development of safety and health culture of construction project through academic institution and industry linkages through Technical and Vocational Education and Training (TVET) platform. The cooperation of employers and employees, together with the government agencies, Academic institution, public –private networking and the Construction Industry Development Board (CIDB) of Malaysia towards excellence safety culture and sustainable development. The review on construction industry and related issues, Institutional perspectives on safety climate, a systems approach to workforce development and Malaysia's TVET developments is the key element of study and it is combination of several approaches. The framework of the study and flowchart were present to ensure the proposed study is ready to execute.

1. Introduction

The construction sector remains to be the highest contributor in an occupational accident statistic in the developing country [1]. In the developing country, the fatality risk level in construction sector is five times more acceptable than in a manufacturing based industry, whereas three to six times higher in term of the major injury risk [2]. In Malaysia, for the period of 2011 until 2014, construction sector is the highest fatality in occupational accident, involving 136 cases [3]. The number of accidents signifies the safety and health level of the particular workplace and correspondingly the safety performance of the site. In spite of vast initiatives taken by the government and industry for the improvement of safety performance, the result is still far from achieving the target [4]. Regulators, practitioners, and researchers have searched for many possibilities for designing the safety performance assessment tools, which can



support complex organization such as construction sites [5]. For some reason, many construction companies have tried to improve their safety performance through behaviour improvement together with system improvement such as behaviour base system (BBS) and ISO18001 system [6]. Occupational safety and health (OSH) are discipline concerned with preserving and protecting human and facility resources in the workplace. Healthy and productive workforce is the focus of OSH [7]. Commitment from government agencies, employers and employees are needed for right combination of rules, believes, attitudes and good practices of OSH management to create positive safety culture [8].

In order to further boost national OSH to a greater level to protect the nation's human resources, Government has introduced a specific plan. Occupational Safety and Health Master Plan (OSHMP) 2016-2020 is the continuation effort by government to be aligned with the country's policy and transformation plan to achieve Vision 2020 and a developed nation status through the application of a Preventive Culture by 2020 [9]. Excellence OSH level will improve the employee's quality of life and thus contribute to increased productivity and index components through a strategic program to prevent accidents and occupational diseases. There has 2 legislation related to safety and health in construction:

- i. Factory and Machinery Act 1967. Under this act there has specific regulation on construction namely Building Operation and Work Engineering Construction 1986 (BOWEC 1986) [10]
- ii. Occupational Safety and Health 1994. [11]

To relate the OSH in construction industries there has a lot of information from local and international. In the past decades, the Occupational Safety and Health Act (OSHA) reported that construction is one of the most dangerous occupations in most developed country [12]. Each year construction sector has become the most contributors in occupational accident statistic. Fatal work injuries to construction labourers, the occupation within construction trades workers with the highest number of fatalities due to its nature of works and environment [13]. In Malaysia Construction Industry Development Board (CIDB) are the agency that cater the construction industry development with the specific objective.

2. Review on Construction Industry and Related Issues

In Malaysian construction scenario, it is determine that the two major contributors of accident are, work environment and work practice [15]. These facts are also supported by prior study, indicating safety culture and safety climate as significant in reducing the injuries, illnesses and fatalities on construction site [16]. Another study by Cooper in 2003 suggested that safety standards, goals, and safety management, which include employee commitment, communications, workplace hazards and physical work environment determines the safety performance of a construction site. The construction industry has been accident-prone and long criticized for its relatively poor safety performance [17]. Despite the focus on individual behaviours that directly contribute to accidents, many scholars, advocate attaching an equal value to inherent, safety-related organizational factors. As a leading indicator of organizational safety, safety climate continues to be the focus of many studies because of its positive and significant influence on occupational safety behaviour and accident prevention [18][19]. Safety climate, defined as the employees shared perceptions of their work environment, can reflect the current state of the underlying safety culture and highlight areas for overall safety improvement. Due to the significant potential benefits of an improved safety climate, several studies have been conducted to identify the factors that influence its quality. Although the direct contributors to safety climate have not been addressed, much research in this area has been devoted to examining how demographic characteristics influence workers' safety perception, which is recognized as a central component of safety climate [20]. In Malaysia, the industrial accidents in Malaysia are fluctuated from year 2005 till 2017 (as shown in Table 1).

Table 1. National occupational accident rate 2005 – 2017 [25]

Years	Total Industrial Accidents	Accident Rate per 1,000 workers	Fatality Rate per 100,000 workers
2005	51,829	5.16	6.93
2010	41,467	3.68	6.45
2015	38,753	2.81	4.84
2017	42,513	2.93	4.90

Prior research indicates that safety climate in the construction industry is not only affected by individual elements, but can also be dependent on internal organizational attributes, such as leadership style, group cohesion and orientation, and the safety response of supervisors [21][22]. Further studies also suggest that there is a reciprocal relationship between the safety climate of construction project participant organizations and the strategies of external organizations [23]. External organizations such as the government, for example, can stimulate positive improvements in safety climate [24]. Occupational accidents investigated by Department of Occupational Safety and Health (DOSH) as shown in Table 2.

Table 2. Occupational Accidents Statistics by Sector until October 2018 (Investigated) [25]

Sector	NPD	PD	Death	Total
Manufacturing	1188	90	25	1303
Mining and Quarrying	18	2	2	22
Construction	61	6	81	148
Agriculture, Forestry and Fishery	264	7	18	289
Utilities (Electricity, Gas, Water and Sanitary Services)	47	0	1	48
Transport, Storage and Communication	54	2	9	65
Wholesale and Retail Trades	49	2	1	52
Hotels and Restaurants	59	2	1	62
Finance, Insurance, Real Estate and Business Services	102	5	13	120
Public Services and Statutory Authorities	21	0	3	24
No information	497	11	19	527
Total	2360	127	173	2660

NP - Non permanent disability

P- Permanent disability

According to Table 2, the occupational accidents decreases significantly from 51,829 in the year 2005 (51,829) to 38,753 in the year 2015. However, in the year 2017, surprisingly it jumps to 42,513 resulting in 2.93 accident rate per 1,000 workers and fatality rate per 100,00 workers to 4.90. As for year 2018 (until October 2018) there are a total of 2660. Construction job is among the dangerous job in the world. In most developing countries, it is identified as the highest contributor for occupational accident and fatal injuries. According to International Labor Organization (ILO), construction sites in developing countries are 10 times more dangerous than in industrialized countries. Although the relationship is not supported by empirical evidence, their identification is based on solid theories and several years of observations [26]. Cultural differences and communication deficiencies hinder the prevention of accidents and may contribute for their occurrence [27].

2.1. Institutional perspectives on safety climate

Institutional theory views organizations as open systems that are subject to the influences of particular environments. It emphasizes the critical role of the institutional environment in driving organizational decisions, behaviours and changes with the aim of gaining social legitimacy. This is in contrast to the efficiency-seeking logic of transaction cost economics. Indeed, many previous studies have proved that institutional theory can provide powerful explanations of several organizational behaviours, such as innovation acceptance and strategic change [28]. Based on these successful applications of institutional theory, this study posits that the institutional approach offers systematic insights into the varying levels

of safety climate between construction industry organizations. As an important organizational concept, safety climate is regarded as the product of collective sense-making in which members assess their organizational safety environment. It reflects the extent to which an organization prioritizes and pays attention to safety [29]. This sense-making process can be influenced by both individual personalities and organizational characteristics [30].

Although safety climate is positively related to safety behaviour and safety performance, its benefits cannot always counteract the difficulties faced in developing a safer climate, which demands the efforts of all organization members and must be accompanied by organizational structural changes [31]. For this reason, the cultivation of a safety climate has been somewhat ignored by organizations due to related practical concerns, such as the implications on cost and project schedule. In construction projects, the participation of multiple stakeholders increases the complexity of the sense-making process because the safety climates in these participant organizations are iterated [32]. There has a few accident causation models and the contribution tabulated in Table 3 below.

Table 3. Accident causation models main contribution and critique

Model	Contribution	Critique
<i>Generic Accident Process Control</i>		
Sequential models	Accident can be avoided removing any factor in the sequence leading to it	Simplistic and omit data/interactions
Epidemiological models	A framework for analyzing existing accidents	Entirely descriptive and fails to directly evaluate causation
Energy transfer Models	A set of generic countermeasures strategies	Neglects categories of accidents
System models	Performance evaluation and insight into accident causation	Accidents considered as a control problem
<i>Human error and dangerous behaviour models</i>		
Behavioural models	Individual human characteristics may contribute for accidents	Discredited
Human decision process models	Understanding and predicting human decision in accidents	No complete explanation of accident
Human information processing models	Describing basic error mechanism and document the knowledge required to perform task safety	No complete explanation of accident
Error Taxonomy models	Relation of multiple factors which must be considered for analysing human error	No complete explanation of accident
<i>Human lesions mechanism model</i>		
Cumulative stress model	Relate physical stressors with cumulative damage to people	Fails to directly evaluate causation
Immediate lesions modes model	Relate physical stressors with cumulative damage to people	Fails to directly evaluate causation

2.2. Systems Approach to Workforce Development

In accordance with the World Bank's assessment tool, the three interconnected core dimensions are: (1) the strategic dimension, which sets the direction for workforce development that is aligned with the economic objectives of the economy; (2) system oversight in terms of the regulatory framework and governance of the system, the policies and practices that support the operational functions of the system in terms of the quality of TVET and the pathways for skills upgrading; and (3) service delivery, which is concerned with results-based management of public and private TVET institutions to ensure the provision of relevant skills development programs (see Figure 1). For the system to perform efficaciously, a free flow of feedback and information between the three dimensions is required using common standards to minimise duplication and fragmentation in the delivery of education and training service. In particular, the policy goals (and the associated core dimensions) may be summarised in Figure 1.

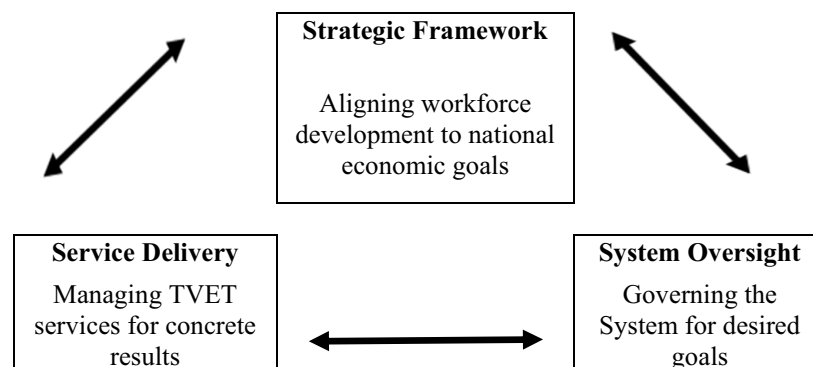


Figure 1. Three functional dimension of holistic workforce development system

The evaluation of the state of Malaysia's TVET system (and that of Singapore) presented below is based on the above framework using the World Bank SABER workforce development assessment tool [33].

2.3. Developments in Malaysia's TVET

In 1991, Malaysia's then Prime Minister laid out a strategic vision to transform Malaysia into a knowledge-based, sophisticated, united, and developed country by the 2020. This vision would be realised through the development of a highly skilled and talented workforce operating in challenging environment. Malaysia also faces the conundrum of high youth unemployment in the midst of skills shortages. Although an estimated 60% of new jobs will require skilled labour, the Ministry of Education states that technical and vocational education and training (TVET) will continue to play a subordinate role to academic education. This alone stands in sharp contrast to countries with strong technological capabilities such as Korea, Singapore, and Taiwan, let alone Germany, which all boast strong TVET systems. For Malaysia, aspiring to join the ranks of developed countries, the role of quality TVET, among others, is vital. The increase in labour demand engendered by decades of rapid growth has not been matched by a natural increase in labour supply [34].

After all, this subsystem is made up of two of the three pillars of the Malaysian education system (the third pillar being academic education):

- i. Technical and vocational education offered by polytechnics, technical institutes or colleges, and community colleges. Graduates from these institutions fill supervisory occupations, including as technical assistants, and supervisors.

- ii. Vocational skills training, undertaken by institutions, both public and private. The graduates from these institutions would take up employment in skilled and semi- skilled occupations. This pillar is likely to contain providers outside the formal system and not licensed by, or registered with, the government.

Furthermore, this sub-system should play an important role in economic development because it should be closely linked to the labour market. The structure of Malaysia's TVET subsystem within the education system is shown in Figure 2. Quite aside from whether these policies and measures have been effective, they suffer from several weaknesses. The first is the limited involvement of other stakeholders in the policy-making process. Specifically, industry involvement in articulating manpower needs has been limited until formal consultations were organised as part of the input into the Tenth Malaysia Plan. Indeed, projections of manpower needs had been made mostly by foreign consultants such as the Boston Consulting Group [35].

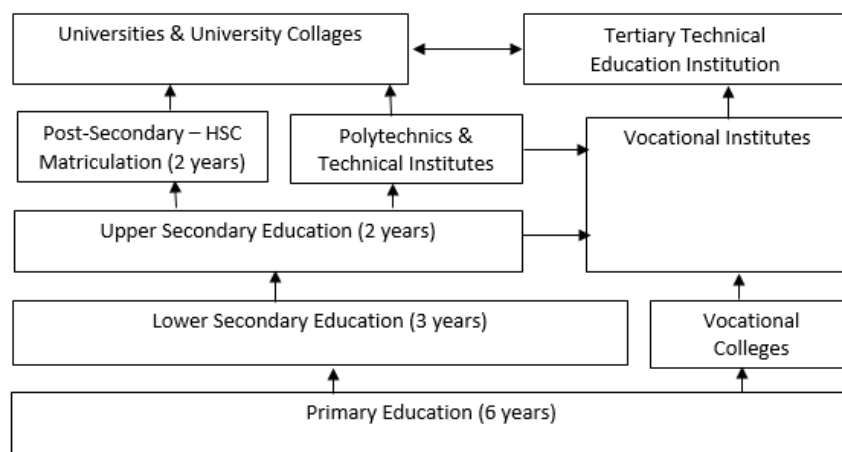


Figure 2. Pathways in Malaysia's education system [34]

3. Method

To ensure thus an improved TVET system lead to arrange of economic benefit, the flowchart and framework was suggested and it follow by of the proposed study as shown in Figures 3 and 4 respectively.

The framework that suggested is according to stakeholder's commitment. The industry will give the input and the academic institution will develop the curriculum with the current practice and recognize by the respected authority. To end of the process the student /participant will easily to place in construction related industry and the idea of safety culture could be implemented.

	Context	→	MOHE	→	TVET Ins.	→	MTUN, Poly, Collage
	Input	→	MTS	→	PEO	→	CLO
	Process	→	T & L	→	Curriculum	→	Evaluation
	Product	→	Knowledge	→	Skill	→	Workforce

Figure 3. Research Framework

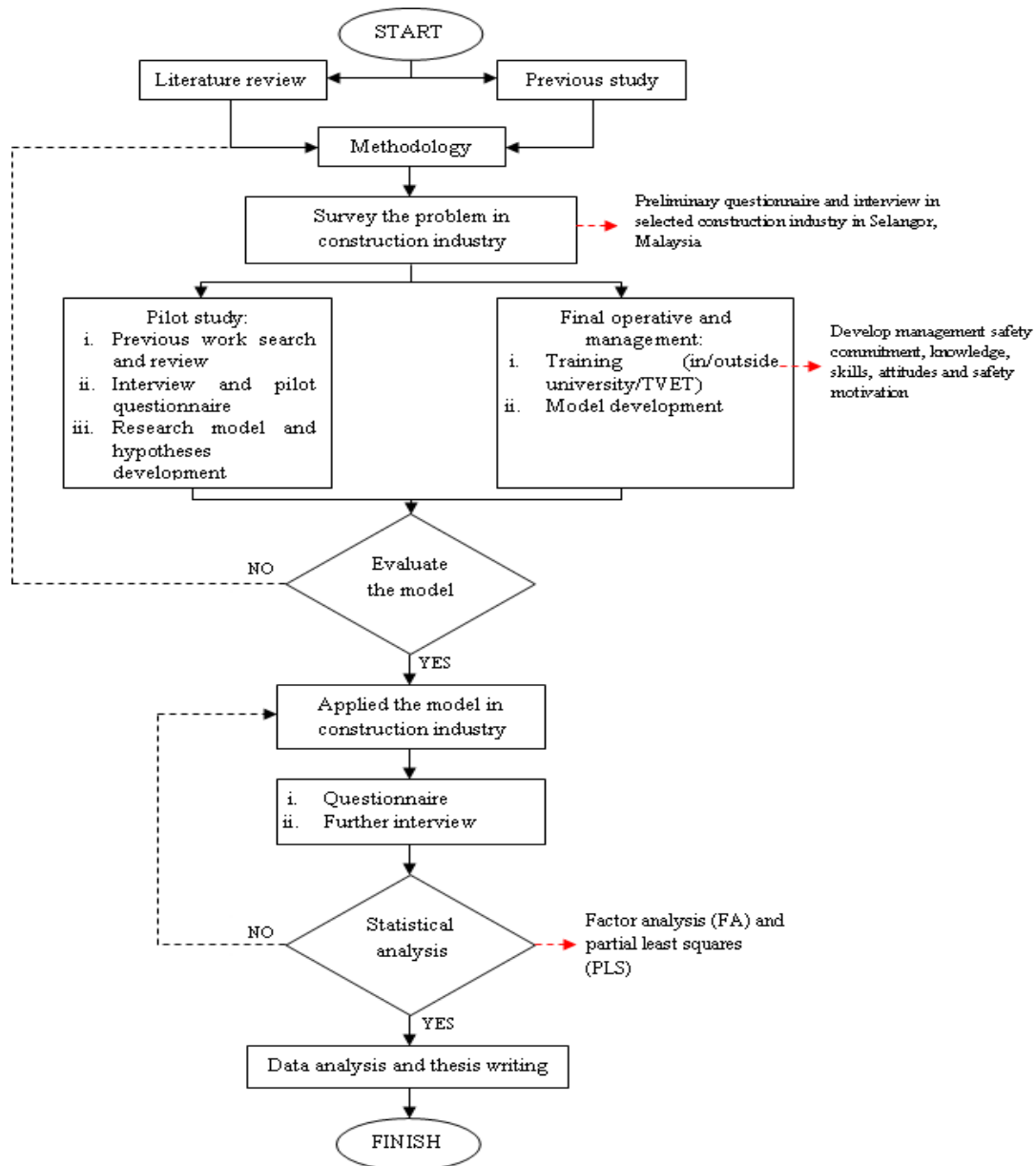


Figure 4. Research flowchart

4. Conclusion

The proposed study is ready to execute since the key element of the framework is already summarize. The TVET innovation program will lead to the sustainable development and the skill workforce through the participation of all respected parties and stakeholders.

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