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Review of critical success factors affecting Malaysia's construction industry's sustainable health and safety practices

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Abstract

Purpose – Contrasted with some other industries, the construction industry has been linked with the most noteworthy accident occurrence rate, the majority of which has been related to poor health and safety practises. This paper therefore sets out to conduct a comprehensive review of the critical success factors that can aid sustainable health and safety practises on construction sites in Malaysia.

Design/methodology/approach – The review focussed heavily on published reports, drawn between the years 2000 and 2022. The Scopus database was used for gathering the articles reviewed for this study.

Findings – After reviewing various literature studies, a total of 106 critical success factors were identified. All these factors were then categorised under the three pillars of sustainability. A total of 48 factors were grouped under the economic factors, 37 factors were grouped under the social factors and the remaining 21 factors were grouped under the environmental factors.

Originality/value – This paper conducted a comprehensive review of the critical success factors for bridging sustainability and health and safety. This study will help in developing a sustainable health and safety model that can drastically reduce the accident rate on the construction site.

Keywords Sustainability, Training, Safety, Injuries, Accidents

Paper type Review paper

1. Introduction

The construction sector is critical to several nations' socio-economic growth; its importance to the national economy cannot be overstated because it generates a large number of job opportunities (Yiu *et al.*, 2017; Liu *et al.*, 2016; Silvius and Schipper, 2016).The industry distinguishes itself amongst all other industries as it offers an infrastructure that facilitates national development and advancement (Olanrewaju and Abdul-Aziz, 2015).

Notwithstanding its important role in the economic growth, the construction sector continues to have an alarmingly high rate of accidents, emphasising that it is a hazardous, exceptionally risky, as well as difficult industry (Awwad *et al.*, 2016; Abas *et al.*, 2013). This is because several construction activities, including working above ground, beneath the earth, in enclosed areas, adjacent plunging equipment, managing massive loads mechanically, carrying dangerous chemicals, heavy loud sounds, heavy particles, utilising tools and machinery, fire explosions, being exposed to electrical cables and being exposed to

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harmful chemicals, are innately harmful to one's health and safety (Umar *et al.*, 2018; Hakiminejad *et al.*, 2015). However, owing to Shamsuddin *et al.* (2015), around 3% of construction workers experience a job ailment or accident each year, leading to 1.7 million missed working days.

The construction industry had the largest fatality rate as reported by the Department of Occupational Safety and Health (DOSH, 2021) compared to any Malaysian industrial sector in 2018, as contained in Table S1. Despite the fact that the number of fatalities in succeeding years has decreased, the construction industry still had the largest number of fatalities in Malaysia over the year, demonstrating that construction is one of the most dangerous businesses in the country. The significant drop in occurrences in 2020 and 2021 was mostly owing to government-imposed shutdowns and restrictions on commercial operations to battle the transmission of COVID-19, which happened at a time when Malaysia's economy was struggling. According to the Department of Statistics Malaysia (DOSM, 2021), Malaysia's GDP declined by 17.2% in 2021, whereas cumulative hours worked dropped by 28.2%.

In an attempt to discover a remedy to this dilemma, experts and scholars have been exploring the fundamental causes of these incidents. Several scholars, such as Tonmoy *et al.* (2018), Yakubu and Bakri (2013), Othman *et al.* (2018), Deepali *et al.* (2017), Ayob *et al.* (2018), Izatul and Ahmad (2016), Ismail *et al.* (2012), Othman and Ahmed (2013) and Bavafa *et al.* (2018) have attempted various strategies to alleviate the challenge of accidents in Malaysia's construction sector, but the issue still continues. As revealed by previous studies, one of the primary causes of this catastrophe is poor health and safety practises. "Occupational health and safety deals with all elements of health and safety in the workplace and has a strong focus on primary prevention of hazards", while health "is a state of total physical, mental and social well-being, not only the absence of disease or disability" (World Health Organization, 2021).

As a result, a sustainable health and safety practise framework, which was lacking in previous studies, must be constructed in order to solve the problem of health and safety. Simply said, sustainability is an innovation that satisfies present needs without endangering future generations' capacity to achieve their own (United Nations General Assembly 1987). Sustainable growth, in most circumstances, strives to create equilibrium between social, economic and environmental issues. When it comes to construction workers, however, both the social and economic components of sustainability have been overlooked, negatively impacting the environmental aspect of sustainability. Contractors, for example, are more concerned with getting tasks done on schedule and making more money at the expense of their employees. There are few or no plans to train and retrain construction workers, particularly semi-skilled and unskilled labour, to perform their tasks safely; similarly, no plans exist to provide them with suitable on-site housing; most of these workers also lack access to good health care while on the job; and they are typically forced to work in both favourable and unfavourable weather conditions with little or no incentive. Most construction workers eat what they see rather than what they desire due to time and financial restrictions. All of these factors raise the chances of accident of a worker, which leads to material waste and more rework. Without all of these considerations, it will be difficult to establish good safety practises on a construction site. As a result, the health and safety paradigm must incorporate sustainability. In light of this, the purpose of this study is to conduct a comprehensive review of the critical success factors that can aid sustainable health and safety practises on construction sites. The next part describes the critical success factors (CSFs) identified in this study for long-term health and safety practises. Prior to that, the process used to identify CSFs for attaining sustainable health and safety standards is addressed. Finally, a CSFs table for sustainable health and safety practises was developed, which can be used in future empirical research.

2. Methodology

A search strategy was devised for the purpose of this study in order to find relevant material. The literature search was conducted using Scopus as the database. This is due to the fact that it covers a wide range of topics, including science, technology, social sciences, arts and humanities (Hong and Chan, 2014). The most important search terms or phrases are "critical success factors" OR csfs AND health OR safety OR accident OR injury OR risk OR danger OR fall OR sustainability AND construction OR site OR industry. The search yielded a total of 649 results. As a result, only journals published between 2000 and 2022 were considered, resulting in the exclusion of 21 papers. Only open-access papers were considered. The subject area was limited to engineering, material science and environmental science, and the document type was limited to articles, conference papers, reviews and conference reviews, while the document source was limited to journals and conference proceedings. Only papers that had reached the final publication stage were included, while papers published in languages other than English were excluded.

A total of 341 articles were removed at this stage. The remaining 287 papers were exported to an excel sheet for the eligibility screening. All duplications were extensively examined in order to maintain the review's quality. All studies that were not within the study scope, had repetitive publishing or had an improper sample size were therefore eliminated. Abstracts of the retrieved articles were also inspected to ensure the quality and relevance of the papers to the current study. A total of 245 papers were eliminated at this stage, leaving 42 papers that passed the screening to be used for this study. Figure 1 indicates the publication selection process for the Prefered Reporting Items for Systematic Reviews and Meta Analysis (PRISMA) systematic literature review process.

Figure 2 shows the overlay network of countries' co-authorship with a minimum of five documents. A total of 11 countries meet this threshold. The figure shows that there are a total of 24 documents with a total link strength of 37. The figure shows that Australia had 21 documents with a total link strength of 15, followed by the United Kingdom with 17 documents and 11 total link strength; while Malaysia had 21 documents and 8 total link strength, followed by Nigeria with 7 documents and 8 total link strength and the United States with 17 documents and 8 total link strength, followed by China with 16 documents and 7 total link strength; whereas, India had 22 documents with 7 total link strength, followed by Singapore with 5 documents and 5 total link strength, followed by Hong Kong with 9 documents with 3 total link strength; while South Africa had 5 documents with 1 total link strength and finally, Turkey had 6 documents with 1 total link strength.

Even though the number of documents was reduced to five, only a few countries were able to meet the threshold. It can therefore be said that many countries are still missing from the list of countries with related research. And a wide gap still exists in co-authorship across other countries. In order to have a full knowledge of the effectiveness of sustainable health and safety practices, similar research has to be conducted in and co-authored across various countries.

3. Literature review

3.1 Critical success factors for health and safety practice

Zeng *et al.* (2020) defined the fundamental safety management factors for construction projects on their own initiative from a resilience standpoint. First, a theoretical framework and crucial safety management components for a construction safety management system (SMS) were established using the resilience theory. The structural equation modelling (SEM) technique was then used to establish the validity of each element. Data management, resource and technological management, organisation and human resource management, as per the result, would all help to improve the project's safety and stability. The degree of occupational

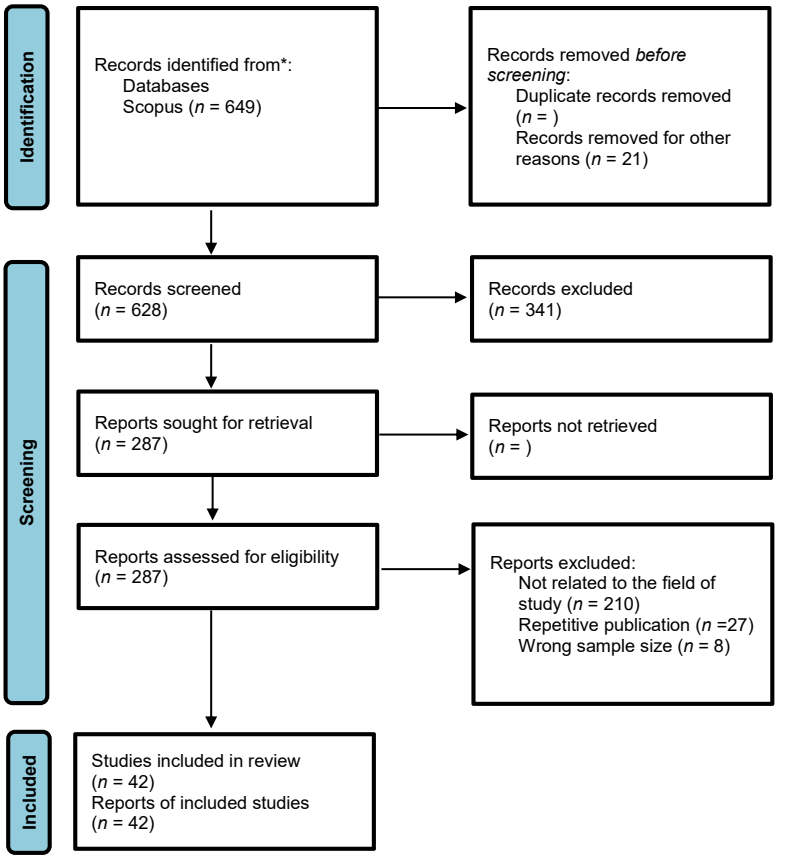

Figure 1.
The PRISMA framework

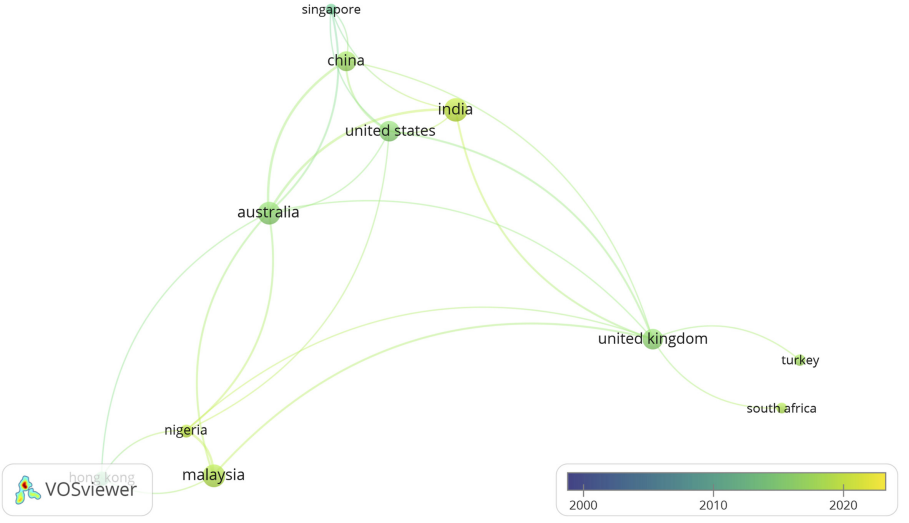

Figure 2.
Network of Countries/ Regions co-authorship

safety can be enhanced by enhancing the robustness of knowledge transfer and strengthening the communication amongst network components. According to the study, both the hazard prevention and the recuperation resilience define the project's safety resilience. Similarly, Keivan and Mahdi (2020) used the frequency and severity importance index to analyse safety aspects in Iranian building projects. The purpose of the research was to establish the causative factors of construction-related fatalities in Tehran and to propose mitigation strategies. Accident-causing variables were divided into two categories: distal and proximal causes. In Tehran, the distal features of occupational accidents are the result of a range of difficulties and reasons, with "financial constraints", "insufficient funding for monitoring", "shortage of sufficient expertise", "employing untrained operators", and "decreased project funds" amongst the most significant factors. To minimise and avert fatalities at the Tehran construction site, the study recommends that "management reserve adequate finances for constructing sectors" and that "management have adequate as well as appropriate expertise and understanding of the project".

Al Haadir and Panuwatwanich (2011) conducted research on critical success factors for implementing safety programmes in Saudi Arabian construction firms. The study's purpose was to identify the critical factors that influence the effective application of safety procedures in Saudi Arabian construction companies. A total of 15 critical success factors were discovered and tested. The variables were then prioritised using an analytical hierarchy process (AHP), with feedback from a panel of experts from 18 Saudi Arabian construction firms. According to the data, senior executives are playing the most significant role in effectively implementing safety programmes in construction projects. Wei *et al.* (2020) also investigated a Taiwanese case study as well. The success factors (SFs) of site safety management (SSM) in Taiwan were extracted using principal components analysis using 33 selected success criteria for SSM of construction projects. The fundamental links between all these SFs were investigated using SEM. Based on the outcomes of this research, the identified SFs for SSM have modest connections. Management behaviours, a safe working environment and safety assets, employee safety attitudes and avoidance and corrective efforts were identified as key determinants of SSM success.

Yadi *et al.* (2018) investigated the important SFs for high-rise building construction project safety management in China. The purpose of the research was to discover and examine relationships amongst key success factors (KSFs) for high-rise building construction project safety management. The study gathered data using semi-structured interviews and a survey questionnaire completed in China. The study proposes a third-order CSF framework with six CSFs: management standards, management organisation, technological and managerial plans, employee safety attitude, safety atmosphere and employee safety standards. Amongst them, the most important factor determining construction safety performance management is management organisation, with employee safety attitude being a primary driver. The study concludes that improving the expert proficiency of risk control organisations can enhance the safety efficiency of high-rise construction activities significantly.

Anwar *et al.* (2019) investigated the most important SFs for implementing safety programmes in Indonesian building projects. The purpose of the study was to learn more about the most critical KSFs in the implementation of work safety management programmes in Indonesian projects. The research discovered and tested 13 KSFs. According to the outcomes of the AHP and Pareto analysis, 7 KSFs add considerably to the successful execution of work safety programmes in the area. Workplace incentives, collaboration, leadership, assignment and obligations, adequate resource distribution, unambiguous and quantifiable milestones, as well as safety briefings are all stated in order.

Khalid *et al.* (2021) study the relative importance of primary parameters affecting health and safety efficiency, as well as the need for a strong SMS that combines all components into a unified structure. The research utilised an empirical research method relying on a literature review and primary data collected methodically using peer-reviewed publications.

Organisational, management, legislative, social, environmental and human challenges were the six areas highlighted. According to the study, (1) implementation of safety rules, (2) guidance, (3) safety preparation, (4) safety adherence, (5) performance evaluation, (6) risk analysis, (7) safety assessment and (8) safety attitude can result in efficient safety practices, according to the study. And it comes to the conclusion that these aspects are intertwined and cannot be separated. However, in order to significantly enhance the safety performance goal on building projects, the attention given to elements affecting safety should be re-aligned and re-balanced.

Similarly, Tezel *et al.* (2021) looked into crucial success criteria for the construction safety training. The research concentrates on the factors that contribute to better safety practices. In this context, a survey was designed and sent to the Engineering News-Record (ENR) 2020 Top 400 Contractors. The answers of the survey were used to classify and label the variables in terms of total variance using a factor analysis. A total of 21 CFSs were found and investigated in the research. Project and firm-related factors, demographic considerations, practical issues, motivating factors, organisational aspects and human-related factors arose from the assessment of 21 elements. Project and firm-related factors were discovered to be the most relevant variables in maximising the efficiency of safety awareness.

Similarly, Othman *et al.* (2020) investigated crucial success factors that influence the adoption of construction safety measures in underdeveloped countries. The study's purpose was to identify the variables that might influence the implementation of safety practises in construction projects in underdeveloped countries. Following a comprehensive review of the literature, 21 critical success factors were determined. A total of 16 semi-structured interviews with experts in the Iraqi construction business were conducted to gain a better understanding of these issues. The participants agreed that the success criteria were critical, and they emphasised the relevance of a number of elements, including management dedication, training courses, implementation of safety rules and procedures and stakeholder involvement. Technology was mentioned by the interviewers as a new factor.

Buniya *et al.* (2021) looked into the critical success factors for implementing safety programs in Iraqi building sites. The purpose of the research was to identify the CSFs that influence how safety measures are implemented in the Iraqi building construction industry. The CSFs were identified via literature review and validated via semi-structured interviews with building industry experts. Exploratory factor analysis was used to evaluate the statistical data, and the result showed that the CSFs may be classified into four components: employee participation, safety protection and monitoring strategies system, safety structure and management dedication. The connection between the execution of the safety system and the entire project efficiency was then determined using partial least square structural equation modelling (PLS-SEM). The results suggest that putting in place a safety programme has a significant and beneficial effect on project success.

3.2 Critical success factors for sustainability

Eleni (2018) conducted a systematic literature review on the critical success factors for sustainable construction. The systematic literature review was conducted using a variety of query criteria. An aggregate of 31 papers were identified as being worth the investigation. The characteristics of the retrieved article set in terms of publications, authors and contents were examined and discussed. There were 35 variables discovered in total, separated into five areas of research. Within the article set, the occurrence of the retrieved variables was investigated, providing crucial quantitative and qualitative perspectives into contemporary sustainable building patterns. According to the study, sustainable construction needs consideration of a variety of factors and should be approached holistically. To attain sustainable construction, a variety of factors from multiple divisions are required: environmental, social, economic, technical and regulatory sustainability.

In order to alleviate housing demand, Akanbi *et al.* (2017) performed a study to determine critical success factors (CSFs) for attaining sustainable social housing (SSH) from economic, environmental and social perspectives. A collection of 21 SFs for achieving SSH were discovered using a content analysis method and relevant published research. NVivo and the Statistical Package for Social Science were used to analyse the data collected from the pertinent papers and participants. According to the study's results, accessibility, cost-effective preparation, suitable building projects, innovation, ecological conservation, utilisation of eco-friendly materials, efficient town planning, proper layout, protection of persons and assets, welfare services and guaranteeing social harmony are all CSFs for accomplishing SSH.

Saeed *et al.* (2017) looked into the critical success factors that impact the integration of sustainability into project management approaches in underdeveloped countries. Following a thorough review of the literature, with innovation diffusion philosophy as the fundamental starting point, CSFs connected to the tripartite bottom line of sustainability (environmental, social, and economic) were discovered following a thorough review of the literature. Relying on 16 semi-structured interviews, the report's outcomes were conveyed as a conceptual framework. In a poll of 101 returned surveys, the framework was verified by PLS-SEM as the technique of validation. The results shed light on how to include sustainability in project management methods in underdeveloped countries.

Sunil *et al.* (2018), for instance, employed Grey-Decision Making Trial and Evaluation Laboratory (DEMATEL) to model critical success factors for supply chain sustainability operations in India. The paper examines the KSFs for successful implementation of sustainability activities in the supply chain in the Indian setting. Following professional inputs, 15 CSFs for the effective implementation of sustainability programmes were chosen and validated from the literature. A method based on the Grey-(DEMATEL) was used to envisage the organisation of complex causal links between the recognised CSFs. According to the study, government authorisation was deemed to be the most important component, and "community wellbeing and improvement" was considered to be the most easily altered aspect.

Kiani and Standing (2018) classified 41 project management critical success factors (CSFs) into five groups: (1) project, (2) project management, (3) organisation, (4) external environment and (5) sustainability. To determine the CSFs' reliance and weight, information was gathered from 26 Australian building project managers. Employing the fuzzy decision making and evaluation laboratory (fuzzy DEMATEL) method, it is proved that the organisation, external environment and sustainability are "cause" criteria, whereas projects and project management are identified as "effects". The fuzzy analytic network process (fuzzy ANP) is used to weigh the sub-criteria, which takes into consideration the interconnection of the major criterion. The results indicated that the most importance is attributed to the top management and sponsorship support, stakeholder aspirations and end-user-imposed limits. Project managers can considerably improve project success by concentrating on the most important essential SFs rather than devoting equitable consideration to all essential success criteria.

In order to ensure viable construction works, El Touny *et al.* (2021) establish and emphasise integrated sustainable critical success factors (ISCSFs) that impact the efficiency of Egyptian construction works. The most essential SFs have been identified and classified into two groups. For (1) inner connected elements and (2) outer associated elements, there are ten subclasses (1) company-related factors; (2) project-related factors; (3) project management related factors; (4) resource/procurement-related factors (labors, materials, equipment and subcontractors); (5) human capital-related factors; (6) support-related factors (financial, human resources, security and legal and administration); (7) stakeholder-related factors (clients, consultants, project managers and end-users); (8) innovation, learning and growth-related factors; (9) country-related factors; and (10) industry-related factors in three distinct stages. This factors were analysing for improving project effectiveness while utilising the three aspects of sustainability (economic, social and environmental) as a decision-making tool.

Likewise, Olawumi and Chan (2019) look into the KSFs that can help with BIM as well as sustainability in building operations. Professional views on the 30 CSFs discovered were gathered through a two-round Delphi poll. The professional panel's replies were assessed utilising empirical as well as inferential analytics. The research highlighted people-centric, data-centric and technological interventions in the built environment as the main drivers. Substantial outcomes were reached from a comparative assessment of the professionals. The information from every stage of the Delphi survey was analysed using Cronbach's reliability testing, mean score ranking, Shapiro–Wilk test of normality, Kendall's concordance and chi-square tests, IRA, Spearman's correlation test and Mann–Whitney analysis. The professional panel attained a satisfactory level of correlation after the second stage of the Delphi poll, and the IRA statistics were utilised to validate that the professionals concurred on each of the CSFs.

Radek and Branislav (2018) looked into hazard control and knowledge management as important SFs in sustainability projects. The study's purpose was to determine the most important factors that have lately impacted the performance of sustainability practices. The research was carried out as a qualitative research project using observation and inquiry methodologies in the form of a semi-structured governed interview. The study discovered 21 of the most common criteria for post-project stage failure. The study concludes that guaranteeing effective and useful post-project stage advancement, particularly via post-implementation process assessment as well as the compendium of a collection of advancement recommendations for prospective project management, offers a pragmatic foundation for applying skill management and project management philosophies.

Table S2 contains all of the essential success variables that have been identified, as well as how they fit into the three categories of sustainable factors.

4. Discussion

Sustainability is an economic, social and environmental idea. The goal is to structure civilisation and human activity in such a way that society and its members can achieve their current goals and realise their full potential while protecting biodiversity and making plans and taking actions that will allow these ideologies to be sustained indefinitely. Each segment of an organisation, from the community to the world, is impacted by sustainability. Sustainability can be defined as ensuring the optimal conditions for humans and their surroundings both today and indefinitely into the future. As a forward-thinking and imaginative advancement model, sustainable development promotes a trajectory of positive change that is primarily based on social, economic and environmental considerations. The three core concerns of sustainable development, according to Taylor (2016), are social equity, environmental protection and economic growth. This suggests that the idea of sustainable development is primarily supported by three conceptual foundations. These are "economic sustainability", "social sustainability" and "environmental sustainability".

4.1 Economic sustainability

Economic sustainability involves a manufacturing structure that meets current rates of consumption without jeopardising the requirements of the future (Lobo *et al.*, 2015). In the past, economists overemphasised the market's ability to properly distribute resources since they assumed that the availability of natural resources was infinite (Du and Kang, 2016). They also thought that technological development would accompany economic improvement to replace natural resources depleted during manufacturing (Cooper and Vargas, 2004). Natural resources are not unlimited, and not all resources can be renewed or are sustainable, as has been demonstrated. The natural resource foundation has been overwhelmed by the expanding the economic structure, forcing a re-evaluation of conventional economic

postulates (Du and Kang, 2016). This has led a lot of academics to wonder if unrestrained development and usage are even possible. Manufacturing, transportation, as well as consuming are the three primary economic factors, but the accounting system employed to direct and assess the economy with reference to these activities significantly alters values, which is not good for society and the environment (Cao and Emission, 2017). According to Allen and Clouth (2012), meagre natural resources are used to sustain and preserve human life. Dernbach (2003) has previously stated that although human demands for food, clothes and shelter rise as a result of an increase in the population, the methods and resources present on the globe cannot be raised to match the needs indefinitely. Additionally, Retchless and Brewer (2016) contend that because economic expansion appears to be the major focus, significant cost factors are disregarded, such as the effects of pollution and exhaustion, while the rising need for commodities and services persists to propel markets and compromise environmental harm (UNSD, 2018). Consequently, to ensure economic sustainability, choices must be made in the most just and financially responsible manner while taking relevant sustainability factors into account (Zhai and Chang, 2019).

4.2 Social sustainability

The concepts of fairness, equality, availability, engagement, cultural identity and sustained growth are all elements of social sustainability. The idea indicates that since advancement is about humans, people matter (Benaim and Raftis, 2008). According to Littig and Grießler (2005), social sustainability essentially refers to a method of social structure that reduces poverty. But in a more basic sense, "social sustainability" refers to the connection between social issues like poverty and ecological damage (Farazmand, 2016). According to the philosophy of social sustainability, eradicating poverty should not result in unjustified environmental degradation or unstable economic conditions. It should seek to reduce poverty while utilising society's already-existing economic and natural resources (Kumar *et al.*, 2014; Scopelliti *et al.*, 2018). Benaim and Raftis (2008) contended that social sustainability is difficult to accomplish because the social dimension appears complex and daunting. Saith (2006) believes that social sustainability involves facilitating the potential of individuals, societies and traditions to help facilitate a fulfilling life, dwelling on adequate medical care, training, equality for women, harmony and security all over the world. The dynamics inside the social structure are very ephemeral and difficult to model, in contrast to the environmental and economic systems, where flows and feedback loops are clearly apparent (Benaim and Raftis, 2008; Saner *et al.*, 2019). According to Everest-Phillips (2014), the description of accomplishment inside the social structure is that "humans are not subjugated to circumstances that weaken their potential to satisfy their goals". Kolk (2016) contends that guaranteeing that everyone's necessities are provided is not social sustainability. Instead, it attempts to provide an opportunity for everybody to be able to meet their desires if they choose so. To advance towards social sustainability, people, organisations and communities must remove any obstacles that stand in the way of this capability (Brodhag and Taliere, 2006; Pierobon, 2019). According to Gray (2010) and Guo (2017), social sustainability also includes a wide range of concerns like civil rights, promoting gender balance and fairness, public involvement and due process, which all support harmony and societal cohesion for sustainable development.

4.3 Environmental sustainability

Environmental sustainability refers to how the ecological habitat continues to be adaptable and prolific in order to maintain a person's existence. Ecosystem vitality and the sustaining capability of the natural habitat are related to environmental sustainability (Brodhag and Taliere, 2006). It necessitates that natural resources should be used in a sustainable manner,

both as a drain for garbage and as a source of economic inputs. The assumption is that garbage cannot be produced any quicker than it can be absorbed by the environment, and natural resources cannot be used up any sooner than they can be replenished (Diesendorf, 2000; Evers, 2018). This is so that balance can be sustained inside the Earth's boundaries. However, because technical development might be unable to maintain exponential growth, the pursuit of unrestrained growth is exerting ever greater demands on the Earth's system and straining these constraints. There is more and more evidence to back up worries about environmental sustainability (ICSU, 2017). For instance, the effects of climate change offer a compelling case for the necessity of environmental sustainability. The term "climate change" describes large and persistent modifications to the climate system brought on by either natural climate variability or human activity (Evers, 2018). These changes include warming of the climate and seas, melting of ice sheets, rising sea levels, increased ocean acidity and growing greenhouse gas concentrations (Du and Kang, 2016). Biodiversity is already being impacted by climate change. For instance, Kumar *et al.* (2014) found that greater temperatures often have an impact on population sizes, animal and plant species distributions and animal and plant movement patterns. According to Campagnolo *et al.* (2018), it is imperative that all civilisations adapt to the new realities surrounding the management of ecosystems and the physical limits to expansion in order to ensure sustainability.

5. Research implication and limitation

This research study has contributed to the growing body of knowledge on health and safety practises in the construction industry by looking at the sustainability of health and safety practises in Malaysia. The findings of this study would help in developing a sustainable health and safety model to drastically reduce the accident rate on construction sites. This study will also serve as a basis on which researchers can consolidate in an effort to develop a sustainable health and safety programme that will help construction stakeholders improve health and safety of workers on construction sites. Notwithstanding the study's contribution, the study's major limitation is that statistical analysis was not conducted to validate the result of this research. Therefore, further empirical research is required to test the validity of these factors and use them to develop a model for effective health and safety practise on construction sites in Malaysia.

6. Conclusion

This study examined different literature on critical success factors that can help to enhance health and safety practises on construction sites in Malaysia in order to reduce the threat of accidents on construction sites, which previous literature has connected to inadequate safety practises. In this study, 42 articles were analysed, and 106 essential success variables were found. All these factors were then categorised under the three pillars of sustainability. A total of 48 were grouped under the economic factors, 37 were grouped under the social factors, and the remaining 21 factors were grouped under the environmental factors. The economic factors are factors relating to finance, production and services provided by both managerial teams and workers generally, while the social factors have to do with equity and fairness in the distribution and provision of resources for the workers to aid their health and safety practices. Environmental factors are factors that can help to preserve the natural environment and make the ecological habitat adaptable and maintainable for human existence.

References

Abas, A.B., Mohd Said, D.A., Aziz Mohammed, M.A. and Sathiakumar, N. (2013), "Fatal occupational injuries among non-governmental employees in Malaysia", *American Journal of Industrial Medicine*, Vol. 56 No. 1, pp. 65-76, doi: 10.1002/ajim.22056.

Akanbi, O.O., Champika, L. and Akintola, A. (2017), "Critical Success Factors (CSFs) for achieving sustainable social housing (SSH)", *International Journal of Sustainable Built Environment*, Vol. 6, pp. 216-227.

Al Haadir, S. and Panuwatwanich, K. (2011), "Critical success factors for safety program implementation among construction companies in Saudi Arabia", *Procedia Engineering*, Vol. 14, pp. 148-155.

Allen, C. and Clouth, S. (2012), "Green economy, green growth, and low-carbon development – history, definitions and a guide to recent publications", *UNDESA: A Guidebook to the Green Economy*, available at: https://sustainabledevelopment.un.org/content/docu ments/GE%20Guidebook.pdf

Anwar, A., Mawardi, A. and Albert, E.H. (2019), "Key success factors for safety Programs implementation in Indonesian construction projects", *International Journal of Civil Engineering and Technology (IJCIET)*, Vol. 10 No. 2, pp. 1385-1394.

Awwad, R., El Souki, O. and Jabbour, M. (2016), "Construction safety practices and challenges in a Middle Eastern developing country", *Safety Science*, Vol. 83 No. 1, pp. 1-11.

Ayob, A., Shaari, A.A., Zaki, M.F.M. and Munaaim, M.A.C. (2018), "Fatal occupational injuries in the Malaysian construction sector– causes and accidental agents", *IOP Conference Series: Earth and Environmental Science*, Vol. 140, 012095, doi: 10.1088/1755-1315/140/1/012095.

Bavafa, A., Mahdiyar, A. and Marsono, A.K. (2018), "Identifying and assessing the critical factors for effective implementation of safety programs in construction projects", *Safety Science*, Vol. 106, pp. 47-56.

Benaim, C.A. and Raftis, L. (2008), *The Social Dimension of Sustainable Development: Guidance and Application: Thesis Submitted for Completion of Master of Strategic Leadership towards Sustainability*, Blekinge Institute of Technology, Karlskrona.

Brodhag, C. and Taliere, S. (2006), "Sustainable development strategies: tools for policy coherence", *Natural Resources Forum*, Vol. 30, pp. 136-145.

Buniya, M.K., Othman, I., Sunindijo, R.Y., Kashwani, G., Durdyev, S., Ismail, S., Antwi-Afari, M.F. and Li, H. (2021), "Critical success factors of safety program implementation in construction projects in Iraq", *International Journal of Environmental Research and Public Health*, Vol. 18, p. 8469, doi: 10.3390/ijerph18168469.

Campagnolo, L., Carraro, C., Eboli, F., Farnia, L., Parrado, R. and Pierfederici, R. (2018), "The ex-ante evaluation of achieving sustainable development goals", *Social Indicators Research*, Vol. 136, pp. 73-116, doi: 10.1007/s11205-017-1572-x.

Cao, J.G. and Emission (2017), "Trading contract and its regulation", *Journal of Chongqing University (Social Science Edition)*, Vol. 23, pp. 84-90.

Cooper, P.J. and Vargas, M. (2004), *Implementing Sustainable Development: From Global Policy to Local Action, Rowman and*, Littlefield Publishers, Lanham, MD.

Deepali, D.K., Milind, S.D. and Akshay, S.K. (2017), "Review on study of safety culture at construction sites", *International Journal of Advance Research in Science and Engineering*, Vol. 6 No. 3, pp. 685-689.

Department of Occupational Safety and Health DOSH (2021), "Laman web Rasmi Jabatan Keselamatan dan Kesihatan Pekerjaan Malaysia - Utama", 2021, available at: http://www.dosh.gov.my/index.php/ms/ (accessed 12 February 2021).

Department of Statistics (2021), Available at: https://www.dosm.gov.my/v1/index.php? r=column/cthemeByCat&cat=77&bul_id=RllTZE4xQjcrU1RzeHEwNkg2aXlwZz09&menu_id=OEY5SWtFSVVFVUpmUXEyaHppMVhEdz09 (accessed 15 October 2021).

Dernbach, J.C. (2003), "Achieving sustainable development: the Centrality and multiple facets of integrated decision making", *Indiana Journal of Global Legal Studies*, Vol. 10, pp. 247-285, doi: 10.2979/ gls.2003.10.1.247.

Diesendorf, M. (2000), "Sustainability and sustainable development", in Dunphy, D., Benveniste, J., Griffiths, A. and Sutton, P. (Eds), *Sustainability: The Corporate Challenge of the 21st Century*, Chapter 2, Sydney, pp. 19-37.

Du, Q. and Kang, J.T. (2016), "Tentative ideas on the reform of exercising state ownership of natural resources: preliminary thoughts on establishing a state-owned natural resources supervision and administration commission", *Jiangxi Social Sciences*, Vol. 6, p. 160.

El Touny, A.S., Ibrahim, A.H. and Mohamed, H.H. (2021), "An integrated sustainable construction project's critical success factors (ISCSFs)", *Sustainability*, Vol. 13 No. 15, p. 8629, doi: 10.3390/ su13158629.

Eleni, S. (2018), "Critical success factors for sustainable construction: a literature review", *Management of Environmental Quality: An International Journal*, Vol. 30 No. 1, pp. 176-196, doi: 10.1108/MEQ-02-2018-0043.

Everest-Phillips, M. (2014), *Small, So Simple? Complexity in Small Island Developing States*, UNDP Global Centre for Public Service Excellence, Singapore.

Evers, B.A. (2018), "Why adopt the sustainable development goals? The case of multinationals in the colombian coffee and extractive sector", Master Thesis, Erasmus University, Rotterdam.

Farazmand, A. (2016), *Global Encyclopedia of Public Administration, Public Policy, and Governance*, Springer International Publishing, Amsterdam.

Gray, R. (2010), "Is accounting for sustainability actually accounting for sustainability . . . and how would we know? An exploration of narratives of organisations and the planet", *Accounting, Organizations and Society*, Vol. 35 No. 1, pp. 47-62, doi: 10.1016/j.aos.2009.04.006.

Guo, F. (2017), "The spirit and characteristic of the general provisions of civil law", *Law and Economics*, Vol. 3 Nos 5-16, p. 54.

Hakiminejad, A., Fu, C. and Titkanlou, H.M. (2015), "A critical review of sustainable built environment development in Iran", *Proceedings of the Institution of Civil Engineering Sustainability*, Vol. 168, pp. 105-119.

Hong, Y. and Chan, D.W. (2014), "Research trend of joint ventures in construction: a two-decade taxonomic review", *Journal of Facilities Management*, Vol. 12 No. 2, pp. 118-141.

ICSU (2017), "A guide to SDG interactions: from science to implementation", in Griggs, D.J., Nilsson, M., Stevance, A. and McCollum, D. (Eds), International Council for Science. (ICSU), Paris. doi: 10.24948/2017.01.

Ismail, F., Ahmad, N., Janipha, N.A.I. and Ismail, K. (2012), "Assessing the Behavioural factors of safety culture for the Malaysian construction companies", *Procedia-Social and Behavioural Sciences*, Vol. 36 No. 1, pp. 573-582.

Izatul, F.M.K. and Ahmad, C.A. (2016), "A conceptual framework of safety and health in construction management", *MATEC Web of Conferences*, Vol. 66, pp. 1-9, 00107.

Keivan, A. and Mahdi, R. (2020), "Investigation of safety factors through frequency and severity importance index in Iranian construction project", *Journal of Energy and Environmental Pollution*, Vol. 1 No. 1, pp. 18-28.

Khalid, U., Sagoo, A. and Benachir, M. (2021), "Safety Management System (SMS) framework development – mitigating the critical safety factors affecting health and safety performance in construction projects", *Safety Science*, Vol. 143, p. 105402, doi: 10.1016/j.ssci. 2021.105402.

Kiani, M.R. and Standing, C. (2018), "Critical success factors of sustainable project management in construction: a fuzzy DEMATEL-ANP approach", *Journal of Cleaner Production*, Vol. 194 No. 1, pp. 751-765, doi: 10.1016/j.jclepro.2018.05.120.

Kolk, A. (2016), "The social responsibility of international business: from ethics and the environment to CSR and sustainable development", *Journal of World Business*, Vol. 51 No. 1, pp. 23-34, doi: 10.1016/j.jwb.2015.08.010.

Kumar, S., Raizada, A. and Biswas, H. (2014), "Prioritising development planning in the Indian semi-arid Deccan using sustainable livelihood security index approach", *International Journal of Sustainable Development and World Ecology*, Taylor and Francis Group, Vol. 21, p. 4, doi: 10.1080/13504509.2014.886309.

Littig, B. and Grießler, E. (2005), "Social sustainability: a catchword between politica pragmatism and social theory", *International Journal of Sustainable Development*, Vol. 8, pp. 65-79, doi: 10.1504/IJSD.2005.007375.

Liu, H., Skibniewski, M.J. and Wang, M. (2016), "Identification and hierarchical structure of critical success factors for innovation in construction projects: Chinese perspective", *Journal of Civil Engineering Management*, Vol. 22, pp. 401-416.

Lobo, M.-J., Pietriga, E. and Appert, C. (2015), "An evaluation of interactive map comparison techniques", *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems - CHI '15*, New York, ACM Press, pp. 3573-3582, doi: 10.1145/2702123.2702130.

Olanrewaju, A.L. and Abdul-Aziz, A.R. (2015), "Building maintenance processes, principles, procedures, practices and strategies", *Building Maintenance Processes and Practices*, Springer Singapore, pp. 79-129.

Olawumi, O.T. and Chan, M.W. (2019), "Critical success factors for implementing building information modeling and sustainability practices in construction projects: a Delphi survey", *Sustainable Development*, Vol. 2019, pp. 1-16.

Othman, E. and Ahmed, A. (2013), "Challenges of mega construction projects in developing countries", *Organization, Technology and Management in Construction: an International Journal*, Vol. 5, pp. 730-746.

Othman, I., Majid, Mohamad, H., Shafiq, N. and Napiah, M. (2018), "Variety of accident causes in construction industry", *MATEC Web of Conferences*, Vol. 203, p. 02006.

Othman, I., Kamil, M., Sunindijo, R.Y., Alnsour, M. and Kineber, A.F. (2020), "Critical success factors influencing construction safety program implementation in developing countries", *Journal of Physics: Conference Series*, IOP Publishing, Vol. 1529, pp. 1-8, doi: 10.1088/1742-6596/1529/4/042079.

Pierobon, C. (2019), "Promoting sustainable development through civil society: a case study of the EU's NSA/LA thematic programme in Kyrgyzstan", *Development Policy Review*, Wiley, Vol. 37, doi: 10.1111/dpr.12411.

Radek, D. and Branislav, L. (2018), "Risk management and knowledge management as critical success factors of sustainability projects", *Sustainability Journal*, Vol. 10, doi: 10.3390/su10051438.

Retchless, D.P. and Brewer, C.A. (2016), "Guidance for representing uncertainty on global temperature change maps", *International Journal of Climatology*, Vol. 36 No. 3, pp. 1143-1159, doi: 10.1002/joc.4408.

Saeed, B., Reza, H., Hamed, G. and Shankar, S. (2017), "Critical success factors (CSFs) for integration of sustainability into construction project management practices in developing countries", *International Journal of Project Management*, Vol. 1, pp. 1-17.

Saith, A. (2006), "From universal values to millennium development goals: lost in translation", *Development and Change*, Vol. 37 No. 6, pp. 1167-1199, doi: 10.1111/j.1467-7660.2006.00518.x.

Saner, R., Yiu, L. and Nguyen, M. (2019), "Monitoring the SDGs: digital and social technologies to ensure citizen participation, inclusiveness and transparency", *Development Policy Review*, Wiley, Vol. 38 No. 4, pp. 483-500, doi: 10.1111/dpr.12433.

Scopelliti, M., Molinario, E., Bonaiuto, F., Bonnes, M., Cicero, L., De Dominicis, S. and Bonaiuto, M. (2018), "What makes you a "hero" for nature? Sociopsychological profiling of leaders committed

to nature and biodiversity protection across seven; EU countries", *Journal of Environmental Planning and Management*, Vol. 61, pp. 970-993, doi: 10.1080/09640568.2017.1421526.

Shamsuddin, K.A., Ani, M.N.C., Ismail, A.K. and Ibrahim, M.R. (2015), "Investigation the safety, health and environment (SHE) protection in construction area", *International Research Journal of Engineering and Technology*, Vol. 2 No. 6, pp. 624-636.

Silvius, A.G. and Schipper, R. (2016), "Exploring the relationship between sustainability and project success-conceptual model and expected relationships", *SciKA-Association for Promotion and Dissemination of Scientific Knowledge*, Vol. 4, pp. 5-22.

Sunil, L., Sachin, K.M., Ravi, S., Chandra, P.G. and Suresh, J. (2018), "Modelling critical success factors for sustainability initiatives in supply chains in Indian context using Grey-DEMATEL", *Production Planning and Control*, Vol. 29 No. 9, pp. 705-728, doi: 10.1080/09537287.2018.1448126.

Taylor, S.J. (2016), *A Review of Sustainable Development Principles: Centre for Environmental Studies*, University of Pretoria, South Africa.

Tezel, A., Dobrucali, E., Demirkesen, S. and Kiral, I.A. (2021), "Critical success factors for safety training in the construction industry", *Buildings*, Vol. 11 No. 139, pp. 1-24, doi: 10.3390/buildings11040139.

Tonmoy, K.B., Shakil, A. and Md Shahed, M. (2018), "Health, safety and quality management practices in construction sector: a case study", *Journal of System and Management Sciences*, Vol. 8 No. 2, pp. 47-64.

Umar, T., Egbu, C., Wamuzir, S. and Honnurvali, M.S. (2018), "Occupational safety and health regulations in Oman", *Proceedings of the Institution of Civil Engineers-Management, Procurement and Law*, Vol. 171 No. 3, pp. 93-99, doi: 10.1680/jmapl.18.00007.

United Nations General Assembly (1987), "Report of the World Commission on Environment and Development: Our Common Future; Transmitted to the General Assembly as an Annex to Document A/42/427 – Development and International Co-operation: Environment; Our Common Future, Chapter 2: towards Sustainable Development", Paragraph, United Nations General Assembly, Oxford University Press, Vol. 1.

UNSD (2018), "SDG indicators metadata repository", available at: https://unstats.un.org/sdgs/metadata/

Wei, T.C., I-Chen, T., Hew, C.M., Shih, T.L., Yu-I, L., Ji-Kai, Y. and Leonard, M. (2020), "Construction safety success factors: a Taiwanese case study", *Journal of Sustainability*, Vol. 12 No. 1, pp. 1-19.

World Health Organization (2021), Available at: https://www.who.int/healthtopics/occupational-health (accessed 15 October 2021).

Yadi, L., Yan, N. and Wei, T.C. (2018), "Critical success factors for safety management of high-rise building construction projects in China", *Advances in Civil Engineering*, Vol. 2018 No. 5, pp. 1-15, 1516354, doi: 10.1155/2018/1516354.

Yakubu, D.M. and Bakri, I.M. (2013), "Evaluation of safety and health performance on construction sites (Kuala Lumpur)", *Journal of Management and Sustainability*, Vol. 3 No. 2, pp. 100-109, ISSN 1925-4725 E-ISSN 1925-4733.

Yiu, N.S.N., Sze, N.N. and Chan, D.W.M. (2017), "Implementation of safety management systems in Hong Kong construction industry – a safety practitioner's perspective", *Journal of Safety Research*, Vol. 64, pp. 1-9, doi: 10.1016/j.jsr.2017.12.011.

Zeng, Z., Yuan, J., Shao, Q., Zhang, L., Wang, G. and Li, X. (2020), "Developing key safety management factors for construction projects in China: a resilience perspective", *International Journal of Environmental Research and Public Health*, Vol. 17 No. 17, p. 6167.

Zhai, T.T. and Chang, Y.C. (2019), "Standing of environ- mental public-interest litigants in China: evolution, obstacles and solutions", *Journal of Environmental Law*, Vol. 30, pp. 369-397, doi: 10.1093/jel/eqy011.

Further reading

Li, Y.Y., Chen, P.-H., Chew, D.A.S., Teo, C.C. and Ding, R.G. (2011), "Critical project management factors of AEC firms for delivering green building projects in Singapore", *Journal of Construction Engineering and Management*, Vol. 137, pp. 1153-1163.

Yi, W. and Chan, A. (2016), "Health profile of construction workers in Hong Kong", *International Journal of Environmental Research and Public Health*, Vol. 13 No. 12, p. 1232.

Zhang, X., Wu, Y., Shen, L. and Skitmore, M. (2014), "A prototype system dynamic model for assessing the sustainability of construction projects", *International Journal of Project Management*, Vol. 32, pp. 66-76.

Supplementary material

The supplementary material for this article can be found online.

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