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International Journal of Construction Management

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/tjcm20

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INTERNATIONAL JOURNAL OF CONSTRUCTION MANAGEMENT
2022, VOL. 22, NO. 3, 473–488
https://doi.org/10.1080/15623599.2019.1634666

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Building sustainability in the construction industry through firm capabilities, technology and business innovativeness: empirical evidence from Malaysia

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ABSTRACT
While the identification of the drivers of social sustainability in construction firms has remained one of the popular topics in the literature, many questions about these drivers remain unanswered, especially in the context of the developing countries. This study empirically determines some organizational internal drivers influencing the social sustainability performance in construction firms. To achieve this, we developed a conceptual model and tested on a sample of registered and active large construction firms from the Malaysian Construction Industry Development Board, using partial least-squares structural equation modelling for analysis. The study reveals that organizational internal drivers could trigger social sustainability performance. However, our analysis shows that organizational capabilities – complex tangible and intangible resources that are controlled by a firm through certain organizational practices and which enable it to implement value-creating strategies-partially mediates the relationship between these drivers and social sustainability. While few limitations of this study include the fact that the data used are the subjective opinions of the top officials who responded to the survey, our findings reveal that construction firms with efficient resource capabilities tend to adopt more sustainability in project delivery. This study contributes to the ongoing discussion on the important factors for social sustainability in construction.

KEYWORDS
Sustainable construction; organizational innovativeness; organizational capabilities; technology orientation; construction firms

Introduction

There was a growing realization, during the last decade, that the production and consumption rates and technological advancements were giving rise to severe global ecological and social problems threatening the sustainability and the continued growth of the societies. This was based on the report of the World Commission on Environment and Development (The Brundtland Commission, WCED 1987), where the key threats to modern society are identified under rising poverty and urban development, population growth, food and energy insecurity, and water scarcity. These problems were seen to have arisen out of the changes in our social systems, and warnings were sounded that achieving sustainability in human societies would require radical innovation and market strategies; especially from the firms towards restructuring their production patterns in both amount and type (Lafferty and Meadowcroft 2000). Since the Brundtland commission's publication, firms in both developed and the developing economies have increasingly sought to be more sustainable. But firm efforts to launder their image as sustainable have been faulted for being mere superficial and usually not beyond public relations rhetoric (Wolf 2013). However, the Malaysian Construction Industry (MCI), just like in most developing nations, still needs to grapple with the continuous occurrence of poor occupational safety, low quality of life, unfair distribution of social benefits and several unsafe practices faced by construction workers during project execution and the eventual end users. These incidences necessitate the consideration of social sustainability dimension, conceptualized in this study to include issues such as construction firms' considerations of health and safety, user comfort, community welfare, accessibility, social involvement, workers' welfare, and aesthetics in their project delivery (Abidin 2005;

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Bamgbade et al. 2017a). In furtherance of this argument, construction firms are required to develop and implement innovative business models (referred to in this study as one of the organizational internal drivers) to be able to contribute meaningfully to the social sustainability agenda in construction projects. Aside from sustainability delivery, innovation in business models could also increase efficiency (in terms of quality improvement, lower production costs), engender greater market share and client satisfaction (Seaden et al. 2003; Luo and Child 2015).

Firm business innovativeness explains capabilities to exploit successfully new ideas by incorporating innovative technologies, policies and best practices for competitive advantage within the industry and in the global environment (Seyfang and Smith 2007). A considerable amount of prior studies has identified this concept as an essential firm resource needed to meet the environmental challenges, such that innovative terminologies like sustainable innovation, eco-efficiency, and eco-preneurship have always been used to describe green business initiatives (Beveridge and Guy 2005; Bamgbade et al. 2017b). Studies like Chen et al. (2016) have also indicated that leading construction firms in green building and sustainability create new business models from time to time, but they are also the early adopter of the innovative business system as a way of improving their social sustainability performance. In spite of the abundance of studies on innovation and technology adoption in many industries, like the manufacturing sector, the construction industry (especially in the developing nations) is regarded as a laggard sector as many firms are neither technology-oriented nor feel the need to innovate to meet local clients' needs (Seaden and Manseau 2001; Adeleke et al. 2019). Such a laggard attitude towards technology adoption raises doubt as to whether the firms would ever be proactive in sustainability delivery as do some other industries.

However, studies in recent times have shown how firms' technology orientation, especially, technologies, like the Building Information Technology (BIM) and computer-aided design (CAD), are revolutionizing the traditional building design and construction in both the developed and the emerging economies, such that construction impacts are reduced and better sustainability recorded (Wong and Zhou 2015). For instance, Sertyesilisik (2017) highlighted how the usage of contemporary sustainable technologies (such as green roofs, airtight construction technology and solar heating) is presenting myriads of benefits ranging from long-term cost savings to reduction in energy consumption, operation and maintenance costs, and reduced depreciation in construction end-products' price and rent. In fact, these technologies are fast becoming trendy and are assisting construction firms to remain competitive in the ever-changing market environment. In this way, technology orientation (referred to in this study as another organizational internal driver), is enhancing capabilities to build technological breakthroughs, and it is an essential strategy for growth in new firms as well as for sustainability improvements going by the resource-based view (RBV; Walley and Whitehead 1994; Shan et al. 2014; Salimon et al. 2017). While there is always a positive impact of construction technology on sustainability delivery, this relationship requires an extensive analysis of intermediate steps, as the extant studies provide certain controversial results about this relationship (Wong and Zhou 2015).

Aside from these considerations, there is a need to pursue research that helps to identify such organizational competencies necessary to address firm social sustainability, particularly in Malaysia where social issues in construction such as accident-prone work environment, construction personnel's misconduct as identified in the Occupational Safety and Health Master Plan Malaysia 2015 (OSH-MP 15) as well as in other extant studies (cf. Foo et al. 2013) have not been adequately addressed. Thus, in spite of the considerable attention given to organizational capabilities and social sustainability performance relationship in the previous studies – Gelhard and von Delft (2016) addressed the roles of firm capabilities in re-allocating resources as important enablers of sustainability performance – but the effect is only indirect, necessitating other mediation that could impact directly on sustainability delivery.

To understand the circumstances surrounding how business innovativeness and technology orientation could enhance firm social sustainability performance, it is important to take an intermediate variable (such as organizational capabilities) into account. Hence, one of the objectives of this study will be to determine the effect of organizational capabilities as a mediator variable in the relationship between business innovativeness and social sustainability. This study examines firms in the MCI quantitatively using a large, representative sample rather than case studies or anecdotal evidence based on very few firms. In doing so, this study intends to provide answers to the following questions:

1. Does business innovativeness influence firm social sustainability?
2. Are technology-oriented firms able to deliver better social sustainability?

3. Are construction firms' capabilities helpful in their social sustainability performance?
4. Do organizational capabilities mediate the relationship between business innovativeness and social sustainability?5. Do organizational capabilities mediate the relationship between technology orientation and social sustainability?

The rest of the paper is organized as follows. Section 2 establishes more details about the theoretical and empirical literature on social sustainability drivers as well as the research hypotheses. In Section 3, the research methodology for this study is explained. –>Section 4 presents data analysis and the results. Section 5 provides a discussion and implications of the research.

Theory and hypotheses

The core principle of the firm's RBV emphasized the rationale behind the different inter-firm's performance levels (Barney 1986). As indicated in Figure 1, the RBV theory identifies firms' capabilities as well as their unique structure of both tangible and intangible resources (Prahalad and Hamel 1990). Firm's resources and capabilities were also categorized as technical competencies, financial resources, leadership, experience and innovation capabilities (Isik et al. 2009). Therefore, by identifying these capabilities, Wernerfelt (1984) argues that firms are able to take up different strategies, create above-normal return rates and attain a sustainable competitive edge. According to Barney (1991), resources must be valuable to the end users, rare, inimitable to competitors in order to attain a sustainable advantage. The RBV predicts that resources that are unique, rare and valuable improve firm practices, and firms can gain the sustainable competitive advantage once their development is supported by specific firm-level competencies (Sarkis et al. 2010).

The RBV is a framework for a better understanding of firm-level development with resources as the building blocks (Li et al. 2014). By extension, the RBV was also conceptualized to include different sustainability strategies leading to the development of firm-specific capabilities. This, according to Hart (1995), is the natural-resource-based view of the firm – rooted in competitive advantage and which is based upon firm's relationship with the natural environment by continuously improving operations to respond to calls for social and environmental justice (Hart 1995; Hart and Dowell 2011; Bamgbade et al. 2017b). The management literature has extensively highlighted

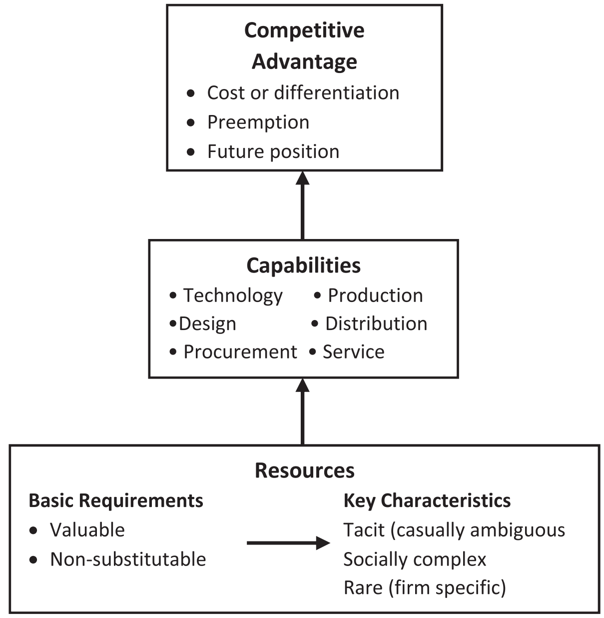

Figure 1. The resource-based view theory of the firm.

firms' sustainable capabilities and technological competence as important commitments towards reducing impacts on the environment (De Medeiros et al. 2014), particularly in the developing world where the energy and infrastructural facilities are at a premium. Sustainability should afford firms the opportunity for competitive advantage through the accumulation of specific and rare firm resources, involving a deliberate orientation towards new technology.

Business innovativeness and social sustainability

Innovativeness represents firm's readiness to deviate from the present state of the art in technologies and practices and venture into novel products and services to the market or opening up new markets with innovative processes and behaviour (Wang and Ahmed 2004). According to Knowles et al. (2008), one of the dimensions of innovativeness is business systems, which implies firm's ability to actively seek and implement innovative business systems for competitive advantage, meeting customers' needs and for sustainability consideration. In view of this, Camisón and Villar López (2010) argues that business innovative capabilities create and captures new values for firms by implementing new business models within workplace or external environment through a transformation of managerial mind-sets. Accordingly, the adaptive capability of environmental changes is an important strength that explains how firms' business innovativeness is helping in attaining a competitive edge. However, firms' adaptive strength and good strategies alone might not be enough to cope with the present ever-dynamic business environment. It is projected that a firm's business innovative capabilities will be an advantage in sustainability adoption. In Morioka et al. (2006), business innovative capabilities in firms are recognized as an important dimension to adequately address the production and consumption problems. Moreover, since sustainability is not limited to the environmental issues alone, social sustainability considerations are important, and the path towards achieving long-term progress in sustainability is through a comprehensive understanding of these relationships (El-Kafafi and Liddle 2011). Thus, keeping the foregoing arguments in mind, the following hypothesis is proposed.

> H1: Firm's willingness and propensity to innovate in business models positively influence social sustainability.

Technology orientation and social sustainability

Technology orientation is a representation of a firm's capability to recognize and adapt to emerging technologies. Firms' technology orientation (especially in R&D) describes their ability to attain a substantial level of technological improvement to develop new products (Gatignon and Xuereb 1997). This implies that firms with technology-orientation prioritize the use of modern technologies in products delivery, while also investing strongly in R&D. By implication, technology orientation in firms should set more radical sustainability agenda in motion leading to greater competitive advantage.

Over the past three decades, the BIM and the CAD technology have radicalized the traditional building design patterns and construction in both the developed and the emerging economies, such that construction project decisions are generated through the use of 3D simulations (Wong and Zhou 2015). While recent studies have dichotomized technology-push and customer-pull areas of research, the main argument in this section is that firms that are guided by technology accumulate a vast amount of knowledge for their sustainability advantage (Zhou and Li 2010; Salojärvi et al. 2015). By implication, technology-oriented firms are better leveraged in addressing social-related issues, employees' welfare, as well as clients and regulators' concerns, as greater care is required to deal with user comfort especially when they demand better products at lower costs (Costa et al. 2015). In this way, it is argued that technology orientation improves products and services performance by being competitive, and therefore, remains sustainable. Thus, the following hypothesis is proposed:

> H2: Technology orientation in construction firms positively influence social sustainability

Organizational capabilities and social sustainability

It is important to outline the rationale behind some firms' commitment to strategic initiatives in support of social sustainability, despite the fact that others do not. But it is even more important to understand the initiatives and routines that are helping these sustainability-committed firms to better deal with sustainability challenges (Rashid et al. 2015). Extant literature has demonstrated that the firm's capabilities are essential to deal with social pressures from stakeholders (Sarkis 2012; Dangelico et al. 2013; Glavas and Mish 2015). Wirahadikusumah and Ario (2015) also considered contractors' corporate social responsibility (CSR) activities both on-site and within the project communities as a required cultural value necessary to support sustainability implementation. Consistent with the RBV theory, organizational capabilities are reflections of the complex tangible and intangible resources that are controlled by a firm through certain organizational practices and which enable it to implement value-creating strategies. According to Cai and Zhou (2014), firms need to improve their internal drivers (in terms of technological capabilities and organizational capabilities) in order to adequately improve their sustainability performance. This is in agreement with the RBV theory of firms that indicates organizational capability as one of the organization's core capabilities directly related to sustainability performance (Bernauer et al. 2006). In summary, emphasis on certain firm capabilities (conceptualized in this study as firm culture, flexible design, quality orientation, product diversity and customer loyalty) is essential for better social sustainability performance in project delivery. Thus, the following hypothesis is proposed.

> H3: Organizational capabilities will positively influence their social sustainability.

Business innovativeness, technology orientation and organizational capabilities

Previous studies have emphasized that firms have to become innovative throughout their operational activities so that they can effectively foster strategic capabilities like customer satisfaction, product diversity and design flexibility (Dutrénit 2007; Jantunen et al. 2012). When a firm pursues an innovation, it is typically reacting to changing customer demands and the innovativeness needed to develop such capabilities will involve synchronizing operations all through the entire value chain and, thus, providing flexible design, product diversity, quality orientation and respond adequately to changing customer needs (Zhang et al. 2003). Business innovativeness indicators involving creating, adopting and implementing new business systems put firms in a better competitive position and allow them to initiate key resources and capabilities that can improve sustainability delivery. Building on prior literature (Knight and Cavusgil 2004), this study argues that innovative-oriented ability to create, adopt and implement new business systems are necessary practices for other capabilities like customer satisfaction, flexible product design and diversity, and quality orientation.

In the same manner, the implementation of new technologies within a firm is a key component of the conceptualization of organizational capability. This view suggests that the adoption of new technologies is critical to establishing critical organizational capabilities that are necessary for attaining sustainability. Additional research suggests a significant relationship between technological opportunism (implying a firm's ability to sense and respond to new technologies) and technology adoption (Trainor et al. 2011). This research direction suggests that technology orientation can positively influence customer satisfaction, product diversity and design flexibility that represents the conceptualization of organizational capabilities. Hence, the following hypotheses are presented.

> H4: Firm business innovativeness will positively influence their organizational capabilities

> H5: Technology orientation in firms will positively influence their organizational capabilities

The mediating role of organizational capabilities

The previous studies have so far provided evidence that business innovativeness has a positive association with social sustainability (cf. Hollands 2008). Some studies have also shown that technology orientation significantly influences social sustainability performance in firms (Wu and Issa 2014; Wong and Zhou 2015). While most studies consider that innovativeness is positively related to firm social sustainability performance, such a relationship is not empirically conclusive at best (Luo and Bhattacharya 2006). Similarly, Carayannis et al. (2015) demonstrated that innovative organizations may not directly improve their sustainability performance but rather, several other factors do intervene to allow for a more parsimonious relationship. The study affirmed that although innovativeness strengthens social sustainability performance, there is a possibility to be mediated by factors that impact directly on social sustainability. Therefore, this study deems it is necessary to identify the potential mediator variable in such links. Hence, the previous theoretical analysis leads us to propose organizational capabilities as a mediating variable in the two aforementioned relationships.

In accordance with the resource-based theory, this study considered that sustainability could best be achieved at firm-level through innovative business models. Hamel and Prahalad (1989) also observed that firms that were highly rated to global leadership positions in sustainability typically initiate innovative practices that were beyond their initial capabilities or resources. Consequently, an increase in innovative business models can stimulate organizational capabilities and raise the likelihood of firm performance in social sustainability to improve. The following hypothesis is proposed.

> H6: Organizational capabilities mediate the positive relationship between business innovativeness and social sustainability.

Alternatively, considering the empirical and theoretical evidence above, technology orientation will affect social sustainability through organizational capabilities. The authors expect that the more emphasis a firm places on technology orientation, the more likely it will improve its organizational capabilities and, subsequently, will enhance its social sustainability. Based on this logic and the extant studies, the following hypothesis is proposed.

> H7: Organizational capabilities mediate the positive relationship between technology orientation and social sustainability.

Method

Sample selection

In this research, the authors chose the highest grade of construction firms (the G7 contractors) within the MCI for the population of the empirical study. The rationale behind this is that firms in this category are better leveraged to embrace sustainable construction where other smaller construction firms encounter difficulties in adopting it because of resource inadequacy

(Zeng et al. 2007; Qi et al. 2010). According to the Construction Industry Development Board (CIDB) in 2014, the total number of active G7 contractors in all the eleven states of Peninsular Malaysia stood at 4,520. Table 1 provides a description of the demographic profile of the responding firms. The demographic characteristics of the construction firms that took part in the survey include the company age, the operational location of the companies, and the number of employees.

To determine the sample size from this population, G*Power 3.1 software for sample size determination was utilized, where a priori power analyses (Cohen 1988) was performed. As shown in Figure 2, the sample size N was computed as a function of the required power level ($1 - \beta$), the pre-specified level of significance (α), and the effect size of the population that will be determined with probability $1 - \beta$. It should be noted that in a priori test, statistical power is well controlled before the actual study is conducted (Faul et al. 2007). As noted by Cohen (1977), the rule of thumb for calculating the sample size is the effect size

Table 1. Firm characteristics.

Parameters	Frequency	%
Company age (years)		
1–5	36	21.1
6–10	27	15.6
More than 10	109	63.3
Operational location		
Local markets	35	20.3
Within few states	40	23.3
Regional market	20	11.1
Across the entire Malaysia (including East Malaysia)	68	37.8
International market	9	5.0
Workforce (number of employees)		
<100	120	69.7
101–250	13	7.6
251–500	10	5.6
>500	29	16.1

($f^2 = 0.15$); significance alpha level ($\alpha = 0.05$); desired statistical power ($1 - \beta = 0.95$); and a total number of three predictors (business innovativeness, organizational capabilities and technology orientation). As shown in Figure 2, the statistical test results indicated that a minimum sample size of 119 is required for a linear multiple regression-based statistical analysis. It is also evident that Cohen (1977) recommended a value of 0.95 for the determination of effect sizes used in this study. However, a sample size of 119 appears inadequate for a population of 4,520 construction firms. Consequently, an additional sample size determination procedure (Krejcie and Morgan 1970) was explored. Based on this procedure, a total number of 354 construction firms were deemed appropriate for a population of 4520. However, the low rate of response peculiarity of the MCI is considered in the questionnaire administration (Waris et al. 2014). To take care of this tendency and minimize sampling error, the researchers doubled the sample size based on the recommendations of Hair et al. (2008). Hence, 708 questionnaires were administered to the construction firms across the eleven states of West Malaysia.

As regards the sample unit in this study, since the unit of analysis is the construction organizations, the questionnaire respondents are single individuals from each firm. This must be either an executive director, a project manager, a marketing manager, an engineer, a quantity surveyor, a contract manager, a construction manager, or any other employee who is conversant with the variables in this study. The researchers personally administered and mailed copies of questionnaires to 787 construction firms. While data collection lasted for 20 weeks (6 months), 189 usable questionnaire copies were returned, and 172 were subsequently analyzed representing 22.9% of the total. Nine invalid and incomplete questionnaire copies

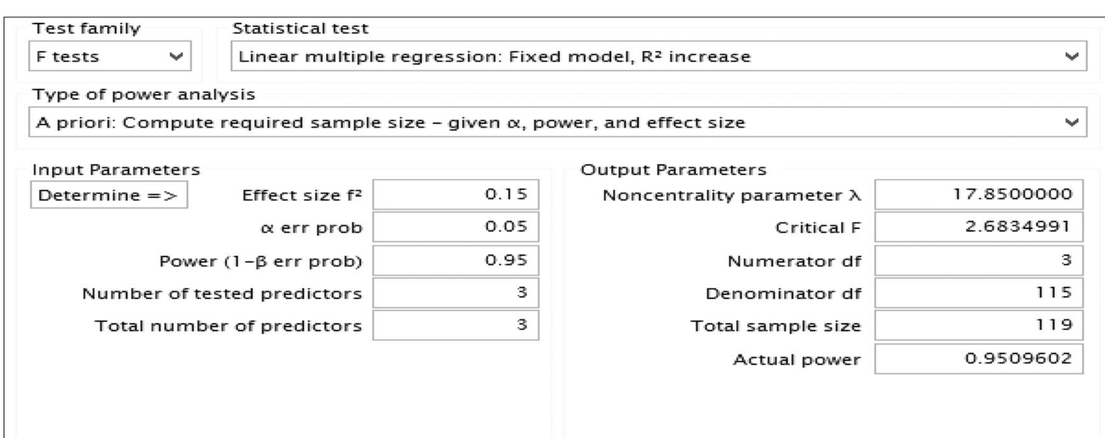

Figure 2. Power analysis for medium effect.

were excluded, and another eight cases were removed after the assessment of multivariate outliers with the aid of Mahalanobis distance (D^2). Therefore, the effective response rate was approximately 24%, which is an adequate survey response rate in the construction industry (Akintoye 2000; Dulaimi et al. 2003).

Measures

Since this study uses already validated scales, the researchers made necessary adjustments to the survey instrument, including the language. The measures used in the questionnaire survey are given in the Appendix, while all the variables in this study were measured in Likert 1–5 scale in which the range of responses was 1, not at all, to 5, completely true. The authors measured business innovativeness using Kamaruddeen et al.'s (2012) scale. According to this scale, organizational innovativeness was measured as a second-order construct consisting of four reflective dimensions identified in the innovativeness literature (Damanpour et al. 1989).

Technology orientation was measured by applying the scale used in Gatignon and Xuereb's (1997) empirical research. According to this study, technology orientation is made up of nine items representing the domain of new products development, rapidity of new technologies integration, and being proactive in new technology development.

All of the scales used to measure organizational capabilities dimensions have their origin in the research developed by Lopez-Cabrales et al. (2006). This is defined by 24 items distributed over five dimensions: firm culture, customer loyalty, flexible design, product diversity and quality orientation.

As regards social sustainability, the scale worked out by Abidin (2005) was adopted. This measure has been used in several studies (e.g. Al-Saleh and Taleb 2010; Tam 2010; Bamgbade et al. 2017a). The scale concentrated on whether the responding firms consider the core social sustainability issues in their construction projects on a 1 to 5-point Likert scale, where the range of responses includes 1 = not at all, to 5 = completely true.

To prepare the final survey, the researchers validated the instrument through the face and content validities with experts on all the survey sections. Three experts were selected from the School of Technology Management and Logistics, University Utara Malaysia, while another four construction industry's practitioners were also contacted for the same exercise. Their contributions and recommendations were subsequently incorporated into the second version of the questionnaire. The research, therefore, proceeded to a pre-test using 45 construction firms. The final questionnaire thus contained 43 items.

Data analysis and results

This study applies several tests to take care of potential sources of bias in the data collected (Armstrong and Overton 1977). To ensure that there is no statistical difference between the 'early' respondents and the 'late' respondents, the extrapolation methods of Armstrong and Overton, (1977) was carried out. The test shows that the assumption of equal variances between these two groups was not violated in this study. Based on the fact that data for all the four latent variables in this study were self-reported from a single source at one point in time, there may be a possibility of common variance bias. Thus, following the recommendations of Huber and Power (1985), and Podsakoff *et al.* (2003), and in view of the fact that the responses could not be obtained from different sources over a long period, this study followed all the steps required in questionnaire survey design. In the survey, the authors guaranteed response anonymity and made a clear separation of the measurement of the predictors from those of the criterion variables. In applying the single-common-method, Harman's one-factor test was applied across all the responses, and there was no single factor identified to explain the variance across all the items. The implication of this is that a mono-method bias is not likely in this study. Out of the 10 factors that are identified, which explain a cumulative of 72.62% of the variance, the largest factor explains 42.47% of the total variance. Going by the assumptions of Podsakoff and Organ (1986), since no single factor explains more than 50% of the variance, this study's variables are accepted as valid (Podsakoff and Organ 1986).

This study also computes variance inflation factors (VIFs) for each exogenous latent variables for collinearity diagnostic measures. Hair et al. (2011) suggested that within the PLS-SEM environment, a VIF value above 5.0 and a tolerance value of 0.20 or lower, respectively, could indicate multicollinearity problems. The test indicates that there is no evidence of collinearity among this study's exogenous latent constructs because the VIF values generated were less than 5 and the tolerance values recorded exceed 0.20. Hence, multicollinearity is not an issue in this study.

Statistical method

In this study, the data analysis method used is the partial least-squares structural equation modelling (PLS-SEM) technique for analysing both the outer and the inner models. The PLS-SEM was chosen considering the fact that this study intends to predict the changes in the endogenous latent variables in response to changes recorded in the exogenous latent variables (Reinartz et al. 2009; Roldán and Sánchez-Franco 2012; Salimon et al. 2017; Adeleke et al. 2018). This technique is also proven to support this study's model that comprises multiple constructs, path relationships and indicators as well as advanced elements such as the mediator variable and hierarchical components (Sarstedt et al. 2014; Richter et al. 2016).

Measurement model

The measurement model began with the assessment of individual item reliability (Table 2). All the loadings are evidently above the accepted 0.7 thresholds (Carmines and Zeller 1979), for both the indicator variables and the first-order constructs (dimensions) that are related to reflective second-order constructs.

Construct reliability assessment was carried out by observing the composite reliability (Werts, Linn and Jöreskog 1974). In Table 2, all the four second-order constructs meet the requirement of construct reliability since the composite reliabilities recorded for them are greater than 0.7 as suggested by Nunnally (1978). Additionally, as shown in Table 2, all the constructs, including their dimensions achieved convergent validity because their average variance extracted (AVE) exceed the 0.5 level as recommended by Fornell and Larcker, (1981). In determining the discriminant validity, the square root of the AVE (the diagonal figures in Table 3) was compared with the correlations between latent constructs (the off-diagonal figures). Overall, each latent construct is more related to their measures than to others.

Table 2. Individual reliability, composite reliability and average variance extracted for the first-order and second-order constructs.

	Factor loadings	
Constructs Social sustainability	First order	Second order (AVE = 0.667, CRC = 0.933)
SoS 1	0.869	
SoS 2	0.833	
SoS 3	0.832	
SoS 4	0.825	
SoS 5	0.852	
SoS 6	0.849	
SoS 7	0.634	
Organizational capabilities		AVE = .500, CRC = .959
Customer loyalty	AVE = 0.69, CRC = 0.92	0.83
CL1	0.863	
CL2	0.810	
CL3	0.876	
CL4	0.896	
CL5	0.698	
Organizational culture	AVE = 0.60, CRC = 0.90	0.91
OC1	0.765	
OC2	0.790	
OC3	0.767	
OC4	0.767	
OC5	0.791	
OC6	0.769	
Flexible design	AVE = 0.68, CRC = 0.91	0.72
FD1	0.868	
FD2	0.855	
FD3	0.837	
FD4	0.862	
FD5	0.691	
Product diversity	AVE = 0.64, CRC = 0.88	0.91
PD1	0.798	
PD2	0.814	
PD3	0.794	
PD4	0.803	
Quality orientation	AVE = 0.72, CRC = 0.93	0.90
QO1	0.811	
QO2	0.850	
QO3	0.880	
QO4	0.871	
QO5	0.826	
Technology orientation		AVE = 0.587, CRC = 0.908
TO1	0.801	
TO2	0.726	
TO3	0.773	
TO4	0.750	
TO5	0.761	
TO6	0.760	
TO7	0.787	
Business innovativeness		AVE = 0.711, CRC = 0.908
BI1	0.769	
BI2	0.891	
BI3	0.894	
BI4	0.813	

Structural model

The assessment of the inner model (the structural model) was carried out by estimating the path coefficients and their significance through a bootstrapping technique, the evaluation of variance explained (R^2 values) and the tests for predictive relevance (the Q^2 value) to determine the model's quality. In this structural model analysis, all three main paths are significant (Figure 3). Likewise, all the endogenous latent variables achieve R^2 values higher than 0.5, which are moderate according to Chin's (1998) recommendation. The cross-validated redundancy measure (Q^2) was also examined following the recommendations of

Geisser (1975), Stone (1974), and Hair et al. (2014), and the result confirms that the inner model (Figure 3) has an adequate predictive relevance for the two predictor latent variables (i.e. organizational capabilities and social sustainability).

In order to test the mediating paths hypothesized in this study, the analytical approach of Preacher and Hayes (2008) was applied. The total effects of the

Table 3. Descriptive statistics and discriminant validity coefficients.

Construct	Mean	SD	1	2	3	4
1. Business innovativeness	3.781	0.665	**0.843**			
2. Social sustainability	3.969	0.647	0.491	**0.817**		
3. Organizational capabilities	3.981	0.686	0.591	0.510	**0.707**	
4. Technology orientation	3.49	0.823	0.618	0.568	0.610	**0.766**

Note: The diagonal elements (bold) are the squared correlations of the variance shared between the constructs and their measures, while the off-diagonal elements represent the correlations between the latent constructs. To ascertain discriminant validity, the diagonal elements should be higher than the off-diagonal elements.

business innovativeness (d) and technology orientation (e) on social sustainability are depicted in Figure 4. The total effect is arrived at through a range of direct and indirect forces. Equally, in Figure 5, the total effect of the business innovativeness on social sustainability can be expressed as the sum of the direct effect (d') and indirect effects (a^*c). Thus, going by the approach of Taylor, MacKinnon, and Tein (2008), $d = d' + a^*c$. One of the major advantages of this approach is the ability to isolate the indirect effect (a^*c) as hypothesized in H6. The relationships d and d' as given in H1 is observed in order to determine the presence of either a full or partial mediation in the model. This procedure is repeated in the total effect of technology orientation on social sustainability, $e = e' + b^*c$ where b^*c represents the indirect effect as hypothesized in H7.

The results of this assessment are shown in Table 4 and Figure 4. Business innovativeness has a significant

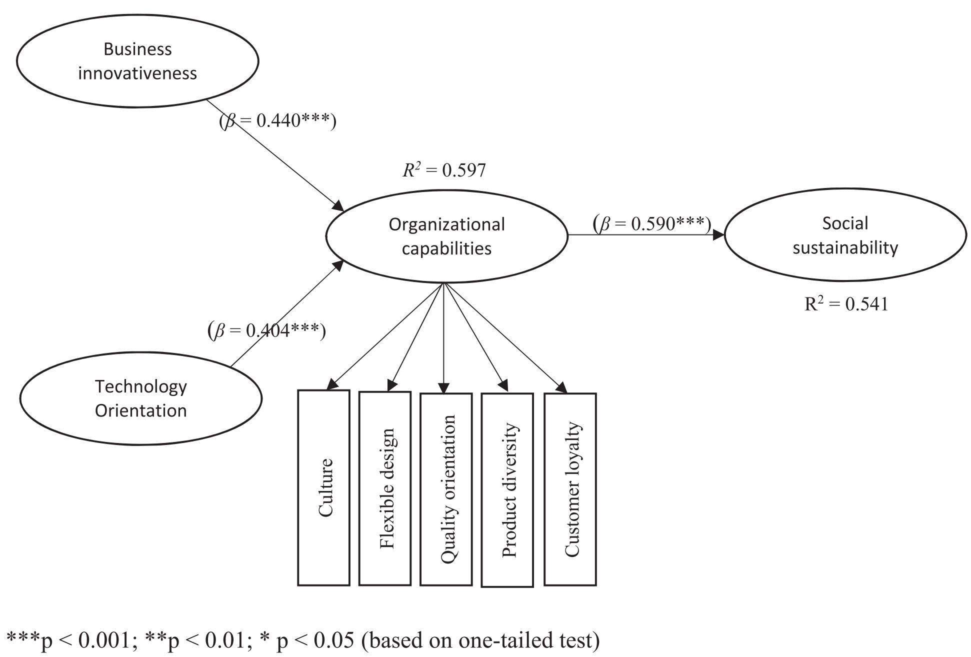

Figure 3. Structural model results.

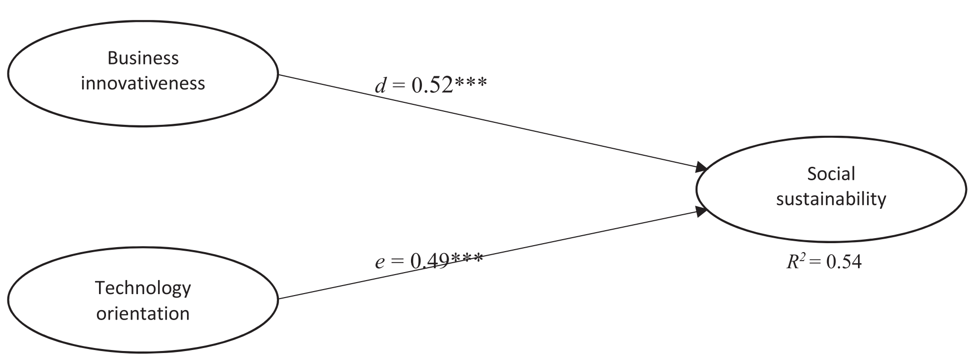

Figure 4. The model with total effects.

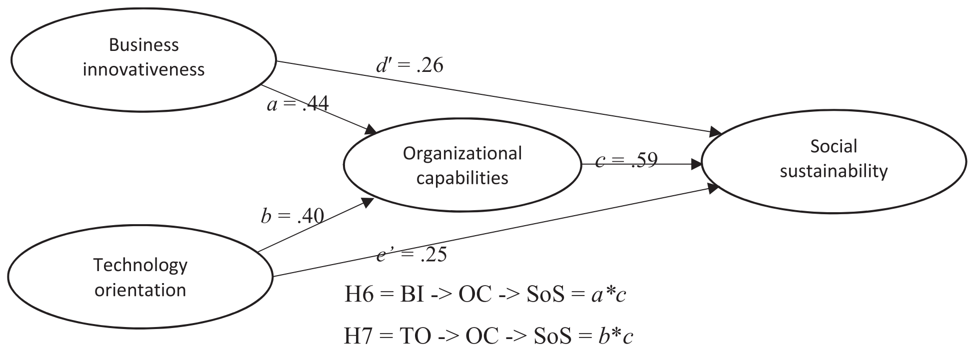

Figure 5. The model with mediated effects.

Table 4. Path coefficients and indirect effects for mediation models.

Relationships	Total effects	Direct effect to OC	Direct effect to SoS	Indirect effect Estimate
BI → SoS	0.52***(2.50)			
TO → SoS	0.49***(5.57)			
BI		0.44***(10.42)	0.26***(7.89)	
TO		0.40***(10.90)	0.25***(8.65)	
OC			0.59***(11.45)	
BI → OC → SoS = a^*c				0.25
TO → OC → SoS = b^*c				0.24

BI, business innovativeness; TO, technology orientation; OC, organizational capabilities; SoS, social sustainability.
***$p < 0.01$; t-values in parentheses.

total effect on social sustainability ($d = 0.52$, $t = 2.50$). Consequently, this has given support to H1. It implies that business innovativeness improves social sustainability in construction firms. The second hypothesis (H2) which conjectured that technology-oriented construction firms will perform better in social sustainability is also supported ($e = 0.49$, $t = 5.57$). As regards the relationship between organizational capabilities and social sustainability (H3), the result, as indicated in the structural model analysis, implies a positive relationship ($b = 0.59$; $t = 11.45$). The hypothesized path between business innovativeness and organizational capabilities (H4) was positively significant ($a = 0.44$: $t = 10.42$), while H5, which speculated that technology orientation will influence organizational capabilities was also supported statistically ($b = 0.40$; $t = 10.90$).

When organizational capabilities was introduced as a mediator (Figure 5), business innovativeness' relationship with social sustainability remains significant, although its direct effect on social sustainability reduced ($d' = 0.26$, $t = 7.89$). Its indirect effect via organizational capabilities achieves a point estimate of 0.25 (a^*c). This means that organizational capabilities partially mediates the influence of business innovativeness on social sustainability, supporting H6 (Baron and Kenny 1986). H7 is also supported. The indirect effect through organizational capabilities (b^*c) has a total effect of 0.24 (Table 4). In this respect, it can be observed that although, technology orientation has a substantial total effect on social sustainability ($e = 0.49$; $t = 5.57$) (Figure 4), but, when organizational capabilities is included in the model to play a mediating role, technology orientation's effect on social sustainability was reduced, albeit a significant effect ($e' = 0.25$, $t = 8.65$) (Figure 5). Therefore, it can be concluded that organizational capabilities partially mediates the effect of technology orientation on social sustainability (Baron and Kenny 1986).

Discussion

By examining three types of firms' internal drivers and their inter-relationship, the authors offer a different direction to social sustainability that previous studies failed to consider. Furthermore, the analysis of direct and indirect effects of the drivers for social sustainability provides valuable guidelines for developing well-aligned social sustainability performance in construction firms.

First, consistent with previous studies in the field of social sustainability (Rodriguez-Melo and Mansouri 2011; Jiang and Wong 2016; Bamgbade et al. 2017), the findings of this study indicate that business innovativeness and technology orientation have positive impacts on social sustainability performance.

Similarly, this study confirms previous findings that highlight the importance of organizational capabilities on CSR and environmental management systems (Kesidou and Demirel 2012). Organizational capabilities act as a bridge between technology orientation and social sustainability performance. It is important to recognize the mediating role of organizational capabilities as previous studies estimated the impacts of organizational capabilities by concentrating only on their direct effect. As evident in Table 4, the interrelationship between firms' drivers (organizational innovativeness, organizational capabilities, and technology orientation) and social sustainability performance is well outlined. The statistical findings that indicate that business innovativeness had stronger positive direct effects ($\beta = 0.52$) and indirect effects ($\beta = 0.26$) on social sustainability performance extend the understanding of innovation and construction sustainability literature by highlighting the fundamental role that business innovativeness plays in enhancing social sustainability performance of construction firms.

The findings in Table 4 lend additional support to the proposition that organizational capabilities partially mediate between business innovativeness and social sustainability performance, as well as between technology orientation and social sustainability performance. That is, organizational capabilities could effectively facilitate social sustainability performance. These findings imply that firms should first improve their organizational capabilities, develop necessary business innovative capacities, and upgrade and adapt to emerging technologies in order to prepare for improving their social sustainability performance. Overall, this study provides additional evidence for the RBV that extensively indicates firms' capabilities and technological competence as important commitments towards achieving sustainability improvements (De Medeiros et al. 2014). The empirical findings of this study shed light on the drivers of social sustainability performance based on a new dataset of 172 Malaysian construction firms. The findings in this study revealed some interesting new insights: (i) business innovativeness affect social sustainability partially through organizational capabilities; and (ii) organizational capabilities partially mediates between technology orientation and social sustainability performance.

Several contributions are noteworthy in this research. While an extensive review of the literature revealed the existence of some similar models, their focus was on few factors only (e.g. Wolf 2013; Gelhard and Von Delft 2016; Jiang and Wong 2016), and they did not deal with organizational capabilities. Based on the synthesis of the extant literature, the authors developed a conceptual model wherein business innovative capabilities, technology orientation, and organizational capabilities (with the following dimensions: culture, flexible design, quality orientation, product diversity and customer loyalty) were included. The findings showed that models that incorporate multiple constructs and hierarchical components as firms' internal drivers better explain social sustainability performance than models that include only a few factors. The conceptual model in this study would serve as the basis for more comprehensive studies in the future and as a tool for policy formulation aimed at stimulating social sustainability performance.

Research implications

Our findings have some important theoretical implications. First, the sample in this study comprised large firms from the construction sectors. Most empirical studies on sustainability have been concentrating on the manufacturing sector (e.g. Darnall et al. 2010; Dangelico et al. 2013; Adebambo et al. 2014; Egilmez et al. 2014). The construction industry has been largely referred to as a laggard in technology and sustainability adoption, even though it has a considerable impact on the environment and, therefore, much to contribute to the global sustainability agenda (Soltani 2016; Bamgbade et al. 2018). Second, the findings is also in consonance with the RBV of firms, which observed that companies that are better able to understand, nurture and leverage their core competencies (in terms of innovative capabilities, customer loyalty, product diversity, quality orientation, and flexible design) outperform others that are engrossed with more conventional models to strategic business planning (Prahalad and Hamel 1990). Therefore, findings in this study have confirmed that core organizational capabilities are one of the major drivers of social sustainability performance.

While the findings in this study might not be valid universally, because the sample of firms is from a country; nonetheless, they have cogent implications for policymakers as well as corporation managers on the subject of boosting social sustainability performance in Malaysian construction firms. Several studies have pointed out the direct impact of technology orientation on firm sustainability performance (Molamohamadi and Ismail 2013; Teh et al. 2015), but they did not pay attention to the inclusion of a mediator variable in such relationships. The mediating effect of organizational capabilities highlights the role played by these drivers (culture, flexible design, quality orientation, product diversity, and customer loyalty) in facilitating social sustainability performance in firms. In this sense, as the MCI pushes for stronger sustainability performance, it cannot rely only on organizational innovativeness and technology orientation. It is important that corporation stakeholders further emphasize the core capabilities measures to enhance the influence of these drivers. This study had hitherto contemplated that such a mediating role might bolster the direct effect of technology orientation on firm social sustainability, and as envisaged, the indirect effect via organizational capabilities was able to strengthen the hypothesized paths. This finding supports the submission of some authors. On the one hand, there are authors who have concluded that innovativeness must be in place for firms to perform well in social sustainability delivery (El-Kafafi and Liddle 2011). On the other hand, authors have also found that firms' technology orientation is a critical antecedent for sustainability delivery in the whole lifecycle of a construction project (e.g. Wong and Zhou 2015). This study explains this result, while also taking into consideration the fact that technology orientation stimulates an organization's capabilities that are necessary for social sustainability.

The present study also confirms the influence of organizational capabilities on social sustainability. This is addressed in some studies (such as in Machado et al. 2017) but lacked a sound empirical foundation. This is attributable to some ambiguity in the cause and effect relationship, in addition to the fact that organizational capabilities occur throughout a series of operational phases that can render the whole procedure a bit complex. This correlates with the fact that organizational capabilities can also be influenced by other important factors that have an immediate influence on the results.

Limitations and directions for future research

This study has a few limitations which require further studies. This study is cross-sectional, which considers the dynamic nature of organizational capabilities, and considering the fact that organizational capabilities occur over time, it might be better examined using longitudinal data or time-series. While arguments abound in support of organizational capabilities affecting social sustainability, the other causal direction could also be modelled, i.e. social sustainability performance might also engender better organizational capabilities. Thus, additional research might be conducted longitudinally to test measures at different periods in order to further examine the hypothesized relationships set out in the proposed theoretical model.

The data used in this study are largely the subjective opinions of the top officials who responded to the questionnaire survey. While their subjective views obtained with the aid of multi-item scales are fairly consistent with objective measures, there are possibilities of differences between objective data and respondents' perceptions. Subsequent studies might consider this area by adopting objective items through case studies.

The role of the inter-organizational capacity building was not considered in this study, even though this may inspire further research areas that could possibly examine other external capabilities. The clients and other competitors in the industry could provide these capabilities, in the form of valuable information and novel ideas.

The study focuses on large construction firms in Malaysia. Thus, the findings are explicitly applicable to large construction firms, which are greater in size and active in transnational construction projects as compared to other smaller firms that operate locally. Large firms put greater emphasis on sustainability performance owing to the fact that they are under obligation to observe certain stringent international codes of practice. These differences in firm size constrain the generalization of the findings of this study to other smaller construction firms that are restricted to local operations.

Social sustainability in firms depends not only on internal drivers but also on some external predictors, which include environmental policies, customers' sustainability demands, and competitive pressure (Li and Ye 2011). Thus, future studies might consider the impact of these external predictors on sustainability performance.

Conclusions

In this study, the authors examined the problem of complex social sustainability in construction organizations using the literature from the RBV of firms as its theoretical underpinning.

Second, it has been able to contribute to the ongoing construction sustainability literature by integrating firm business innovativeness and technology orientation into an all-inclusive research model stimulating firm capabilities and the resultant influence of this on the social sustainability performance of construction firms.

Third, this study makes some contributions to the literature on organizational capabilities by demonstrating the significance of the highlighted firm capabilities for sustainability performance. Although business innovativeness and technology orientation are considered as important determinants of organizational social sustainability performance, the authors were able to establish that these influences on social sustainability performance might be indirect – necessitating the mediation role of organizational capabilities. In this manner, business innovativeness has a stronger indirect effect on social sustainability through organizational capabilities than a direct effect (partial mediation). Likewise, technology orientation also affects social sustainability through organizational capabilities (partial mediation).

Acknowledgements

The authors gratefully acknowledge the support and data provided by the construction companies and all personnel who participated in this study.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This work was supported by the Fundamental Research Grant Scheme (FRGS) from the Malaysian Ministry of Higher Education Malaysia [S/O code 12871].

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Appendix

Social sustainability

SoS 1: Health and safety is an important sustainable construction consideration in our projects.

SoS 2: User comfort and satisfaction is an important sustainable construction consideration in our projects.

SoS 3: Community welfare is an important sustainable construction consideration in our projects.

SoS 4: Accessibility is an important sustainable construction consideration in our projects.

SoS 5: Social involvement is an important sustainable construction consideration in our projects.

SoS 6: Workers' welfare is an important sustainable construction consideration in our projects.

SoS 7: Aesthetics is an important sustainable construction consideration in our projects.

Business innovativeness

BI 1: Creating new business systems is critical to the success of our company.

BI 2: Our firm tends to be an early adopter of the innovative business system.

BI 3: Within our firm, we are able to implement innovative business systems used by other companies.

BI 4: Our firm actively seeks innovative business systems from outside this company.

Customer loyalty

CL 1: The key objective is customer satisfaction.

CL 2: The organization is always available to hear customers' needs or criticisms.

CL 3: The organization treats all customers fairly and impartially.

CL 4: The per cent of customer retention is high in comparison with other businesses in the same sector.

CL 5: The warranty allows a refund or repair of a bad product.

Organizational culture

OC 1: Managers communicate to employees the shared values of the organization.

OC 2: Workers can identify and articulate the firm's shared values.

OC 3: There are very few instances when workers' actions appear to violate the firm's espoused values.

OC 4: The coherence between the employee's values and organizational culture is examined in the selection process.

OC 5: Employees' behaviours that are coherent with organizational culture are rewarded.

OC 6: Managers provide support to employees to reach organizational goals.

Flexible design

FD 1: Jobs are broadly designed.

FD 2: The culture is characterized by a willingness, even eagerness, to change.

FD 3: Financial, physical, intangible, and human resources can be easily moved.

FD 4: Decision making is highly decentralized.

FD 5: Unimportant functions are externalized or outsourced.

Product diversity

PD 1: Our business is located in several sections

PD 2: Our firm is able to obtain several products/services at the lower cost through its synergy.

PD 3: Our products/services are unique but related

PD 4: Product diversity is one of our firm's priority.

Quality orientation

QO 1: There is a strong commitment to quality at all organizational levels.

QO 2: Ongoing improvement is a key objective (target) for the firm.

QO 3: Our workers keep records and measures about the quality of their work.

QO 4: Techniques like 'brainstorming' are used to improve the quality of our outputs.

QO 5: Workers critically analyse the quality of their output.

Technology orientation

TO 1: Our firm uses sophisticated technologies in its all units.

TO 2: Our firm uses state of the art of technology for products development.

TO 3: Our firm is very proactive in the development of new technologies.

TO 4: Our firm has the will and the capacity to build and market a technological breakthrough.

TO 5: Our firm has built a network of relationships with suppliers of technological equipment.

TO 6: Our firm's R&D programmes are more ambitious to create knowledge among employees and improving organizations' performance.

TO 7: Our firm is very proactive in providing innovative technical solutions to respond to clients' needs.