



Do all elements of green intellectual capital contribute toward business sustainability? Evidence from the Malaysian context using the Partial Least Squares method

Yusmazida Mohd Yusoff ^{a, *}, Muhamad Khalil Omar ^a, Maliza Delima Kamarul Zaman ^a, Sarminah Samad ^b

^a Faculty of Business and Management, Universiti Teknologi MARA, 42300, Bandar Puncak Alam, Selangor, Malaysia

^b College of Business and Administration, Princess Nourah bint Abdulrahman University, Riyadh, Saudi Arabia

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ABSTRACT

Few articles have focused on the green aspect of intellectual capital namely green intellectual capital. Nowadays, due to increasing concerns regarding environmental issues, it is essential to investigate the effects of green intellectual capital on organisational sustainability. Hence, this study examines the linkage between the dimensions of green intellectual capital (green human capital, green structural capital, and green relational capital) and business sustainability. Data were gathered from 168 manufacturing small medium enterprises (SMEs) in Malaysia, and analysed using the Partial Least Squares approach. The results show that green structural capital and green relational capital have positive relationship with business sustainability, while green human capital did not. Finally, the implications and limitations of this study were discussed and the recommendations for future studies presented.

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1. Introduction

Sustainability has become a topic of interest for both academics and practitioners. A wide discussions and debates about the concept of sustainability, its important and the way to achieve it are pervasive. The economic profits of business activities have increased prosperity and living conditions globally; however it leads to environmental destruction and social inequality directly and indirectly (Sullivan et al., 2018). Current research by Gong et al. (2018) showed that many environmental destructions occurred and an estimated 60% of the ecosystems worldwide have been degraded. If nothing is done to solve this, environmental problems will continue to increase and it will worsen. However, most of the organisations claim that these environmental corruptions are not

caused by their business activities and see it as the issue to be ignored. Besides that, not all organisations were up on the idea of sustainability. In fact, business landscapes are now different than before with limitation of resources, increasing rates in technology, emerging markets and new business models disruptions for conventional method (Sullivan et al., 2018).

The term sustainability was first applied to in dealing with natural environment degradation and its negative impact on human health, social well-being and economic growth. The definition from World Commission on Environment and Development (WCED, 1987) points out that sustainability is the “development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs” which commonly and widely used in literature and can be applied to these three composite outcomes namely economic, social and environmental.

This is an important issue to be widely discussed as various organisations, states and cities have begun to take a new and different path. They have been actively looking for new innovative

* Corresponding author.

E-mail addresses: yusmazida@gmail.com (Y.M. Yusoff), khalil.omar@salam.uitm.edu.my (M.K. Omar), malizadelima@salam.uitm.edu.my (M.D. Kamarul Zaman), sarminasamad@gmail.com (S. Samad).

solutions to be implemented in the aim to minimise negative impact of human activities on the environment and at the same time enhancing the health of societies in which they live while generating profit. However, many organisations are still unsure on what needs to be done and what strategies to use. The strict environmental regulations alone by the government actions are not enough to implement sustainable business. To deal with the environmental shift trend, organisations are required to create new strategy which is no longer optional but it is necessary and important to all organisations alike (Ray and Grannis, 2015).

In this regard, research on green business such as green innovation adoption (Aboelmaged and Hashem, 2019), green human resource management (Zaid et al., 2018), green supply chain (Jabbour and Jabbour, 2016), green purchasing (Zhang et al., 2018) and low-carbon development (Ma et al., 2019) has grown steadily. Apart from that, Chen (2008) suggested that investment in intellectual capital (IC) that is related to environmental protection known as green intellectual capital (GIC) not only meet environmental management, but also competitive advantage. Furthermore, Mårtensson and Westerberg (2016) stressed on how organisation develops their internal capabilities through the basic fundamental aspects of environmental strategy. Regrettably, there are missing of internal capabilities elements in environmental prevention (Cleff and Rennings, 1999; Delmas et al., 2011; Sharma and Aragon-Correa, 2005).

IC is the sum of all intangible resources (Stewart, 1991) possessed by the organisation which has become more essential rather than tangible resources (Allameh et al., 2010). Previous literature has repeatedly showed the relationship between IC and various organisation's performance. However, GIC is unfamiliar among both academicians and practitioners. In needs to be noted that GIC is a plausible solution for the sustainability issues that have been addressed above.

Chen (2008) as the first researcher who introduced the GIC concept remarked that it can continuously improve competitive advantage of the organisation. GIC is defined as sum of tangible resources or knowledge associated to the environmental protection or innovation (Chang and Chen, 2012; Chen, 2008; Huang and Kung, 2011). Three main components of GIC namely green human capital (GHC), green structural capital (GSC) and green relational capital (GRC).

This research is significant to the context of this study. The significant contribution of SMEs to economic development to all nations globally including Malaysia has been recognized by various opinions empirically and theoretically (Khan and Khalique, 2014; Musa and Chinniah, 2016; Ong, 2015). Moreover, SMEs in Malaysia are dominant which represents 98.5 per cent of total establishments (National SME Development Council, 2017). This big number definitely an important driver to the national economic growth. Additionally, SMEs contribute more than 37.1 per cent of national GDP in Malaysia as well as about 66.0 per cent of the employment (National SME Development Council, 2017). Aboelmaged and Hashem (2019) argue that empirical study on internal capabilities related to green innovation in SMEs context is underexplored and hardly found in the literature. Moreover, Chen (2008) claims that there is less attention given to green intellectual capital in SMEs compared to larger organisations especially in developing nation. Filling these gaps is seems very important for SMEs policies (Moilanen et al., 2014).

Besides that, the SMEs in manufacturing context is chosen for the study setting for three reasons. First, SMEs in the Malaysian manufacturing sector comprised of 47,698 companies which is very dominant i.e. 97.14 per cent of the total manufacturing establishment in the country (National SME Development Council, 2017). Second, manufacturing sector is one of the biggest contributors to

the national economy; however, it is also leads to the environmental destructions (Yong et al., 2019). Lastly, Cai et al. (2019) stressed that the implement of innovation to fulfil the environmental pressure particularly in manufacturing sector towards green transformation is an urgent task due to the large amount and wide distribution of energy consumption.

This paper is novel conception due to the lack in prior studies as many did not focus on the relationship between GIC and business sustainability (BS) in the context of developing country; Malaysia to examine the relationship between GIC and BS in manufacturing SMEs. The paper is organised as follows. First, we review the literature of the constructs in theoretical model and develop a series of hypotheses. Second, we provide explanations of the method used in this study. Third, we present results and lastly, we discuss the results and implications of the study.

1.1. Research objective

This present study aims to examine the relationship between green intellectual capital dimensions (green human capital, green structural capital and green relational capital) and business sustainability. A total of 168 manufacturing SMEs in Malaysia were involved in this study.

1.2. Research question

This study should be conducted to access the green intellectual capital-business sustainability linkage. For instance, Mishal et al. (2017) and Cavicchi and Vagnoni (2017) suggest that intellectual capital enhances sustainability of the organisation. Similarly, previous scholars asserted that intellectual capital leads to innovation (Allameh, 2018) and enhances reputation and performance (Ginesti et al., 2018; Bontis et al., 2018). Chen (2011) asserted that the concept of environmentalism has become popular in today's business world. Many organisations are trying hard to become more sustainable organisation. Previous scholars noted that GIC might provide owners or managers with a depth understanding and knowledge to achieve better financial performance (Erinos and Rahmawati, 2017) and green competitive advantage (Firmansyah, 2017). Thus, it is vital to linked GIC to BS. The research question as follows:

RQ1: Does green human capital play a significant role in improving business sustainability?

RQ2: Does green structural capital play a significant role in improving business sustainability?

RQ3: Does green relational capital play a significant role in improving business sustainability?

2. Literature review

2.1. Business sustainability

The term 'sustainability development' was first introduced in a report entitled the limits of growth published in 1972 (Gunilla, 2014). The study was later reproduced in the Brundtland Report in 1987, and then further published in the World Commission on Environment and Development (WCED) in 1989 (Borim-de-Souza et al., 2015). The report defined the sustainability of present development without ignoring the needs of future generations. According to the report, the term 'sustainability' is based on two main concepts; the poor's necessary needs and the environmental limitation to meet future needs. Another contributor to the field is Elkington (1994), who introduced the triple bottom line (TBL), which is a sustainability-related framework comprising three lines, namely profit, people, and planet or also known as the 3Ps

(Montabon et al., 2016). The concept not only introduced the report formatting for business report accounting but also the requirement to include the evaluation of the business in decisions of risks, accountability, and all financial aspects of social and environmental opportunities. The terms 'TBL' and 'sustainability' are usually used interchangeably (Alhaddi, 2015).

There is no one definition for sustainability (Galpin and Hebard, 2015), with many research scholars providing more than 70 various definitions (Lozano, 2008) of the term (Barkemeyer et al., 2014; Habidin et al., 2015; Owens and Legere, 2015; Ratiu and Anderson, 2015). Svensson and Wagner (2011) viewed sustainability as an organisation's connection with planet earth—the mother of all stakeholders. Sustainability, according to Savitz and Weber (2014), creates benefits for their stakeholders, improves the lives of the people whom it interacts with, and protects the environment. They also claimed that the three dimensions of sustainability are closely related, and any change in one would change the other (Savitz and Weber, 2014). Contrary to Montabon et al. (2016), who stressed that sustainability is highly dependant on reducing environmental problems, the view that sustainability increases social health and wealth at the same time is not true.

Bansal and Desjardine (2014) defined sustainable development as the proactive strategies implemented by an organisation to achieve its stakeholders' objectives while taking into account the needs of the future generation. In other words, sustainability aims to achieve three performance goals, which are economic, social, and environmental, all at the same time (Sartori et al., 2014). Meng (2015) argued that the term 'sustainability' generally touches on balancing and sustaining the wellbeing of people. Besides that, sustainability does not only focus on the three above-mentioned aspects but is also linked to corporate social responsibility (Kopnina, 2017) and moral issues (John and Narayanamurthy, 2015). However, Stancu et al. (2015) asserted that profit was more important than moral issues and corporate social responsibility. Past researchers also agreed, mentioning that if organisations aimed for profitability, they would increase their initiatives to minimise wastage while increasing profits, as well as recycle and reuse limited resources to enhance economic performance, which is one of the environmental aims of sustainability (Maletic et al., 2015).

Although the aim of sustainability is to keep balance of multi-dimensional performances, its meaning are inconsistent (Bansal and Desjardine, 2014). Consequently, the misconceptions of the term abound, with many different abstract and theoretical concepts being associated with it (Jabareen, 2008). Following the above various standpoints, business sustainability in this study refers to the organisational aim to achieve profit and improve social development while accounting for environmental aspects (Galpin et al., 2015).

2.2. Green intellectual capital

Today's world is now focusing more on intangible assets rather than tangible assets to achieve better performance (Agostini et al., 2017) (Eisenhardt and Schoonhoven, 1996). It is believed that intangible assets will ensure an organisation's survival (Obeng et al., 2014), encourage value creation (Berezinets et al., 2016; Edvinsson and Malone, 1997; Sullivan, 1999), and improve competitive advantage (Roos, 2017). The term "intangibles" or "intangible assets" also refers to intellectual capital (IC) (Alcaniz et al., 2011; Petty and Guthrie, 2000). Organisations that have a higher IC will benefit more than those with a poor IC (Ahmad and Ahmed, 2016). Recently, Verbano and Crema (2016) suggested IC as a weapon for overcoming the weakness of SMEs.

The term 'IC' was coined by John Kenneth Galbraith in 1969

(Bontis, 1998) with Tom Stewart further popularising the concept in 1991 (Serenko and Bontis, 2004). The IC concept has generated much discussion, culminating in a wealth of literature on the subject across various disciplines. Stewart (1991) defined IC as "the sum of things known by everyone in businesses, which ensures competitive advantage in the market or the total stocks of the collective knowledge, information, technologies, intellectual property rights, experience, organisational learning and competence, team communication systems, customer relations, and brands that are able to create value for an organisation".

Edvinsson and Sullivan (1996) suggested another definition of IC as "knowledge that comprises ideas, inventions, patents, computer programs, trademarks, and design that can be converted into organisational value". Roos and Roos (1997) expressed IC as "all non-monetary and nonphysical resources that are fully or partly controlled by the organisation and that contribute to the organisation's value creation". Brooking (1996), who is another contributor in the field, described IC is a term given to all intangible assets that enable an organisation to function. Bontis (2000) asserted that IC is the set of all knowledge that was and is possessed by the employees and the organisation to achieve a competitive advantage or other benefits that would create a fortune.

Although there has been a proliferation of literature discussing the concept of IC, the IC definitions put forth are almost metaphorically similar. From the above definitions, it can be concluded that IC describes all the intangible resources of an organisation that enable the organisation to create value and achieve a competitive advantage. Besides that, existing literature has repeatedly illustrated IC concepts from various points of view. However, the integration of IC with environmental concepts (known as GIC) is uncommon with both academics and practitioners not giving the subject due attention.

Chen (2008) was the first researcher to introduce the concept of GIC. Later, Yong et al. (2019) posited the view of GIC as an unimportant field in management literature and thus its very scarce definitions. Of these few definitions, Chen (2008) described GIC as the sum of intangible resources, capabilities, knowledge and relationships related to green protection or environmental innovation. Liu (2010) described GIC as the combination of capability and green knowledge of organisations to enhance competitive advantage. Similarly, Lopez-Gamero et al. (2011), suggested GIC as the overall knowledge that helps in conducting green management to obtain competitive advantage.

Chen (2011) asserted that the concept of environmentalism has become popular in today's business world, as it aims to reduce environmental impacts and regulate climate change to further motivate the organisation to produce green innovation. However, the high consumer awareness on environmental issues has forced organisations to find better strategies to comply with environmental trends by integrating environmental management to improve their green image and competitive advantage (Chen et al., 2014; Murga-Menoyo, 2014). Huang and Kung (2011) also claimed that GIC helps organisations meet strict international environmental regulations, creates value for the organisation, and meets the high customer demands regarding environmental issues.

Chen (2008) further claimed that to successfully adopt an environmental strategy, the organisations must have environmental knowledge that will help them establish the relevant possibilities for process and product alteration. In this way, GIC not only minimises environmental impact, but also provides a competitive advantage to organisations through lowering costs (Chang, 2011; Chen, 2008). This study adopted three elements to explain GIC, namely green human capital (GHC), green structural capital (GSC) and green relational capital (GRC), as suggested by Chen (2008).

Studies on GIC are scant. In the limited literature, [Yong et al. \(2019\)](#) found that both green structural capital and green relational capital had a positive effect on green human resource management in large manufacturing organisations. [Aboelmaged and Hashem \(2019\)](#) revealed that sustainable human capital had an insignificant effect on green innovation adoption. Meanwhile, [Yusoff et al. \(2019\)](#) found that organisational learning capability had a positive relationship with business sustainability. [Erinos and Rahmawati \(2017\)](#) found evidence to support the positive relationship between green intellectual capital and financial performance. On the other hand, [Firmansyah \(2017\)](#) revealed that two classifications of GIC, namely green structural capital and green relational capital, had a correlation with green competitive advantage.

In addition, [Delgado-Verde et al. \(2014\)](#) found that the GIC component; green social capital, positively related to environmental product innovation, but green organisational capital did not. [Chang and Chen \(2012\)](#) revealed that corporate social responsibility and environmental consciousness had a positive effect on green intellectual capital. [Huang and Kung \(2011\)](#) found that green intellectual capital mediated the relationship between environmental consciousness and competitive advantage. Finally, [Chen \(2008\)](#) found that green intellectual capital contributed to the competitive advantage of an organisation.

2.3. Hypotheses development

2.3.1. Green human capital and business sustainability

[Wright et al. \(1994\)](#) suggested that competitive advantage could be sustained based on the pool of human capital. Human capital, according to [Subramaniam and Youndt \(2005\)](#), is one of the key strategic resources for organisational success since the knowledge and skills of employees is important to sustain a business in the fast-changing environment of today. In addition, the Human Capital Theory states that the more knowledge and skills possessed by individuals, the more productive they will be ([Davidsson and Honig, 2003](#)). In this knowledge-based era, organisations require employees, decision makers, and problem solvers to be knowledgeable. It is believed that human capital will improve as employees acquire new information, skills, and know-how. Hence, the employees will be able to perform their job efficiently, reduce decision-making errors, improve their quality of work, and achieve better performance ([Luthans and Youssef, 2004](#)).

Nowadays, an organisation cannot ignore the environmental aspect. Hence, it is essential to explore the role of GHC and its effect on business sustainability. [Yong et al. \(2019\)](#) found evidence of GHC having a positive effect on green human resource management. Similarly, [Erinos and Rahmawati \(2017\)](#) found evidence to support the positive effect of GRC on financial performance. Meanwhile, [Chen and Chang \(2013\)](#), in their study, also confirmed the linkage between GHC and green innovation performance.

[Huang and Kung \(2011\)](#) revealed that GIC helped organisations meet strict international environmental regulations, created value for the organisation, and met high customer demands regarding environmental issues. In addition, [Akhtar et al. \(2015\)](#) claimed that human capital is important to achieve sustainability. However, no empirical research has yet investigated the relationship between GHC and business sustainability (BS). As such, this study hypothesises that:

H1. There is a positive relationship between green human capital and business sustainability.

2.3.2. Green structural capital and business sustainability

[Widener \(2006\)](#) claimed that an organisation with poor systems

and procedures would not be able to achieve its full performance. Similarly, an organisation with a strong structural capital will have a strong supportive environment that motivates its employees to learn new knowledge ([Florin et al., 2002](#)). Previous scholars have acknowledged the importance of structural capital in improving organisational performance ([Bontis et al., 2000](#); [Hsu and Wang, 2012](#); [Mention and Bontis, 2013](#); [Sharabati et al., 2010](#); [Wang et al., 2014](#)). In addition, organisations should develop a stable environmental structure to cope with climate challenges. This structure includes internal policies ([Lee et al., 2015](#)), established research and development ([Kuo et al., 2015](#)), and low carbon management practice ([Raar, 2015](#); [Singh, 2015](#)). These factors will enable the organisation to produce positive environmental outcomes, employees with good wellbeing, and generate profit. In addition, a greener culture can improve sales and reduce cost ([Mehta and Chugan, 2015](#)).

Numerous past studies have revealed the significant positive effect of green structural capital on performance outcomes. [Chen \(2008\)](#) and [Firmansyah \(2017\)](#) found evidence of the linkage between green structural capital (GSC) and competitive advantage. [Huang and Kung \(2011\)](#), in their study, revealed the positive effect of GSC on environmental competence and commitment-related activities. [Delgado-Verde et al. \(2014\)](#) found that green organisational capital had a positive relationship with green product innovation. [Erinos and Rahmawati \(2017\)](#) found evidence to support the positive effect of GSC on financial performance. [Gürlek and Tuna \(2017\)](#) showed that there was a significant relationship between green organisational culture and green innovation.

Besides that, [Akhtar et al. \(2015\)](#) claimed that structural capital was important to achieve sustainability. However, no empirical research has yet investigated the relationship between GSC and business sustainability (BS). As such, this study hypothesises that:

H2. There is a positive relationship between green structural capital and business sustainability.

2.3.3. Green relational capital and business sustainability

Relational capital (RC) enables the exchange of information between partners. An organisation can gain important information from its stakeholders. [Nelson and Winter \(1982\)](#) argued that the higher the interaction between partners, the better the organisational routines. The Social Exchange Theory ([Macneil, 1980](#)) posits a relationship between RC and transaction, involving the evolution of the complex personal and organisational structures between organisations. The main feature of the relationship in social exchange, according to [MorganHunt \(1994\)](#), is trust. The collaboration between trustworthy partners enable the relationship between expectations to be improved and stimulates learning ([Doz, 1990](#)). The performance of the organisation can improve as a result of such a close relationship ([Bonner and Walker, 2004](#)).

Most manufacturing organisations are moving towards building close relationships with their suppliers in order to utilise both their capabilities, skills, and information to develop new products faster at lower cost, in turn, positively affecting the performance of the organisation ([Walter, 2003](#)). Moreover, a close cooperation with other organisations can act as a starting point to achieve environmental goals ([Bicknell and Mcmanus, 2006](#); [Kuo et al., 2015](#)). [Nielsen et al. \(2016\)](#) noted that the relationship between organisations, governments, and other institutions, resulted in a more sustainable society. In a current study, [Dickel et al. \(2018\)](#) claimed that stable green collaborations enabled the sharing of environmental awareness among partners that in turn led to the minimisation of environmental uncertainty. Furthermore, [Hansen \(2014\)](#) asserted the importance of networking activities for organisations in establishing good environmental practices. [Matinaro](#)

et al. (2019) also agreed, arguing that knowledge sharing and collaboration were vital in the adoption of a sustainable approach.

The majority of past studies have revealed a significant positive effect of green relational capital on performance outcomes. Chen (2008) and Firmansyah (2017) found evidence of a link between green relational capital (GRC) and competitive advantage. Similarly, Huang and Kung (2011) revealed the positive influence of GRC on environmental competence and commitment-related activities. Moreover, Delgado-Verde et al. (2014) found that, for an organisation to be successful at environmental product innovation, it must have green social capital to encourage cooperative networking among its employees. Erinos and Rahmawati (2017) found evidence to support the positive effect of GRC on financial performance.

Yong et al. (2019) found evidence of GRC having a positive effect on green human resource management. Besides that, Akhtar et al. (2015) claimed that relational capital was important to achieve sustainability. However, no empirical research has investigated the relationship between GRC and business sustainability (BS). As such, this study hypothesises that:

H3. There is a positive relationship between green relational capital and business sustainability.

2.4. Theoretical background

Two main theories namely Natural Resource Based View (NRBV) by Hart (1995) and Intellectual Capital-based View (ICBV) theories by Reed et al. (2006) were used in this study. NRBV complements Penrose (1959) well known resource based view (RBV) suggesting natural one. Hart (1995) claimed that environmental resources and capabilities are required to obtain competitive advantage in the present and future. On the other hand, RBV according to Hart (1995) ignoring the interrelationship between the natural environment and the organisation.

Besides that, intangible assets become the strategic valuable resources and capabilities to the organisation. However, the difficulties to measure these intangible assets raised by scholar such as Bontis (1998). They tried to overcome those bottlenecks on intangible's measurement by introducing intellectual capital measurement models, which is known as ICBV (Reed et al., 2006). Generally, ICBV concentrated on intangible or intellectual resource measurement which categorizing them in three classifications namely human capital, structural capital and relational capital.

The current study tried to link these two theories to conceptualize the intangible resources that leads to business sustainability by assimilating the “green” into conventional intellectual capital namely green intellectual capital.

2.5. Conceptual model

The novelty of the current study is to examine the GIC and BS linkage. Fig. 1 show the proposed conceptual model.

3. Methodology

3.1. Survey and data collection

SMEs in manufacturing industry is the target sample in this study. In Malaysia, SMEs in the manufacturing sector is an organisation that employs not more than 200 full time employees and has an annual sales turnover of not exceeding RM50 million. The list is taken from the Federation of Malaysian Manufacturers (FMM) Directory 2017 as a sampling frame. Survey questionnaires and purposive sampling were used to select the study sample from the

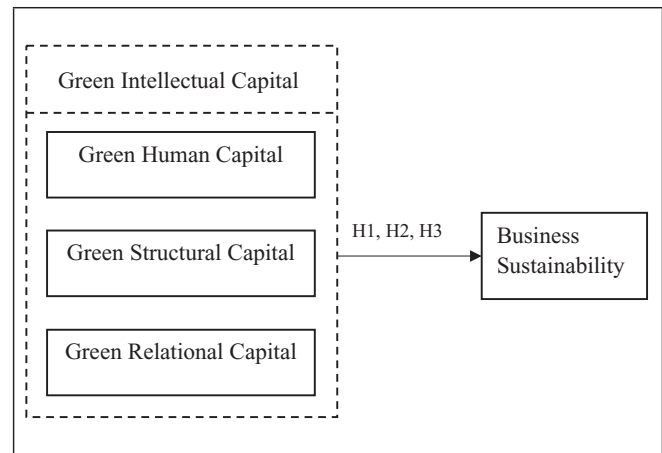


Fig. 1. Conceptual model.

owners or top managers. A total of 840 questionnaires were distributed to the target respondents to get the minimum sample of 341 as suggested by Krejcie and Morgan (1970).

This study has two phases of data collection. The first phase of data collection was between July to September 2017 using self-administered technique. A total of 400 SME manufacturers were selected from FMM Directory 2017. The questionnaires accompanied by a cover letter were distributed to top management of the SMEs manufacturers. Only one individual is required to complete the questionnaire for each organisation. They were requested to complete and return the questionnaire within two weeks. In order to motivate the respondents to return the completed questionnaire, a self-addressed reply and pre-paid envelope was enclosed.

The second phase of data collection, another 440 questionnaires were distributed within a three month period (October 2017 to January 2018). This was done through the mailed and online techniques. The organisations were first contacted by phone and directed to the human resource department. The researcher explained the objective of the research and the importance of their cooperation to provide feedback. After obtaining the details of the key informants (top management), emails were sent requesting them to participate in the survey. The respondents were given two choices of methods to answer the questionnaire whether to use an excel questionnaire that was attached together with the email or by web survey by clicking on the attached link of the survey. The choice of methods is needed due to ease the respondents response to the survey. The respondents were given two weeks to answer the questionnaire. Two email reminders were sent to those who did not yet respond. As for last reminder, the respondents were contacted by phone.

The total response are 176 respondents. However, eight sets of questionnaires were incomplete and were removed from further analysis. A total of 168 useable questionnaires with response rate of 20.9 per cent were included for final analysis. This response rate of this study is considered acceptable as suggested by Sekaran and Bougie (2010) stated that the ideal response rate is between the range 5 per cent and 35 per cent for social science studies. It is supported by Visser et al. (1996) stated that the lower the response rate of nearly 20 per cent typically produced more accurate results.

The low response in this study is considered acceptable. For example, similar studies in manufacturing sector (Agostini et al., 2017; Chang and Chen, 2012; Chen, 2008; Delgado-Verde et al., 2014; Huang and Kung, 2011). For instance, the study conducted by Huang and Kung (2011) reported 18.92 per cent with 227 samples, Agostini et al. (2017) reported 15.4 per cent with 150 samples, Chen

(2008) reported 21 per cent with 126 samples, Delgado-Verde et al. (2014) reported 21.3 per cent with 157 samples, Chang and Chen (2012) reported 30.5 per cent with 122 samples and there were 112 complete and useable response in Yong et al.'s (2019) study, representing a response rate of 17.3 per cent.

3.2. Measurements

Green intellectual capital (GIC) is comprised of green human capital (GHC), green structural capital (GSC) and green relational capital (GRC) was adapted from Huang and Kung (2011) with overall 18 items. According to Huang and Kung (2011), this measurement was used due to a number of modifications to align with the implication of green structural capital based on the study by Menguc and Ozanne (2005). The measurement scale was scored on a 7-point Likert-type scale which range between 1 (strongly disagree) to 7 (strongly agree). In addition, this measurement also used by other previous studies (e.g. (Firmansyah, 2017; Omar et al., 2017)).

The measurement of business sustainability was adopted from Chow and Chen (2012). Respondents were asked to rate organisation's performance related to three main aspects namely economic, social and environmental with the total number of items is 22. Table 1 illustrates the measurement used in this study.

4. Results

4.1. Demographic profile

Most of the manufacturing SMEs (51.8%) have more than 150 employees, 51 organisations (30.4%) have employees from 51 to 150, followed by 23 organisations (13.57%) have employees from 5 to 50, as well as only 7 organisations (4.2%) having 5 employees. In term of years operating, 52 organisations (31.0%) have started a business in more than 20 years, 45 organisations (26.8%) started their operation during last 16–20 years followed by 37 organisations (22.0%) were operated in last 11–15 years, 17 organisations (10.1%) were operated in less 5 years–10 years each.

4.2. Data analysis

This study using SmartPLS 3.2.7 application to analyse the research model (Ringle et al., 2015). Total sample size of 168 was insufficient to use CB-SEM due to small-size. Hence, PLS-SEM was utilized for small-size sample as suggested by Hair et al. (2012).

4.2.1. Measurement model

The business sustainability construct involved a second order factor. Thus, the validity and reliability of first order, followed by second order were tested. Table 2 showed all factors loading, average variance extracted (AVE) and composite reliability (CR). The AVE values of all constructs exceeded 0.5 and the CR values of all constructs exceeded 0.7. The three criteria's also passed for second order factor; hence, convergent validity has been achieved for both first and second order factors.

Next, discriminant validity was verified to show the dissimilarity between measurement tools of each construct. Table 3 show HTMT value (Henseler et al., 2015) and the value not more than 0.85 as suggested by Kline (2011) indicated that the model achieved discriminant validity after deleting seven items (GHC1, GHC5, GSC1, GSC2, GSC8, GRC3 and GRC4).

4.3. Structural model

Structural model represents the hypothesized relationship

among the constructs. The standardized value of structural model relationship (path coefficients) is between -1 and $+1$. According to Hair et al. (2017), the closer the coefficient to 1, the strong positive relationship; while the closer the coefficient to 0, means the weaker relationship. Results shows that GSC ($\beta = 0.284$, $p < 0.05$) and GRC ($\beta = 0.467$ $p < 0.05$) were positively associated to business sustainability while GHC ($\beta = 0.034$, $p > 0.05$) was insignificant. Thus, H2 and H3 were supported while H1 was not supported. GRC is a strongest effect on BS as compared to GSC.

As suggested by Hair et al. (2017), R^2 , beta and t-value are used to access structural model via bootstrapping procedure with 5000 resample (Mahmud et al., 2017). The study examined the R^2 value, which represents the amount of variance in the endogenous constructs explained by exogenous constructs (Hair et al., 2017). The value of R^2 is in the range between 0 and 1. The R^2 for BS is 0.548, indicating 54.8 per cent of the BS can be explained by GIC.

In term of effect size, f^2 can be calculated as the change in R^2 when a certain exogenous construct is removed from the model can be evaluated whether the removed construct has a substantive impact on the endogenous constructs (Hair et al., 2017). It represents the contribution made by the exogenous variable to the R^2 of the endogenous latent variables. The rule of thumb by Cohen (1998) described that the f^2 values of 0.02 is weak, 0.15 is moderate and 0.35 have strong effect. Referring to Table 4, it is proven that entire path in the model of the study, exhibit that there is an effect size of GIC construct in predicting the BS construct. Therefore, it can be concluded that the result confirms that GSC and GRC are significant and are substantively important for the study.

Next, the study access the predictive relevance by using blind-folding procedure. The predictive relevance of endogeneous constructs is achieved when if the value of Q^2 more than 0 (Hair et al., 2017). The result show that Q^2 was 0.229, which exceed 0. It indicates that the predictive relevance of the model was acceptable. Table 4 showed the result of the structural model.

5. Discussion

The main objective of this study was to examine the relationship between GIC dimensions and BS. As far as the author's knowledge, this is the first empirical study examining the theoretical framework in Malaysia.

5.1. Theoretical contribution

There is an urgent need to adopt green strategies such as GIC to solve environmental issues. The advantage of the adoption of GIC has been acknowledged by past researchers such as Huang and Kung (2011) and Chen (2008). However, the relationship between GIC and business sustainability (BS) has yet to be studied. Hence, this study fills this gap by investigating the influence of GIC dimensions, namely GHC, GSC and GRC, on BS. The data was collected from 168 manufacturing SMEs operating in Malaysia, and the proposed relationships examined. Three primary conclusions were derived from the findings.

Firstly, the result showed that GHC and BS had an insignificant relationship. This finding contradicts with past studies such as Chen and Chang (2013), Chen (2008), Huang and Kung (2011), and Yong et al. (2019), who found a significant contribution of GHC towards various business performances. The insignificant relationship between GHC and BS found in this study could probably be due to a number of reasons. Most prior researches highlighted that SME organisations lacked resources and had a low interest in environmental management (Yacob and Moorthy, 2012). Moreover, most organisations, especially SMEs, tend to neglect the new concept of GHC; they do not completely embed environmental

Table 1
Construct/Items used in the questionnaire.

Construct	No	Item	Adapted from
Green Human Capital	GHC 1	The employees in this company involve a positive productivity and contribution towards environmental protection.	Huang and Kung (2011)
	GHC 2	The employees in this company have an adequate competence towards environmental protection.	
	GHC 3	The employees of this company provide high product and service qualities towards environmental protection.	
	GHC 4	The cooperative degree of teamwork towards environmental protection is performed at high levels in this company.	
	GHC 5	The managers can fully support their employees to achieve their jobs of environmental protection.	
Green Structural Capital	GSC 1	This company has a superior management system of environmental protection.	
	GSC 2	This company has a high ratio of employees of environmental management from its total employees.	
	GSC 3	This company makes an adequate investment in environmental protection facilities.	
	GSC 4	The overall operation processes towards environmental protection in this company operate efficiently.	
	GSC 5	The knowledge management system in this company is favourable for the accumulation and knowledge sharing of environmental management.	
	GSC 6	This company has formed a committee to progress on key issues in environmental protection.	
Green Relational Capital	GRC 1	This company has established detailed rules and regulations of environmental protection	
	GRC 2	This company has established a reward system for accomplishing environmental tasks	
	GRC 3	This company designs its products or services in compliance with the environmental desires of its customers.	
	GRC 4	The customers are satisfied about this company's environmental protection.	
	GRC 5	The cooperative relationships of this company with its suppliers towards environmental protection are stable.	
	GRC 6	The cooperative relationships of this company with its clients towards environmental protection are stable.	
Economic	ES 1	This company sells waste product for revenue.	Chow and Chen (2012)
	ES 2	This company reduces costs of inputs for equal level of outputs.	
	ES 3	This company reduces costs for waste management for equal level of outputs.	
	ES 4	This company works with government officials to protect the company's interest.	
	ES 5	This company creates spin-off technologies that can be profitably applied to other areas of the business.	
	ES 6	This company differentiates the process/product based on the marketing efforts of the process/product's environmental performance.	
Social	SS 1	This company prioritizes employee or community health and safety.	
	SS 2	This company recognizes and acts on the need to fund local community initiatives.	
	SS 3	This company protects claims and rights of original people or local community	
	SS 4	This company shows concern for the visual aspects of the firm's facilities and operations.	
	SS 5	This company communicates the firm's environmental impacts and risks to the public.	
	SS 6	This company considers the interests of stakeholders in investment decisions by creating a formal dialogue.	
Environmental	ENS 1	This company reduces energy consumption.	
	ENS 2	This company reduces wastes and emissions from operations.	
	ENS 3	This company reduces impact on animal species and natural habitats.	
	ENS 4	This company reduces the environmental impacts of its products/service.	
	ENS 5	This company reduces environmental impacts by establishing partnerships.	
	ENS 6	This company reduces the risk of environmental accidents, spills, and releases.	
	ENS 7	This company reduces purchases of non-renewable materials, chemicals, and components.	
	ENS 8	This company reduces the use of traditional fuels by substituting them with less polluting energy sources.	
	ENS 9	This company undertakes voluntary actions (e.g., actions that are not required by regulations) for environmental restorations.	
	ENS 10	This company undertakes actions for environmental audit, public disclosure, employee training and immunity.	

protection in their human capital. In fact, human capital is the utmost important resource with a huge contributes to sustainability (Karchegani et al., 2013). GHC is also seen as a very critical resource for achieving proper development and attaining sustainability (Massaro et al., 2018).

The result of this study is also consistent to that study conducted by Rosli (2012), who claimed that Malaysian SMEs lacked innovation and did not much invest in research and development, which requires highly qualified and skilled employees. In this case, manufacturing SMEs have less competent employees with good environmental knowledge and experience. They are not equipped with adequate training for upgrading skills and competencies, especially in the current knowledge era. These training programs are necessary to embed environmental knowledge into the organisation's human capital to take advantage of opportunities in the

business market and to meet customer demands.

Secondly, GSC was found to have positive relationship with BS. This finding is aligned with the results of a previous study by Chen (2008), showing that GSC correlated significantly with competitive advantage. Similarly, previous studies have proven the contribution of structural capital on the sustainability of an organisation (Akhtar et al., 2015; Massaro et al., 2018). The positive and significant finding of this study showed that manufacturing SMEs acknowledged the important effect of GSC on BS. It is believed that sustainability required organisations to address new market challenges, thus structural capital is essential to support this process. As claimed by Lopez-Gamero et al. (2011), structural capital improvements, new environmental sections within organisations, and new technology are often needed for an organisation to attain sustainability. Furthermore, due to their small size, manufacturing

Table 2
Convergent validity.

First Order	Second Order	Item	Loadings	CR	AVE
Green Human Capital		GHC 1	0.862	0.943	0.768
		GHC 2	0.914		
		GHC 3	0.930		
		GHC 4	0.892		
		GHC 5	0.776		
Green Structural Capital		GSC 1	0.867	0.964	0.769
		GSC 2	0.833		
		GSC 3	0.895		
		GSC 4	0.924		
		GSC 5	0.916		
		GSC 6	0.886		
		GSC 7	0.900		
		GSC 8	0.785		
Green Relational Capital		GRC 1	0.877	0.964	0.844
		GRC 2	0.895		
		GRC 3	0.929		
		GRC 4	0.947		
		GRC 5	0.944		
Economic Sustainability		ES 1	0.633	0.858	0.505
		ES 2	0.811		
		ES 3	0.621		
		ES 4	0.677		
		ES 5	0.767		
		ES 6	0.735		
Social Sustainability		SS 1	0.649	0.897	0.595
		SS 2	0.851		
		SS 3	0.848		
		SS 4	0.768		
		SS 5	0.792		
		SS 6	0.700		
Environmental Sustainability		ENS 1	0.769	0.934	0.587
		ENS 2	0.765		
		ENS 3	0.693		
		ENS 4	0.794		
		ENS 5	0.655		
		ENS 6	0.819		
		ENS 7	0.799		
		ENS 8	0.764		
		ENS 9	0.867		
		ENS 10	0.710		
	Business sustainability	Economic	0.749	0.897	0.746
		Social	0.900		
		Environmental	0.931		

Note: CR = Composite Reliability; AVE = Average Variance Extracted.

Table 3
Discriminant Validity

	BS	GHC	GRC	GSC
BS				
GHC	0.628			
GRC	0.763	0.787		
GSC	0.698	0.839	0.844	

Note: The diagonals represent the square root of the AVE, while the off diagonals represent the correlations. ES=Economic Sustainability; ENS=Environmental Sustainability; SS = Social Sustainability; GHC=Green Human Capital; GSC=Green Structural Capital; GRC=Green Relational Capital.

SMEs are more flexible, so it is easier for them to change and adopt new environmental processes and systems compared to larger organisations.

Thirdly, the finding of this study showed that GRC had a positive influence on BS. The finding of this study aligns with many past studies (Chen, 2008; Erinos and Rahmawati, 2017; Firmansyah,

2017; Yong et al., 2019), which found a significant contribution of GRC towards various business performances. In addition, Akhtar et al. (2015) and Massaro et al. (2018) found an association between relational capital and sustainability. The findings of the study indicate that the relationship between manufacturing SMEs and their stakeholders was based on knowledge sharing and

Table 4
Hypothesis testing.

Hypothesis	Std Beta	Std Error	t-value	p-value	LL	UL	f ²	Decisions
H1: GHC → BS	0.034	0.089	0.375	0.354	−0.121	0.174	0.001	Not Supported
H2: GSC → BS	0.284	0.097	2.938	0.002	0.128	0.444	0.049	Supported
H3: GRC → BS	0.467	0.072	6.501	0.000	0.342	0.579	0.166	Supported

collaboration. It is believed that GRC development should be supported via a collaborative approach. This approach motivates the SMEs to adopt BS practices, especially if its GRC aspect involves the willingness to share ideas of BS practices and the advantages to be gained from such practices. Additionally, SMEs could use GRC to create a shared dialogue within their stakeholders in order to reduce environmental impact and produce eco-friendly products, thus leading to increased sustainability.

Furthermore, this study helped fill the gap in the context of SMEs, as most studies had done on larger organisations and less attention given to SMEs as well as new ventures. Thus, it is essential to fill the research gap, given the importance of SMEs towards wellbeing. Therefore, this study contributed to the existing literature by investigating and analysing SMEs through the perspectives of GIC and BS.

In addition, this study provided several theoretical contributions with respect to the natural resource-based view (NRBV) and the intellectual capital-based view (ICBV). The NRBV suggests that “strategy and competitive advantage in the coming years will be rooted in capabilities that facilitate an environmentally sustainable economy” (Hart, 1995). Meanwhile, the Intellectual Capital Based View (ICBV) mainly focuses on the knowledge asset in organisations, which is acknowledged as a source of competitiveness (Yound and Snell, 2004). Currently, very few scholars have investigated the connection between both ICBV and the natural environment. This field is still at its infancy, and connections between the two factors could be a future path for business strategies. In line with this finding, Chen (2008)’s study is the significant contributor that revealed the importance of GIC as an intangible resource that could result in a competitive advantage.

In addition, studies on GIC in environmental management literature are still lacking. Hence, this study was not only limited to examining GIC; it also introduced a new theoretical lens in the management field. In particular, this study aimed to study the effect of GIC on BS and posited a link between them. The results of this study enable the opening up of new business opportunities for future business environments.

Besides that, past studies on this subject have mainly investigated developed economies while SMEs, particularly in developing countries, have been largely neglected. Hence, the results of this study confirm and extend the results of past studies by adding new insight regarding developing countries, i.e. Malaysia.

5.2. Managerial implications

Apart from the theoretical contributions, this study also provided several implications. The conceptual model proposed in this study is used to serve as a guide for manufacturing SMEs to determine the effect of GIC dimensions on BS. Environmental strategies can open up new business chances for organisations to attain sustainability. Using this model, the organisations can improve their capabilities to achieve cleaner production as well as use GIC as a strategy to sustain their business model in today’s challenging market. Furthermore, the result of this study showed that GSC and GRC had a positive association with BS. Thus, organisations should pay more attention to these two aspects of GIC.

In addition, this study did not find evidence that GHC had an effect on BS. However, this result does not mean that organisations should ignore GHC. In fact, human capital is the most important resource that contributes to sustainability (Karchegani et al., 2013). GHC is seen as a very critical element to achieving proper development and attaining sustainability (Massaro et al., 2018; Rosenbusch et al., 2011). Human capital cannot be owned by the organisation; GHC is possessed by employees and can disappear when they leave the organisation (Chang and Chen, 2012). This statement means that the employees’ knowledge should be preserved so that even if they left the organisation, it would not leave with them.

The organisation should provide enough training to its employees, particularly in environmental protection. Consequently, the employees will be able to produce products or services that meet the environmental criterion demanded by customers. Moreover, the knowledge, skills, values, and experiences of employees have a positive impact on the social and environmental sustainability of SMEs and in promoting innovations in regard to social and environmental practices (Loucks et al., 2010). According to Massaro et al. (2018), better performance can be achieved with a change in the way of thinking and motivation. Organisations must, therefore, improve their human capital by educating them about sustainability issues.

Secondly, green structural capital (GSC) is owned by the organisations and will not disappear when employees leave (Chang and Chen, 2012). This current study supports the significance of GSC towards BS. Business managers need to properly invest in the establishment of good information systems to protect their GIC. The environmental knowledge obtained from their employees and other stakeholders must be stored properly, further highlighting the importance of the GSC role. The green knowledge that resides in the minds of employees will not belong to the organisation unless the organisation codifies and stores it for future use. Thus, managers need to retain all knowledge in proper information systems.

Furthermore, today’s business largely depends on technology. Technology has not only replaced the traditional method of working but has also created new services, which were not previously possible. Hence, managers must also consider investing in environmental processes and systems. Besides that, managers should also create sustainability performance goals as part of the organisational reward system. The employees will be more motivated to engage with environmental protection and sustainability thinking when they receive rewards. In addition, the level of competence of the employees in regard to environmental protection must be evaluated for organisational task effectiveness. This approach can be implemented in the process and procedure of the organisation to foster sustainability.

Thirdly, this study found that positive relationship between green relational capital (GRC) and BS. Past scholars argue that a close cooperation with other organisations could act as a starting point to achieve environmental goals (Bicknell and Mcmanus, 2006; Dickel et al., 2018; Kuo et al., 2015; Matinaro et al., 2019; Niesten et al., 2016). Past scholars also mentioned that for an organisation to succeed, close networking is needed, as this would

enable the organisation to acquire more information directly and rapidly (Cohen and Kaimenakis, 2007; Desouza and Awazu, 2006; Wong and Aspinwall, 2004).

Collaboration is an asset, as it motivates partners to come together to grab opportunities that they would not have been able to pursue alone. All collaborative partners can receive significant benefits in return. It is believed that rich network connections are required to accelerate and enhance sustainability. With a stable relationship, the SMEs will have more access to market information and business environments.

From knowledge sharing, the organisation would be able to take up environmental initiatives to improve profit margin, reduce production cost due to waste, and increase labour productivity. In addition, manufacturing SMEs can actively participate in industry associations that provide guidelines for cultivating better understanding and knowledge of environmental regulations that are now on the rise. Another initiative that can be taken for the organisation to actively join industry associations related to environmental protection. This close relationship will benefit the SMEs in the short and long runs.

5.3. Limitations of the study

This study faced several constraints. Firstly, this study solely conducted in the context of a developing country; Malaysian manufacturing SMEs. Therefore, the generalisation and validation of the findings are very limited. Secondly, this study employed cross-sectional data. A longitudinal study and interview approaches are therefore needed to provide meaningful insights into the change of GIC components over time. Furthermore, the sample size of this study was too small even though the response rate was 20.9%. Hence, large sample sizes are required to confirm the findings. Nevertheless, although this study faced some limitations, the findings still provided new insights on GIC and BS in the context of SMEs, particularly manufacturing SMEs that are in a fast-moving business environment. This study might encourage future studies to investigate the importance of GIC as the driver of BS.

5.4. Suggestions for future study

Despite some limitations, this study can be extended in various directions. Firstly, future studies should involved other sectors such as the IT and bank to investigate the effect of GIC on business sustainability. It is suggested that the manufacturing sector at a larger scale be investigated, and not only the SME setting. Secondly, other study can also be conducted in developed countries either in the different or same industry. A study of this kind, perhaps, could enrich the existing body of knowledge on the effect of GIC globally. Besides that, it would be interesting to carry out a longitudinal study to investigate the change in the variables studied over time. It is believed to help the researchers with wide standpoints in order to identify any improvements in the role of GIC dimensions towards BS. Besides that by adding other variables to give a broader perspective of the factors that most affect the dependent variables.

6. Conclusion

The business landscape in the twenty-first century is now more different than ever before with limitations in resources, increased technological developments, emerging markets, environmental degradations, and new business models disrupting conventional ones. Many organisations are actively looking for new innovative solutions to go green that can be implemented to achieve business sustainability. Therefore, the negative impact of human activity on the environment can be reduced and at the same time, the health of

the societies will increase while still generating profit.

In this regard, the topic of GIC is a plausible solution to solve environmental issues and achieve business sustainability. However, this topic has been relatively limited to only a few studies. Hence, this study provides a better understanding of the relationship between GIC and BS in the context of manufacturing SMEs in Malaysia.

In conclusion, high awareness of environmental issues could motivate manufacturing SMEs to implement green strategies in their business. It is important for manufacturers to invest in GIC to help them achieve BS. This study is the first step in establishing a meaningful BS model that could be used and reiterated in future models.

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