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Nexus between green intellectual capital and green human resource management

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Abstract

This research was a pioneering study that examined the relationship between green intellectual capital and green human resource management. A quantitative research approach using a mail survey was employed to get insights from 112 large manufacturing firms in Malaysia. Partial Least Squares Regression Analysis was employed to examine the proposed relationship. The results indicated that green human capital and green relational capital influenced green human resource management. Surprisingly, green structural capital was not significantly related to green human resource management. As revealed by searches of ISI Web of Knowledge and Scopus, no similar work has tested a similar framework based on evidence from all over the world.

Keywords
Green intellectual capital
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Intellectual Capital-based View Theory
Cleaner production

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• The nexus of green intellectual capital and green human resource management was explored.
• Intellectual Capital-based View Theory was used as a theoretical foundation.

• Green human capital and green relational capital could be linked to the adoption of green human resource management.

• Green human resource management was highlighted in creating cleaner production in the manufacturing industry.

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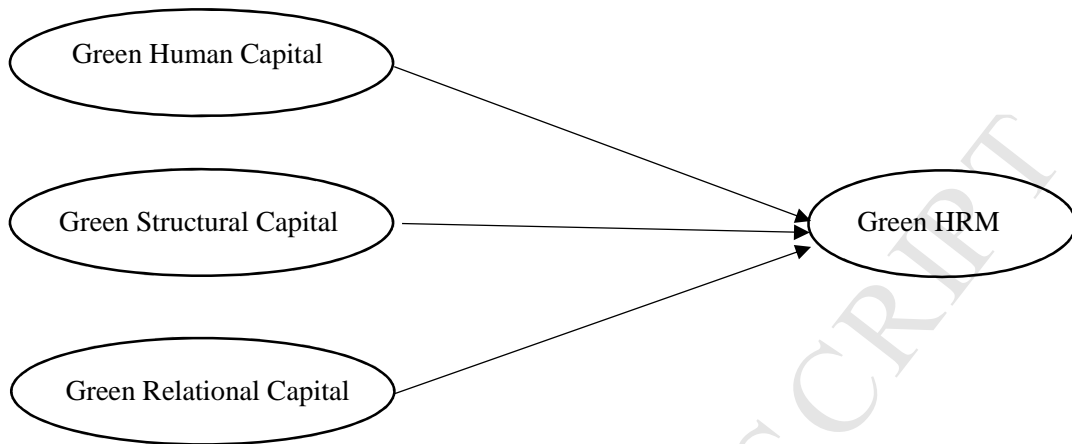
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1. Introduction

The notion of being green has gained attention from both scholars and industry practitioners over the past few decades. In academic circles, research has grown steadily from a general deliberation on green business into "greening" the functional areas within an organization that include green purchasing (Zhang, Li, Cao & Huang, 2018), green supply chain management (Kazancoglu, Kazancoglu, & Sanak, 2018; Zaid, Jaaron, & Bon, 2018), green innovation (Li, Zhao, Zhang, Chen, & Cao, 2018), green finance (Ng, 2018), green management (Mustapha, Abdul Manan, & Wan Alwi, 2018), green information technologies (Przychodzen, Gomez-Bezares, & Przychodzen, 2018), and green human resource management (HRM) (Renwick, Redman, & Maguire, 2013; Zaid *et al.,* 2018).

Businesses operate in a highly competitive global economy in which they must not only be efficient and deliver value, but also must be responsible, and this includes responsibility towards the environment. The intensification of environmental concerns around the globe has led companies to adopt environmental practices at an increasing rate; and such adoptions can benefit companies becoming "green and competitive"(Carmona-Moreno, Cespedes-Lorente, & Martinez-del-Rio, 2012; El-Kassar & Singh, 2018; Jabbour, Freitas, Soubihia, Gunasekaran, & Jabbour, 2015). In the pursuit of this green agenda, scholars (e.g., Renwick *et al.,* 2013) have argued that human resource management (HRM) plays an important role. Hence, embedding green practices within HRM functions could enhance the likelihood of a firm's sustainability.

In an emerging economy such as Malaysia, the need for a highly efficient workforce with a focus on environmental sustainability is paramount. Emerging economies have become the most important economies in recent years because of the high demand for resources, including human resources, which are being used to boost their gross domestic products (GDP). Researchers have reached a consensus that emerging markets are a main destination for organizations from varying industries around the world (Gaur, Kumar, & Singh, 2014; Popli, Akbar, Kumar, & Gaur, 2016, 2017; Singh, Pattnaik, Gaur, & Ketencioglu, 2017; Singh, 2018a). This is because of the large pool of talents and resources available in these regions. Thus, it is necessary to know more about green HRM in Malaysia because, according to Renwick *et al.* (2013), the green HRM literature is largely Western However, given the importance of the development of Asian economies, this is an important gap for future studies to reduce.

Based on the available knowledge, the current literature has examined green HRM in relationship to several factors. Previous empirical studies have examined green HRM in relationship to environmental aspects (O'Donohue & Torugsa, 2016; Rangarajan & Rahm, 2011; Zibarras & Coan, 2015), green supply chain management (SCM) (Longoni, Luzzini, & Guerci, 2016; Nejati, Rabiei, & Jabbour, 2017; Teixeira, Jabbour, Jabbour, Latan, & de Oliveira, 2016), corporate social responsibility (Jabbour, 2011; Wagner, 2013), stakeholder pressure (Guerci, Longoni, & Luzzini, 2016), resistance to change (Nejati et al., 2017), strategic HR competencies (Yong & Mohd-Yusoff, 2016), HR factors (Yusliza, Othman, & Jabbour, 2017), performance (Guerci et al., 2016a; Longoni et al., 2016; Masri & Jaaron, 2017; O'Donohue & Torugsa, 2016; Siyambalapitiya, Zhang, & Liu, 2018; Yusoff, Nejati, Kee, & Amran, 2018), and competitive advantage (Carmona-Moreno et al., 2012).

Kong and Thomson (2009) have highlighted that previous research has investigated the relationships between intellectual capital (IC) and HRM. However, previous works have not directly discussed the link between green IC and green HRM. Kong and Thomson (2009) argued that knowledge could be acquired at various levels of an organization; therefore, IC can be seen as a driving force in forming and implementing HRM practices in an organization. Chen (2008) also mentioned that no research had explored IC with respect to green innovation or environmental management. In her study, Chen (2008) discovered that companies investing many resources and efforts in green IC could not only meet strict international environmental regulations and popular environmental consciousness of consumers, but also eventually obtain a corporate competitive advantage. This is an important fit for organizations in the emerging economies to attract the appropriate talents, achieve competitive advantages and still maintain environmental sustainability. As a consequence, this is a useful avenue for future research.

1.1 *Research objective*

In the light of the aforementioned information, in this paper, three dimensions of green IC (green human capital, green structural capital, and green relational capital) were identified to investigate the effects of these dimensions on green HRM. To achieve this goal, a survey was conducted among 112 large manufacturing firms operating in Malaysia.

1.2   Research question

Research work is required to examine the connections of green IC measures with green HRM. For instance, Boxall and Purcell (2000) and Stovel and Bontis (2002) suggest that the strategic development and management of IC helps senior executives to make the most of their organizational intellectual resources. Kong and Thomson (2009) further added that this implies that IC may provide senior executives with a greater pool of knowledge to make more informed strategic HRM decisions for future organizational challenges. One of the new challenges that organizations are facing in the twenty-first century is how HRM functions of the organization can become green. Keeping in mind these suggestions and the extant literature, it is vital to trace the linkages between green IC and green HRM. Specifically, the research question to be answered is:

RQ1. Does green IC (green human capital, green structural capital, and green relational capital) predict green HRM?

2.   Literature review

2.1   Green HRM

The twenty-first century has become known as the century of culturally diverse emerging markets countries that are geographically spread over across the globe (Singh, 2018a). Green HRM has become a requirement today for many reasons. First, many adverse environmental incidents have been reported. Second, industries use natural resources to produce goods or products often resulting in industrial wastage and pollution of the surrounding environment Third, pollution, ecological imbalances and global warming are seen as by-products of the excess consumption of natural resources that serve raw materials.

The green issue has become prominent in emerging economies such as that of Malaysia. One reason is that emerging economies have begun to use more energy and natural resources in recent years and, as a result, have contributed to environmental degradation. For example, Malaysia had average annual growth rates of CO_2 emissions that were a bit greater than 6%, which was close behind that of the People's Republic of China (2nd largest economy in the world), which was 7.42% (Sadorsky, 2014).

Previous researchers have argued that the manner in which HRM can be greened is often studied in terms of a continuum comprising all HRM practices – analysis and

description of job positions, recruitment and selection, training and development, performance and appraisal, and rewards (Renwick et al., 2013). According to Renwick, Jabbour, Muller-Camen, Redman, and Wilkinson (2015), the most recent studies emerging examine green HR systems and individual staff behaviours, along with multi-level dynamics and new theoretical directions. Their article also contributed to enhancing Green HRM scholarship in several ways, including examining Green HR practices, wider contextual issues, and effect of Green HRM on performance.

Researchers have suggested that HRM can play a fundamental role in facilitating change to green HRM by selecting employees based on the correct criteria, the introduction of training and development of employee skills in environmental management and developing appropriate performance assessment and rewards systems. Renwick et al. (2013) concluded that green HRM practices begin at the point of an employee's entry and continue until the point of the employee's exit. The sustainable management of people, process and product in emerging markets is not an easy task, and organizations always must develop a sustainable architecture to leverage the best out of "mind-share" and "market-share" philosophy (Singh, 2018b). Generic HRM practices have been incorporated with green aspects; therefore, the term "green" has been added in each HRM practice (Renwick et al., 2013) to avoid confusion.

The argument has been made green HRM has a core role and helps to support other functions in maintaining the competitive advantage of organizations in many ways (Carmona-Moreno et al., 2012; Jabbour & Jabbour, 2016; Masri & Jaaron, 2017; Yong & Mohd-Yusoff, 2016). For instance, El-Kassar and Singh (2018) found that the direct effect of environmental performance on competitive advantage was stronger for companies with lower HR practices. In addition, their results also indicate that companies with established HR practices attain a more balanced competitive advantage through a combination of better environmental and organizational performance. Jabbour and Jabbour (2016) proposed a synergistic integrative framework in advancing the roles of green supply chain management (SCM) and green HRM in building more sustainable organizations. Teixeira et al. (2016) found that green training tends to help firms improve their green SCM in the context of more sustainable HRM as well as sustainable management practices, which enables an organization to eventually reduce costs and also to improve organizational reputation. Further, Guerci, Montanari, Scapolan, and Epifanio (2016b) opined that green recruitment attracts talented and green employees.

Some researchers have offered the idea that green HRM practices can help organizations to achieve sustainability. Milliman (2013) suggested that green HR practices are intended to support organizations in promoting the environmental aspects of their sustainable development efforts. Guerci and Carollo (2016) explored HRM-related paradoxes in developing environmental sustainability. Gholami, Rezaei, Mat Saman, Sharif, and Zakuan (2016) highlighted the importance of green HRM system in making the transition to the notion of a "sustainable centre" in sports centres throughout Malaysia and other parts of the world. These studies indicated that Green HRM practices led to sustainability, especially from the environmental perspective. Nevertheless, few studies have tested the relationship between green IC and green HRM; thus, evidence of these relationship appears to be inconclusive.

2.2   *Green intellectual capital*

Studies of intellectual capital (IC) have drawn the wide attention of researchers, and the importance of intellectual capital has been highlighted in management literature. However, IC incorporating environmental concepts – green IC – was only introduced by Chen in 2008 and has not emerged as an important field of study until recently.

Definitions of green IC and environmental IC are scarce in the management literature. Among them, Chen (2008) defined green IC as "the total stocks of all kinds of intangible assets, knowledge, capabilities, and relationships, etc. about environmental protection or green innovation in the individual level and the organization level within a company" (p. 277). Liu (2010) defined green IC as "the integration of green and environment knowledge sources and knowing capability of companies for improving competitive advantage" (p. 2). López-Gamero, Zaragoza-Sáez, Claver-Cortés, and Molina-Azorín (2011) proposed green IC as "the sum of all knowledge that an organization is able to leverage in the process of conducting environmental management to gain competitive advantage" (p. 21).

Intangible assets can be said to be rare and not easily imitated. The opinion is that intangible resources and competencies contribute more a firm's attaining and sustaining superior performance than do tangible resources (Bogner & Bansal, 2007; Chang & Chen, 2012; Wang, Wang, & Liang, 2014) and are crucial for an organization`s survival in dynamic environments (Subramaniam & Youndt, 2005; Teece, Pisano, & Shuen, 1997).

Green IC enables organizations to comply with strict international environmental regulations, to fulfil growing environmental awareness developing among consumers, and to

create value for the organization (Huang & Kung, 2011). Generally, the literature has identified three dimensions that encompass the classification of green IC, namely, 1) green human capital; 2) green structural/organizational capital; and 3) green relational capital.

Green human capital is "the summation of employees' knowledge, skills, capabilities, experience, attitude, wisdom, creativities, and commitments, etc. about environmental protection or green innovation, and was embedded in employees not in organizations" (Chen, 2008, p. 277). Further, human capital is opined to be the basic element of the intellectual capital process that performs the role of a driving force for green structural capital and green relational capital (Li & Chang, 2010; Chahal, & Bakshi, 2014). These attributes are not owned by organizations and cannot be imitated. The attributes of employees that could comprise tacit or explicit knowledge are an invaluable asset in achieving a successful green HRM (Mazzi, Toniolo, Mason, Aguiari, & Scipioni, 2016). Due to this uniqueness, these attributes are a form of competitive advantage for an organization. Green human capital is opined to be the core strategic resource for sustainable competitive advantage in today`s dynamic organizational environment (Bontis, Seleim, & Ashour, 2007; Campbell, Coff, & Kryscynski, 2012; Mengistae, 2006). Human capital is the utmost significant aspect of IC (Wang, Chang, Huang, & Wang, 2014). The belief is that organizations that appreciate the importance of human capital invest in their employees to enjoy better performance (Seleim, Ashour, & Bontis, 2007; Wang et al., 2011). Human capital works alongside other organizational resources and capabilities (Carpenter, Sanders, & Gregersen, 2001), such as green HRM.

Green structural capital has been defined as "the stocks of organizational capabilities, organizational commitments, knowledge management systems, reward systems, information technology systems, databases, managerial mechanisms, operation processes, managerial philosophies, organizational culture, company images, patents, copy rights, and trademarks, etc. about environmental protection or green innovation within a company" (Chen, 2008, p. 277). Furthermore, green structural capital is defined as the "institutionalized knowledge about the form of organizational processes, structures, technologies, policies and culture" (Wang et al. 2014). These resources are valuable intangible assets owned by an organization (Edvinsson & Malone, 1997; Wang et al. 2014) and can be used to support the green HRM in the organization (Kong & Thomson, 2009). An organization's environmental culture can be referred to as the set of assumptions, values, symbols, and organizational artefacts in an organization (Harris & Crane, 2002), and, according to Fernández, Junquera, and Ordiz, (2003), a significant relationship exists between organizational culture and green HRM.

Furthermore, E-HRM which is a part of information technology system of green structural capital, has been found to have relationship with green HRM practices (Yusliza et al., 2017; Yusoff, Ramayah, & Othman, 2015).

Green relational capital has been defined as "the stocks of a company's interactive relationships with customers, suppliers, network members, and partners about corporate environmental management and green innovation, which enables it to create fortunes and obtain competitive advantages" (Chen, 2008, p. 278). Tumwine, Kamukama, and Ntayi (2012) and Welbourne (2008) depict relational capital as an intangible asset that focuses on evolving, nurturing and preserving superior relationships with any organization, individuals or groups that may impact the position of a business in the market. For this reason, it is paramount for organizations to align their interests with those of their stakeholders to survive and to remain competitive. Going "green" is a recent concern for major stakeholders, including customers, suppliers and the government. Hence, there is pressure on an organization to practice green HRM. For instance, Guerci et al. (2016a) showed that customer pressure has a strong relationship with green HRM.

2.3   Hypotheses development

Today, when environmental concerns cannot be ignored by organizations, it is time to explore the relevance of green IC in the environmental management context. In Delgado-Verde, Amores-Salvadó, Castro, and Navas-López's (2014) study, the results indicated that green organizational capital had an indirect impact on environmental product innovation through green social capital. These findings highlighted that green organizational capital (i.e., environmental communication structures, procedures, responsibilities, and policy) had no direct and positive relationship with environmental product innovation. Rather, the success of the environmental product innovation depended heavily on the cooperative relationships among employees (i.e., green social capital).

Chen and Chang (2013) verified the direct effect of green human capital on green innovation performance, and the mediation effect of green human capital on the positive relationships between corporate environmental ethics and the two consequents: green relationship learning and green innovation performance in the Taiwanese manufacturing companies. As a result of their study, they said that companies should improve their green human capital to increase the levels of the positive effects between corporate environmental ethics and the two consequents.

In the field of HRM, previous studies have mainly underlined the influence of HR practices in developing various aspects of IC (Teo, Reed, & Ly, 2014; Yang & Lin, 2009; Youndt & Snell, 2004). However, Kong and Thomson (2009) provided a contradictory view; they argued that IC, strategic HRM and HRM concepts are closely connected and that IC should be the driving force in these relationships. Later, they recommended that future research was required to gain a better understanding of how individual IC components influenced HRM practices. Based on the significant relationship observed between green IC and green innovation, as well as to fill the gap that Kong and Thomson (2009) highlighted and gain a better insight from the environment perspective, this study posits the following:

H1. Green human capital is positively related to green HRM.

H2. Green structural capital is positively related to green HRM.

H3. Green relational capital is positively related to green HRM.

2.4 Theoretical background

The theoretical background of this study is based on the Intellectual Capital-based View Theory (ICV). A handful of influential practitioners, including Sveiby (1997) and Edvinson and Malone, (1997) coined the ICV. This theory evolved with use by other researchers such as Reed, Lubatkin and Srinivasan (2006). ICV complements Leonard-Barton's (1992) well-known knowledge-based view (KBV). Although both theories aim to elucidate the hidden knowledge-based dynamics that underlie a firm's value and both are derived from RBV theory, they seem to have a different focus. KBV is mainly concerned about assessing the effectiveness of an organization's use of knowledge-management tools as knowledge-generating mechanisms such as its information technology systems and information management systems (Leonard-Barton, 1992; Nonaka, Reinmoller, & Toyama, 2001). While ICV's emphasis is on the concentration and dynamics of knowledge capital rooted in a firm and is postulated to have direct relationship with its organizational performance/competitive advantage (Youndt & Snell, 2004). ICV is meant to narrow down the focus on intangible resources.

According to resource-based theory, a firm's intangible resources are more likely to contribute to the attainment and sustainment of a firm's superior performance when they are combined or integrated (Barney, 1991). However, major criticisms of the RBV are that the notion that RBV is too general and lacks a clear explanation of competitive advantage (Foss & Knudsen, 2003; Priem & Butler, 2001).

Hence, this current study will be using the ICV theory to explain the relationship between green human capital, structural capital and relational capital with the green human resource management of the organization. Green HRM has been declared to be a form of competitive advantage. Organizations gain a competitive advantage when they employ the use of green HRM practices such as green training (Murthy, 2008; Yusoff et al. 2018) from the green intellectual capital of an organization.

2.5   *Conceptual model*

The originality of this study is the testing the relationship between Green IC, namely green human capital, green structural capital, and green relational capital on Green HRM. The proposed conceptual model is shown in Figure 1.
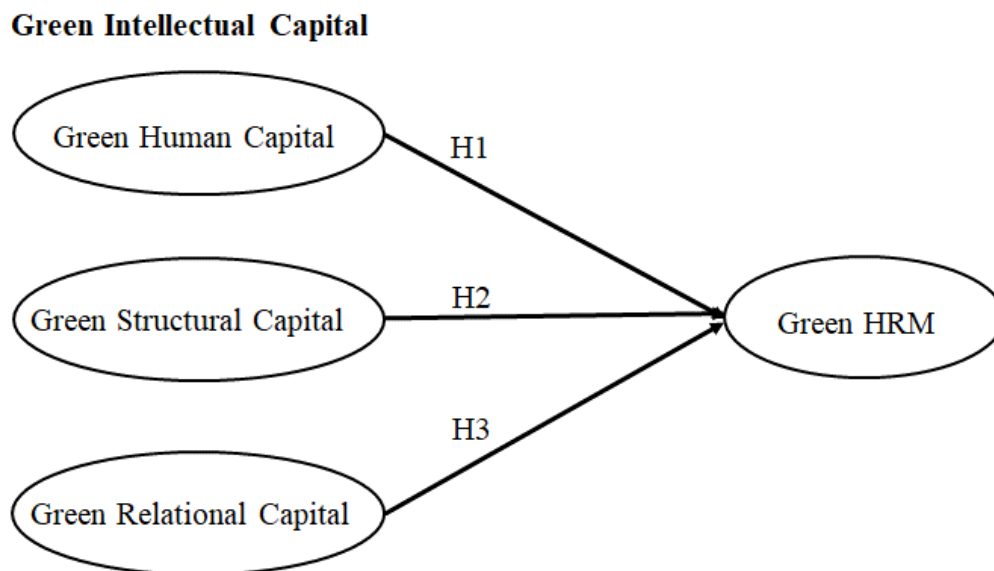
Green Intellectual Capital

Figure 1: Conceptual model

3.   **Methodology**

3.1   *Survey and data collection*

This study employed correlational design to examine the influence of green intellectual capital on green HRM. To examine the conceptual model and test these relationships, a survey instrument was designed, and measurement scales were developed. The draft

questionnaire was constructed and the content validity of the scale was checked and improved with the help of four academics and four experts from the industry. A revised version questionnaire was finalized and then used to test the proposed hypotheses. The measurement scales in the used questionnaire comprised items representing green intellectual capital such as green human capital, green structural capital and green relational capital, and green HRM. All items measuring these variables and the scales are discussed below.

The unit of analysis of the study is the individual firm. The population of this study comprised all large manufacturing firms in Malaysia. In Malaysia, a large firm is an organization having more than 200 employees. Large manufacturing companies were chosen because of their sensitivity to environmental issues, because they are subjected to government rules, and because they have formalized HR practices. These criteria are supported by the studies of Guerci et al. (2016a), Amran, Ooi, Nejati, Zulkafli, and Lim (2012), and Tzafrir (2005).

For this current study, the sampling frame was all large manufacturing firms in Malaysia. The sampling frame was obtained from the Federation of Malaysian Manufacturers (FMM) Directory 2015 (FMM, 2015). Using the FMM Directory 2015, a total of 661 large manufacturing firms were identified based on the number of employees stated in the directory. Given the small sampling frame of the study and the likelihood of a low response from mail survey (Sekaran & Bougie, 2016); all the large manufacturing firms were included in the study. Thus, the sampling technique employed in this study was a census. As such, the all 661 large manufacturing firms in Malaysia were mailed a survey.

This study combines issues related to the environment (green issues) with business aspects (HRM, intellectual capital). Therefore, the appropriate person to provide the required data from should ideally have knowledge about the two aspects. Hence, the questionnaires were addressed to the HR director or HR manager who was actively participating in HRM. As a result, 661 questionnaires were distributed with a cover letter that ensured the anonymity of answers and that included a brief explanation of the research.

3.2 *Measurements*

Green HRM were measured by using a 15-item scale that adapted from Jabbour (2011) and Yong and Mohd-Yusoff (2016). A 7-point Likert-type scale ranging from (1) not at all to (7) to a very great extent was applied to answer each item.

Three dimensions were used to measure *green IC*, namely, green human capital (5 items), green structural capital (9 items), and green relational capital (5 items). These green IC items were adapted from Chen (2008). The measurement scales were scored on a 5-point Likert-type scale with responses to statements ranging from (1) strongly disagree to (5) strongly agree. Table 1 shows the references for all the selected items in the research questionnaire. As highlighted above, all the selected items were validated by the literature.

Table 1

Constructs/Items used in the research's questionnaire

Construct	Definition	Item	Adapted from
Green HRM	The systematic, planned alignment of typical human resource management practices with the organization's environmental goals	GAJ1: Enable involvement in managing environmental activities GAJ2: Enable acquiring knowledge about environmental management GAJ3: Demand knowledge about environmental management GR1: The environmental performance of my company attracts new employees. GR2: The company prefers to hire employees who have environmental knowledge. GS1: Employee selection takes environmental motivation into account. GS2: All selection steps consider environmental questions. GT1: Environmental training is continuous. GT2: Environmental training is a priority. GT3: Environmental training is an important investment. GP1: Every employee has specific environmental goals to achieve. GP2: Contributions to environmental management are assessed. GP3: Individual performance assessment results are recorded. GRW1: Cash rewards are provided to recognize environmental performance. GRW2: Environmental performance is recognized publicly.	Jabbour (2011); Yong & Yusliza (2016)
Green Human Capital	The summation of employees' knowledge,	GHC1: The contribution of environmental protection of	Chen (2008)

	skills, capabilities, experience, attitude, wisdom, creativities, and commitments, etc. about environmental protection or green innovation, and was embedded in employees not in organizations	employees in our firm is better than our major competitors. GHC2: Employee competence with respect to environmental protection in our firm is better than that of our major competitors. GHC3: The product and/or service qualities of environmental protection provided by the employees of this firm are better than our major competitors. GHC4: The amount of cooperative teamwork with respect to environmental protection in our firm is more than that our major competitors. GHC5: Our managers fully support our employees in achieving their goals with respect to environmental protection.	
Green Structural Capital	The stocks of organizational capabilities, organizational commitments, knowledge management systems, reward systems, information technology systems, databases, managerial mechanisms, operation processes, managerial philosophies, organizational culture, company images, patents, copy rights, and trademarks, etc. about environmental protection or green innovation within a company	GSC1: The management system for environmental protection in our firm is superior to that of our major competitors. GSC2: Our firm is more innovative with respect to environmental protection than are our major competitors. GSC3: The profit earned from environmental protection activities of our firm is greater than that of our major competitors. GSC4: The ratio of investments in R&D expenditures to sales for environmental protection in our firm is more than that of our major competitors. GSC5: The ratio of employees to the total employees in our firm who are engaged in environmental management is more than that of our major competitors. GSC6: Investments in environmental protection facilities in our firm are more than those of our major competitors. GSC7: Competence in developing green products in our firm is better than that of our major competitors. GSC8: The overall operational processes for environmental protection in our firm work smoothly. GSC9: The knowledge management system for	Chen (2008)

		environmental management in our firm is favourable for the accumulation of the knowledge of environmental management.	
Green Relational Capital	The stocks of a company's interactive relationships with customers, suppliers, network members, and partners about corporate environmental management and green innovation, which enables it to create fortunes and obtain competitive advantages	GRC1: Our firm designs products and/or services in compliance with the environmentalism desires of our customers. GRC2: Customer satisfaction with respect to environmental protection of our firm is better than that of our major competitors. GRC3: The cooperative relationships concerning environmental protection of our firm with our upstream suppliers are stable. GRC4: The cooperation relationships about environmental protection of our firm with our downstream clients or channels are stable. GRC5: Our firm has well cooperative relationships concerning environmental protection with our strategic partners.	Chen (2008)

4. Results

The total population of the study was 661 large manufacturing firms listed in the Federation of Malaysian Manufacturers (FMM) Directory 2015. However, after excluding eight firms used for the interviews and four companies used for the pretesting of the questionnaire, the population of the study was 649. Accordingly, a total of 649 questionnaires were mailed to the respondents. After a reminder via telephone calls, 112 completed questionnaires were received, giving a response rate of 17.3%. This response rate is considered acceptable given the minimum sample size was targeted at 89, the commonly reported low response rate from a mail survey (Sekaran & Bougie, 2016) and the generally low response rate for this type of correlational study in Malaysia.

In terms of sample size determination, the G-power sampling size determinant was used in this survey. Based on the number of predictors, which are three (3), the minimum sample size recommended was 89. Hence the 112 respondents in this study is considered sufficient as

the minimum needed power in social science management research is 0.80 and this sample size of 112 gives us a power of higher than 0.8.

In addition, the response rate for this study is comparable to other studies on manufacturing companies in Malaysia and hence is considered acceptable. For instance, studies conducted by Behyan et al. (2015) reported 19.48% with 120 samples, Lazim and Ramayah (2010) reported 10.07% with 106 samples, and Loke et al. (2013) reported 10.60% with 228 samples.

4.1 Demographic profile of responding companies

The majority of the companies were from the electrical and electronics industry (25.0%). Most large manufacturing firms in this current study had 201 to 500 employees (42.0%), and the number of employees in HR department was in the range of 5 to 10 employees (35.7%). The large manufacturing firms in this current study had mostly been established for more than 20 years (61.6%). The sample also indicates that the large manufacturing firms participating in this current research are mostly MNCs (52.7%). Notably, most of large manufacturing firms complied with ISO 9000 certification (88.4%) and ISO 14000 certification (71.4%). Regarding geographical location, most companies were located in Penang (47.3%), followed by Selangor (15.2%) and Johor (10.7%).

4.2 Data analysis

To analyse the research model developed for this study, the Partial Least Squares (PLS) analysis was utilized using SmartPLS 3.2.7 software (Ringle, Wende & Becker, 2015). The overall sample size of 112 was too small to use CB-Sem. Therefore, partial least squares structural equation modeling (PLS-SEM) was used that allowed for a small-sized sample in the structural model analysis. One advantage of PLS-SEM is the ability to analyse a small sample size (Hair et al. 2012). First, the measurement model was tested followed by an examination of the structural model following the guidelines in the literature (see Anderson & Gerbing, 1988; Hair, Hult, Ringle, & Sarstedt, 2017).

4.2.1 Measurement model

The model developed included a second order factor for green HRM. Thus, the first order factors were tested followed by the second order factor validity and reliability. As Hair et al. (2017) suggested, factor loadings, average variance extracted (AVE) and composite reliability (CR) were used to test the convergent validity followed by the discriminant validity.

As shown in Table 2, all the first order factors showed loadings of more than 0.7, AVE > 0.5 and CR > 0.7, thus allowing the conclusion that the measures were both valid and reliable. The second order factors also passed the three criteria's, thus both the first order and second order factors were valid and reliable.

Discriminant validity was tested following Fornell and Larcker (1981) who suggested that discriminant validity is achieved if the square root of the AVE is greater than all the correlations in the same row and column of the particular construct. As shown in Table 3, discriminant validity of the constructs was achieved. Table 3, which shows the HTMT criterion (Henseler, Ringle, & Sarstedt, 2015), also passed the 0.85 (Kline, 2011) threshold indicating that discriminant validity was established.

4.2.2 Structural model

To assess the structural model Hair et al. (2017) suggested looking at the R^2, beta and the corresponding t-values via a bootstrapping procedure with a resample of 5,000 (see Mahmud, Ramayah, & Kurnia, 2017). There was no problem of multicollinearity as all the VIF values were less than 5 (Hair et al., 2017). Then, the study examined the effects of the independent variable on the dependent and the mediator on the dependent variable (see Table 4); the R^2 was 0.343, indicating that all the modelled constructs explained 34.3% of the variance in green HRM. Falk and Miller (1992) recommended that R^2 values should be equal to or greater than 0.10 for the variance explained of a particular endogenous construct to be deemed adequate. Hair et al. (2014) addressed the difficulty of providing rules of thumb for acceptable R^2 as it is reliant upon on the model complexity and the research discipline.

While R^2 values of 0.20 are deemed as high in disciplines such as consumer behavior, R^2 values of 0.75 would be deemed as high in success driver studies (e.g., in studies that aim at explaining customer satisfaction or loyalty). In this area of study with three predictors, R^2 values of 34.3% was acceptable. The study also calculated power using danielsoper.com and

with the number of predictors set at 3, a sample size of 112 and R^2 of 0.343, which achieved a power of 0.99, which is very high.

Result shows that green human capital ($\beta = 0.263$, *p< 0.05*) and green relational capital ($\beta = 0.274$, *p< 0.05*) were positively related to green HRM while green structural capital ($\beta = 0.095$, *p> 0.05*) was not significant. Thus, H1 and H3 were supported while H2 was not supported. Green relational capital had a stronger effect on green HRM as compared to green human capital.

Finally, the blindfolding procedure with a distance of 7 was run to assess the predictive relevance of the model. The model possesses predictive relevance for specific endogenous constructs if the Q^2 value amounts to greater than 0 (Fornell & Cha, 1994; Hair et al. 2017). The Q^2 was 0.202, which was greater than 0, indicating that predictive relevance was acceptable.

Table 2
Convergent validity

First Order	Second Order	Item	Loadings	CR	AVE
Green Analysis and Description of Job Position		GAJ1	0.895	0.946	0.855
		GAJ2	0.960		
		GAJ3	0.918		
Green Human Capital		GHC1	0.719	0.908	0.666
		GHC2	0.863		
		GHC3	0.888		
		GHC4	0.889		
		GHC5	0.699		
Green Performance Assessment		GP1	0.961	0.965	0.901
		GP2	0.957		
		GP3	0.929		
Green Recruitment		GR1	0.927	0.931	0.871
		GR2	0.939		
Green Relational Capital		GRC1	0.826	0.949	0.787
		GRC2	0.877		
		GRC3	0.900		
		GRC4	0.906		
		GRC5	0.924		
Green Rewards		GRW1	0.943	0.948	0.901
		GRW2	0.956		
Green Selection		GS1	0.969	0.968	0.938

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		GS2	0.968		
Green Structural Capital		GSC1	0.853	0.948	0.671
		GSC2	0.852		
		GSC3	0.809		
		GSC4	0.818		
		GSC5	0.810		
		GSC6	0.835		
		GSC7	0.812		
		GSC8	0.747		
		GSC9	0.829		
Green Training		GT1	0.946	0.963	0.897
		GT2	0.969		
		GT3	0.925		
	Green HRM	Green Analysis	0.764	0.934	0.703
		Green Performance	0.908		
		Green Recruitment	0.827		
		Green Rewards	0.827		
		Green Selection	0.890		
		Green Training	0.805		

Table 3
Discriminant validity

Construct	1	2	3	4	5	6	7	8	9
Green Analysis and Description of Job Position	■								
Green Human Capital	0.347	■							
Green Performance Assessment	0.602	0.522	■						
Green Recruitment	0.724	0.588	0.759	■					
Green Relational Capital	0.355	0.779	0.533	0.548	■				
Green Rewards	0.524	0.461	0.823	0.669	0.473	■			
Green Selection	0.633	0.555	0.837	0.822	0.506	0.777	■		
Green Structural Capital	0.384	0.813	0.543	0.548	0.913	0.447	0.519	■	
Green Training	0.611	0.537	0.687	0.603	0.518	0.649	0.650	0.489	■

Table 4
Hypothesis testing

Hypothesis	Relationship	Std Beta	Std Error	t-value	*p-value*	*LL*	*UL*	f^2	VIF
H1	GHC → GHRM	0.263	0.122	2.155	0.016	0.067	0.482	0.033	3.244
H2	GSC → GHRM	0.095	0.121	0.789	0.215	0.001	0.236	0.002	4.877
H3	GRC → GHRM	0.274	0.138	1.986	0.024	0.061	0.517	0.031	3.757

5. Discussion

The originality of this research is examining the relationship between green IC and green HRM. Based on the knowledge of the authors, this is the first work testing this theoretical framework in light of empirical evidence from Malaysia, contributing to a better understanding of sustainability in manufacturing companies.

5.1 Theoretical contributions

In Malaysia, the manufacturing industry is one of the main contributors to the country's economy, but it is also the highest contributor to the environmental issues. Hence, aggressively pursuing the adoption of environmentally friendly activities, such as green HRM practices, is becoming crucial to mitigate environmental problems. The benefits of adopting green HRM such as cost reduction, talent attraction and retention have been examined in the literature (Sawang & Kivits, 2014). Kong and Thomson (2009) asserted that intellectual capital is a driving force in forming and implementing HRM practices in an organization; however, the relationship between green IC and green HRM remains to be studied. In view of this gap, this current study investigated the influence of three dimensions of green IC (green human capital, green structural capital, and green relational capital) on green HRM. Using data collected from a sample of 112 large manufacturing firms operating in Malaysia, the proposed relationships were tested.

In terms of green human capital, the results showed a significant and positive relationship with green HRM Practices. This result is in line with the arguments provided by Huang and Kung (2011), in which they stated green human capital possesses environmental competence and commitment to related activities. On the other hand, Chen and Chang (2013) also found the positive influence of green human capital on green innovation performance. In this case, environmental knowledge and experience grained from employment in a previous company might be embedded in the employees, which enables them to facilitate environmental knowledge development, application and dissemination in the company for which they presently work. Imbued with the appropriate knowledge and skills, green human capital they can share their thoughts and provide suggestions on the environmental practices; thus, they are more likely to influence the green HRM practices.

Contrary to expectations, this study did not find green structural capital to have a relationship with green HRM practices. This finding is partially supported by Delgado-Verde et al. (2014), in which they discovered that green organizational capital was not directly associated with environmental product innovation, but through the use of green social capital. A possible explanation for this relationship is because environmental perspectives had been incorporated into their existing management systems due to compliance with ISO 14000 standards. ISO 14000 is a global series of environmental management systems (EMS) standards ensuring that the companies manage their environmental responsibilities properly. Hence, the influence of green structural capital on green HRM practices was not observable. In addition, most large manufacturing firms in this research had been in operation for more than 20 years. Long-established companies often have solid management systems that are not easy to change. Thus, although green structural capital seems to be employed in these companies, this practice is insufficient to influence all the green HRM practices.

The result of this study supports the expectation that green relational capital positively contributes to green HRM practices. Green relational IC is about the relationship of an organizations' stakeholders to environmental management and to the market in which it operates to retain the corporate environmental image and reputation and social relationships (López-Gamero et al., 2011). Chen's (2008) argued that the strong collaboration with other parties can enhance the competitive advantage of a firm. Seemingly, the relationship between manufacturers and their network members is built based on cooperation and knowledge sharing. Therefore, manufacturers may be inclined to adopt green HRM practices if the green relational capital shares the idea of green HRM practices and the benefits associated with the adoption of such practices.

Furthermore, this research reveals important theoretical contributions in the academic and research arenas with respect to the intellectual capital-based view theory (ICV). This theory highlighted the concentration and dynamics of knowledge capital rooted in a firm and is claimed to have direct relationship with its organizational performance/competitive advantage (Youndt & Snell, 2004). ICV is meant to narrow down the focus on intangible resources while green HRM has been declared to be a form of competitive advantage. Based on this theory, green IC can be considered to be a great intangible resource for a firm to attain competitive advantage.

In addition, studies exploring the issue of human resource management from the environmental point of view in the context of a developing country, such as Malaysia, are rather scant. This study enriches the literature on green HRM and extends the scope of HRM

research by studying the link between green IC and green HRM. The finding implies that manufacturing firms in Malaysia with high levels of green human capital and green relational capital can foster their adoption of green HRM practices. However, the influence of green structural capital on green HRM requires further exploration.

This research has examined several green IC measures that attempt to bridge the gap as Kong and Thomson (2009) proposed in relationship to the effects of IC on HRM practices. In particular, the identification of these links among green intellectual capital and with green HRM specifies theoretical prioritization, and validation of green HRM practices in a manufacturing context, hence expanding the understanding of how manufacturing firms should enhance the use of green intellectual capital to support their green HRM initiatives.

5.2 *Managerial implications*

From a practical perspective, this study has several implications, especially for business professionals and policy makers. The conceptual model presented in this study is intended to give a guide for manufacturing firms about the influence of green intellectual capital on the implementation of Green HRM. Given the fact that Green HRM is gaining heightened attention in recent years, using this model of Green HRM in manufacturing industries in developing countries can improve an organization's cleaner production capabilities and the use of Green HRM as a strategy to sustain manufacturing competitiveness.

Furthermore, the results of this study revealed that green IC has a significant influence on green HRM practices – green human capital and green relational capital. This implies that prompt attention should be given to these two aspects of green IC. The results indicated the significance of green human capital towards green HRM practices. Human capital is rooted in employees and can disappear when employees leave (Chang & Chen, 2012). Because environmental knowledge and skills embedded in employees are important for companies to develop green management, it is prudent for companies to attract the best human capital and to develop and cultivate their existing employees so that they can contribute to the development of a green organization.

In contrast to green human capital, green structural capital is rooted in companies and will not be taken when employees leave (Chang & Chen, 2012). This study did not find evidence to support the significance of green structural capital towards green HRM practices. However, this finding does not mean that the importance of green structural capital should be ignored given the prevalence of this variable identified in other studies. Managers must try to

invest and establish strong information systems to retain their IC. At the same time, managers must build an organizational culture about environmental protection. With a strong environmental culture embedded in a company, employees are committed to accomplishing environmental goals.

This study supports the significance of green relational capital towards green HRM practices. Hence, managers should build interactive "green relationships" with their upstream suppliers, downstream customers, and strategic partners, which enable a company to facilitate information-sharing on environmentalism and enhance the development of relevant knowledge. By having environmental knowledge and information, companies are more likely to adopt green HRM practices.

The findings highlighted that green IC is important for large manufacturers in adopting green HRM practices. Thus, policy makers should devise environmental protection training programs for organizational members to enhance the efficiencies and competencies of green human capital in establishing green HRM. Government can build environmental protection facilities in industrial areas that aim to reduce the production of waste in operation processes. Additionally, the government should organize environmental-related conferences or workshops, should encourage firms to cooperate with partners to use the resources more efficiently and help develop cleaner industries.

5.3   *Limitations of the study*

As in any research, this study is not without its limitations. First, a potential limitation of this study is in terms of the generalizability of the findings. This research was conducted in a specific national context (Malaysian large manufacturing firms); hence, the findings may not be applicable to other industries or other cultural contexts. Therefore, the results should be interpreted with caution when generalizing them. Because of this, future research is suggested to test the model among large firms in other countries with the aim of validating it.

A second limitation stems from the fact that this study was based on a self-reported survey by the representatives of large manufacturing firms. Because the questionnaire was structured in such a way that only one person from each company was chosen to represent their company, the issue of common method variance was unavoidable. Common method variance is a problem in research whereby the variability of response overlaps due to data being collected from single sources. However, the issue of common method variance was

rectified by employing a test to assess for its occurrence. This approach is applied widely by social sciences researchers.

Lastly, the present study found partial relationships between green IC and green HRM practices; however, the study only considered the current state of the large manufacturing firms, and this focus does not allow this research to examine either the short or long-term effects of green IC on green HRM. Future research would benefit from a longitudinal approach that traces the development of green HRM practices and investigates how the relationship between variables changes over time.

5.4 *Suggestions for future research*

Although this study has certain limitations, the study offers prospects and directions for future research. First, the conceptual model did not consider the six dimensions of green HRM. We suggest examining each dimension of green IC with the six dimensions of green HRM. In addition, we suggest testing the model in different institutional and governance settings (e.g., developed and developing countries) or conducting a comparative study across different countries and cultural contexts would be interesting. Such diversity would provide a broader view to researchers, enrich HRM literature, and determine the significance of the measurements. Finally, the proposed model can be extended to incorporate sustainability, performance, as well as competitive advantage in future research.

5.5 *Conclusion*

Increased concern about environmental issues in recent years has made the "go green" concept a focal point of companies. In a highly competitive era, business success is no longer achieved simply by having a healthy financial status or creating innovative products but rather success is achieved through human resources. Hence, going green in HRM is essential to increase its efficiency and the competitiveness of a company.

Despite the importance of green HRM, research in this topic is relatively limited (Renwick et al., 2013) and the adoption of green HRM practices scarcely exists in many companies (Wagner, 2011). To generate better insight, this study set out with the main objective of understanding the relationship between green IC and the adoption of green HRM practices in the context of Malaysian large manufacturing firms.

In conclusion, the enormous attention given to environmental issues has encouraged companies to adopt green practices in their business, and green HRM is a necessary change, particularly in manufacturing industry, to build a green organizational identity. It is important for manufacturers to understand the driving force of the adoption of green HRM, to be aware of the benefits associated with green HRM, and to recognize the role of green HRM in supporting and perhaps even achieving business sustainability.

This study serves as a first step in developing a rich and meaningful model of green HRM that is so necessary for any deeper understanding in the near future. Although limitations exist, the hope is that researchers can use the findings of this study as a future reference for the green HRM context.

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