

# Measuring green intellectual capital in Malaysian environmentally sensitive companies

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**Abstract**—The current study examines the connection between the concepts of environmental management and intellectual capital to enable the proposal of a model to measure green intellectual capital for Malaysian environmentally sensitive companies. As of now, the indicators for measuring green intellectual capital for companies have been inconsistent and vary in practices. The indicators in the current study are developed based on the integration of intellectual capital studies and the ‘Hart-Type resource domain’, which is originated from the Natural Resource-based theory (NRBV), one of the well known environmental management theory. Thus, the current study offers some dimensions which highlight four essential components of green intellectual capital, namely as green human capital, green innovation capital, green process capital and green social capital. The current study is motivated to produce one measurement model on green intellectual capital which is applicable to all environmentally sensitive companies in Malaysia

**Keywords**—green intellectual capital, green human capital, green innovation capital, green process capital and green social capital

## I. Introduction

The rapid development of many industries worldwide has caused detrimental effect on environment due to over-consumption and utilization of natural resources (Tan and Lau, 2010). The major effects of environmental degradation are global warming, depletion of stratospheric ozone layer, water pollution, acid rain and desertification (Ramlogan, 1997). According to Eltayeb and Zailani (2009), industry and individual corporations are the biggest contributors of national environmental problems. As a result, the environmental management has become an important field of management in the twenty-first century (Chen and Chang, 2013). Environmental management concerns on how organizations care about the natural environment and minimize the negative environmental effects of their entire operations (Klassen and McLaughlin, 1996; Welford, 2000). In today’s environment, successful and sustainable companies are those who are able to secure resources and develop competencies to address the challenges of natural environmental constraints (Menguc and Ozanne, 2005)

One glaring issues to be addressed in environmental management discipline over the decade is to ensure that investment in environmental management practices will also moving the firms’ direction in gaining and sustaining competitive advantage (Sambasivan, Bah and Jo-Ann, 2013). In the present “knowledge economies” where value is added so much on their intangible resources, rather than tangible

assets and financial resources, more effective approach for environmental management, has been proposed . The new approach of solving the existing environmental problems depends heavily on how knowledge resources are deployed (Wasiluk, 2013), which have been discussed in the emerging concept of green intellectual capital. Existing scholars have conceptualized green intellectual capital as intellectual capital to satisfy the environmental management needs (Chen, 2008; Baharum and Pitt, 2009; Liu, 2010).

In the current study, green intellectual capital can be seen as a subset of the Intellectual capital. From marketing perspective, the value of Intellectual capital is arised due to the gaps between market value and book value (Edvinsson and Malone, 1997). The creation, transfer and application of knowledge enable companies to offer higher added-value of green product and services, which in turn will increase the market value (Huang and Kung, 2011). As a result, the gaps between market value and book value (Intellectual Capital) will also increase due to the contribution of knowledge resources about environmental management (green intellectual capital). Managing tacit and explicit knowledge relating to environmental protection in various investment targets (individual, organizational infrastructure and networking) will sparks shared learning that enable companies to re-evaluate and adapt their current practices to meet company objectives and achieve performance benefits ahead of its competitors (Sellers, 2009).

## II. Objectives and significance of the study

In Malaysia, since the economy is very much dependant on companies contribution and growth, managing green intellectual capital should become great concern as one of the country’s national agenda in combating the environmental issues. This is to ensure that the economy will continue growing in the right directions towards achieving a well balanced developed nation status in 2020. However, in Malaysia, there has been no widely published research that has described the measurement of green intellectual capital. The main objective of this paper is to propose a comprehensive model of green intellectual capital from Malaysian companies perspective, in particular the environmentally sensitive companies. Environmentally sensitive companies are companies, in which their activities are more exposed to higher risk of having the environmental impact (Branco and Rodrigues, 2008). These are companies that involved in

certain operations such as mining, chemicals, transportation, oil and gas, wood and timber, utilities, agriculture, construction, properties and manufacturing (Buniamin, Alrazi, Johari, Abdul Rahman, 2011). The paper offers some dimensions of measuring green intellectual capital which is currently inconsistent and varies in practices. The proposed model is expected to guide managers to deal with the environmental challenges by focusing on each of the construct.

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### III. Literature Review

This sections review the literatures from intellectual capital studies, the NRBV theory and its subsequent proponent that is ‘Hart-type resource domains’, followed by a brief description of existing green intellectual capital measurements.

#### A. Definition and classification of Intellectual Capital

Scholars defined and classified Intellectual capital in several ways. According to Juma (2005), the consensus in developing a universal definition of intellectual capital is still lacking due to the fact that different researchers have focused on individual facets. Intellectual capital has defined by Stewart (1997) as intellectual material comprising of knowledge, information, intellectual property and experience that can be put to use to create wealth. According to Youndt and Snell (2004), intellectual capital is the sum of all knowledge that firms use for competitive advantage. Knowledge comprise of explicit and tacit knowledge, which is the most crucial of organizational resources for competitive advantage (Egbu, 2004). Bontis (1998) and Sveiby (1997) argued that what delivers competitive advantage relies on the ability to create, transform and capitalize on such knowledge. Cohen and Kaimenakis (2007) contended that the existence of knowledge resources will not grant positive results without effective management. It is the quality, instead of its quantity of the firm’s intellectual capital, which comes from the combination of its elements that creates value for the firm.

Most of the management and measurement of intellectual capital studies classified the intellectual capital adopted by

Johnson (1999) and Bontis (1999), that was divided into three types: human capital, structural capital and relational capital (Juma, 2005; Kamaluddin and Abdul Rahman, 2009). Youndt and Snell (2004) also classified intellectual capital into three types but using organizational capital and social capital terms instead of structural capital and relational capital. The Skandia navigator introduced by Edvinsson and Malone (1997) has two main structures of intellectual capital, namely human capital and structural capital, but further extend structural capital into organizational capital and customer capital. The organizational capital is divided into innovation capital and process capital. Van Buren (1999), Wang and Chang (2005) and Tseng and Goo (2005) utilized the Edvinsson and Malone (1997) concept, and separated process capital and innovation capital from structural capital. The four categories of intellectual capital, which constitute of human, process, innovation and customer capital or social capital has increasingly become accepted (Cheng, Lin and Lin, 2010)

- Human capital represents employees’ cumulative tacit knowledge, which originated from genetic inheritance, education, experience, and attitudes regarding life and business (Liu, 2010). Therefore, organization must ensure that everyone in an organization able to verbalized their tacit knowledge (Egbu, 2004; Saint-Onge, 1996). Managing human capital may involve enhancing ability of human resource by increasing rate of knowledge creation and fit their new knowledge to the firms’ needs. Another ways is focusing on how to provide the necessary environments and incentives to produce a stream of desired innovations on a routine basis (Edvinsson and Sullivan, 1996).
- Structural Capital comes up from processes and organizational value, indicating the external and internal focuses of the company, plus renewal and development value for the future (Bontis, 2000). Some scholars replaced structural capital with organizational capital because it is more appropriate for the task of illuminating the institutionalized knowledge, routines, manuals, processes, or systems that an organization owns (Subramaniam and Youndt, 2005; Youndt and Snell, 2004). Following Edvinsson and Malone (1997), organizational capital includes process capital and innovation capital. Innovation capital refers to results of innovation that includes intellectual property rights, such as patents and licenses, trademarks and know-how, which become a key factor for a company’s ability to maintain long-term competitiveness. On the other hand, process capital is defined as workflow, operation processes, specific methods, business development plans, information technology systems, and cooperative culture, etc. (Van Buren, 1999; Joia, 1999)

- Customer capital is described as the knowledge embedded in the marketing channels and customer relationships that an organization develops through the course of conducting business. Some intellectual capital studies use relational capital, instead of customer capital to encompass the knowledge embedded in all the relationships an organization develops with any stakeholder that influences an organization such as customers, suppliers, and partners (Johnson, 1999; Cheng et al, 2010). Similar to the concept of relational capital, social capital derives from interpersonal interactions that features internal and external social connections (Youndt and Snell, 2004; Chen, Wang, Sun (2012). A network of relationships provides access to information, knowledge, and resources, and this will increase the individual's involvement and attachment to the organization (Bozionelos, 2008).

### B. *Environmental Management theory: Natural Resource-based view (NRBV)*

Stemming from the basic tenet of RBV, Hart (1995) develop a 'natural-resource-based view' of the firm, which argued that constraints and challenges posed by natural (biophysical) environment should be considered in the models of sustainable competitive advantage. He argued that the most important drivers than can lead firms towards competitive advantage depend on how resources and capabilities rooted in the firm's interaction with its natural environment. The NRBV highlights three important pillars of proactive environmental strategy as the key capabilities to be linked with superior performance, which include pollution prevention, product stewardship and sustainable development.

Pollution prevention seeks to prevent waste and emission rather than cleaning them up "at the end of the pipe". Product stewardship considers the product's impact on the environment throughout its life cycle through the concept and design along the whole process of manufacturing, distribution, usage and disposal. Sustainable development focusing not only environmental concern but also economic and social concerns and has been separated into two distinct areas: clean technology and Base of the Pyramid. Clean technology depends on innovations that bound standard routines and knowledge that call for firms to reduce the material and energy consumption. On the other hand, base of the pyramid seeks concentration to the role of corporations in alleviating poverty for the poorest of the worlds's citizen. Sellers (2009) and Klassen and Whybark (1999), contended that strategic resources must be firmly embedded to effectively deploy a proactive environmental technology, which in turn have impact on competitive advantage and superior performance.

The organization and the environmental management literature have identified few resources that is associated with a

proactive environmental strategy. Buisse and Verbeke (2003) empirically tested Hart's typology and found evidence, that a firm's environmental strategy can be expressed in unbundled form by simultaneous investments in five distinct 'Hart-type' resource domains (RDs). Other NRBV proponents that also utilized the same resource domains in their studies among others are: Sharma and Vredenburg (1998), Sharma (2000), Sharma and Henriques (2005), Chan (2005), and Sellers (2009). These five resource domains can be described as:

- Conventional green competencies, resulting from investments in products and manufacturing processes (RD 1)
- Employee participation and training in environmental issues (RD 2)
- Green organizational competencies, stretching across functional areas in the firm (RD 3)
- Formal management systems and procedures in environmental management (RD 4)
- Strategic planning that incorporates environmental issues (RD 5)

### C. *Green Intellectual Capital studies*

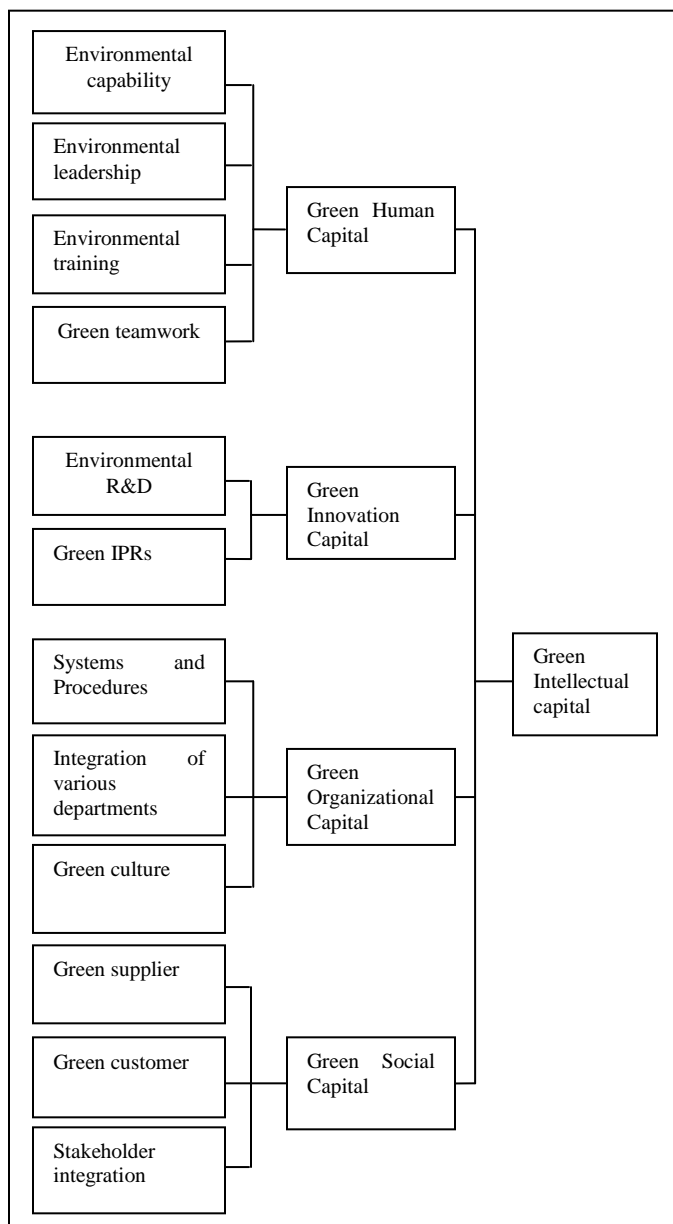
In a research on relationship between green intellectual capital and competitive advantage in Taiwan, (Chen, 2008) has described green intellectual capital as "total stocks of all kinds of intangible assets, knowledge, capabilities and relationships, etc about environmental protection or green innovation on the individual level and the organization level within a company". The classification of green intellectual capital was adapted from Johnson (1999) and Bontis (1999) work. The study classified green intellectual capital into three types, namely green human capital, green structural capital and green relational capital. A similar classification has also being proposed by Liu (2010), another study conducted in Taiwan. The author has defined green intellectual capital as the integration of green and environment knowledge sources and knowing capability of companies for improving competitive advantage. In a case study conducted in Spanish firms, Lopez- Gamero, Zaragoza-Saez, Claver-Cortes, and Molina-Azorin, (2011) contended that sustainability should be extended from relational capital to the human capital, structural capital and relational capital. The creation of the sustainable intellectual capital construct is described as the sum of all knowledge to be leveraged by organization in the process of conducting environmental management to gain competitive advantage. Among the three studies, Chen (2008) model stands out as one of the major points of reference in other researches that utilized green intellectual capital variables

## iv. Proposed model

The proposed model adapt the Skandia navigator model developed by Edvinsson and Malone (1997), which later have been used by Van Buren (1999), Wang and Chang (2005) and Tseng and Goo (2005). The indicators used to measure green

intellectual capital are integration of intellectual capital studies, together with the ‘Hart-Type resource domain’, in environmental management studies. A close examination of the constructs highlighted in the five ‘Hart-type resource domains’ established by Buysse and Verbeke (2003) reveals that most of these constructs are denoted as intangible elements and can be usefully classified under green intellectual capital constructs. The proposed model is expected to add value to the body of knowledge because current study have integrated the NRBV theory, apart from RBV as indicated in Chen (2008) and Liu (2010) work. The current study defines green intellectual capital as knowledge resources utilized by company to address the environmental issues in conducting business activities. It consists of green human capital, green innovation capital, green process capital and green social capital.

Figure 1.0 depicts the proposed green intellectual capital constructs and their sub-constructs



Current study proposes that the green intellectual capital (see figure 1.0) of the environmentally sensitive companies should possess four main constructs, being green human capital, green innovation capital, green organizational capital and green social capital. Green human capital can be viewed as knowledge, skills and awareness to address the environmental issues possessed by individuals, shared and communicated throughout the organization. It refers to environmental capabilities embedded in human capital that must be sustained and shared with managers and other workers through the environmental leadership, environmental training and green teamwork. Managers are expected to influence employees in the environmental protection activities. Environmental training will increase employees’ environmental awareness and courses specifically addressed to the development of new technical and management competencies. As a result, this will provides an opportunity to engage employees in environmental problem solving through green teamwork and enhance their awareness of the need for environmental control, increases their ability to adapt change, and develops a proactive attitude toward environmental issues.

The next proposed construct is green innovation capital, which represent the ability of a company to generate new knowledge, new product and any creative ideas aimed at addressing the environmental issues. For this dimension, it can be indicated by the allocation amount of research and development expenses incurred in producing the green product or green process. The allocation for R&D expenses enables companies to improve and achieve higher levels of knowledge and technological improvement. Another important indicator is the number of Intellectual Property rights (IPRs) such as patents and trademarks due to green production or process. The IPRs gained by company can reduce the scope of imitation, which enables firms that own patented technologies to keep prices prohibitively high and to maintain its long term competitiveness.

The green intellectual capital should also signify the green organizational capital, which corresponds to the management and generation of knowledge in addressing the environmental issues effectively, that supporting employees’ productivity. This construct emphasize on the establishment of environmental system and procedures to improve environmental operations through a system than plans, schedules, implements and checks daily activities and promotes codification and retention of most relevant knowledge concerning the accumulated experience of employees. Apart from that, environmental department will not be fully effective unless it has a close relationship with multiple levels of staff such as R&D, Finance and Marketing. Thus, the integration of environmental concerns in daily management requires participation of each and every employee in every department, rather than the environmental departments alone. Further, green organizational culture guide behavior and process to ensure the organization devoted their commitment to preserve the environment.

Finally, the green social capital should signify the organization's link to the market it operates especially green supplier and green customer and other stakeholders. Supplier coordination and interaction is vital as the new product design and development calls for environmentally friendly materials and technologies. Feedback from customer will motivate firms to adopt green innovations and satisfy their needs, whilst improving their environmental performance. Capability for stakeholder integration could be established through trust-based collaborative relationships with those with noneconomic goals such as local communities, environmental groups, regulators, non-governmental organizations (NGOs).

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