Nexus between Green Intellectual Capital and Organizational Learning Capability. Evidence from Malaysian Manufacturing Sector

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Abstract. The environmental degradation have been concerning by many previous scholars claimed that the high demand for sustainable practices particularly in manufacturing sector due to the large amount and wide distribution of energy consumption. It is an urgent task for organizations to implement the innovation to cope with this issue. Apart from that, most scholars have suggested various possible solutions. Regrettably, very few studies have examined the importance of intellectual capital related to green protection known as green intellectual capital to achieve better performance. Furthermore, as the manufacturing is the main sector that focus on the transformation of low-carbon economy required organizations to keep themselves learned and updated about business challenges. In spite of that, the role of management which facilitate learning to each member which under the concept of organizational learning capability is very important to obtain superior performance. Data were gathered from 168 manufacturing SMEs in Malaysia, and analysed using Partial Least Square approach. Results show that green relational capital has positive relationship with organizational learning capability while green human capital and green structural did not. Finally, the implications, limitations and future studies are discussed.

1. Introduction

Manufacturing industry is one of the biggest contributors to the Malaysia economy; however, it is also the highest contributor to the environmental degradations [1]. If nothing is done to solve this, environmental crises will continue to increase and it will worsen. In response to these concerns, many “green” strategies has been conceived due to greater environmental awareness [2]. Apart from that, Chen [3] suggested that investment in intellectual capital that is related to environmental protection known as green intellectual capital (GIC) not only meet environmental management, but also competitive advantage.

GIC is defined as all tangible assets or knowledge related to the green innovation or protection [3-5]. Three main components of GIC namely green human capital (GHC), green structural capital (GSC) and green relational capital (GRC). Additionally, 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 [6].

However, the efforts and investment of the management towards GIC would be useless in the organizations if learning is not take place. Furthermore, the manufacturing is the main sector that focus on the transformation of low-carbon economy required organizations to keep themselves learned and updated about their business challenges [7]. Thus, it requires organizations to continuously changing, learn how to sustain and grow [8]. One the effective mechanism to achieve this goal is through learning.
In addition, previous researchers noted that it is hard for organizations to use knowledge exploitation to produce innovation without a substantial capability [9] which under the concept of organizational learning capability (OLC).

OLC can be described as the set of management practices that help in facilitating the process of learning within organizations in aiming to increase performance of the organization [10, 11]. Hence, this study aims to examine the relationship between green intellectual capital dimensions and organizational learning capability.

2. Hypotheses Development

2.1 Green human capital and organizational learning capability

Baker [12] noted that high skilled employees are utmost important to the organisation. Human capital that comprised of all knowledge, experience and skills is invisible form and depends on organizational learning capability (OLC) to transform it into visible form. Human capital of the organization and absorptive capacity of individuals can be improved by investment in development and training [13]. The knowledge acquired can be embedded into OLC. Rotherberg [14] claimed that the more knowledge acquired by the employees, the more the better organizational learning capability will be generated. Similarly, previous scholars suggested that human capital is highly connected to OLC [15]. Based on these discussions, there hardly seems in the literature on the relationship between green human capital (GHC) and OLC. Therefore, this study offers the following hypothesis.

H1: There is a positive relationship between green human capital and organizational learning capability.

2.2 Green structural capital and organizational learning capability

Structural capital (SC) will help the development idea across the organisation and participation of the employees in decision-making process [14]. The implementation of good information technology system will help organization to acquire organizational learning capability [16]. Furthermore, organizations tend to absorb external knowledge related the negative consequences of their business operations on the environment such as pollution and waste and applied the new knowledge to facilitates the green innovation practices into their business activities [17]. Based on these discussions, there hardly seems in the literature on the relationship between green structural capital (GSC) and OLC. Therefore, this study offers the following hypothesis.

H2: There is a positive relationship between green structural capital and organizational learning capability.

2.3 Green relational capital and organizational learning capability

Employees that have strong relationship and networks tends to have better information and resource allocation compared who are not [18]. A good relationship provides greater possibilities in knowledge sharing from their partners. The collaboration with other organizations can enhance organizational learning capability [19]. Thus, the organisations gain more knowledge that is new and used it to improve their OLC. Based on the above fact, there hardly seems in the literature on the relationship between green relational capital (GRC) and OLC. Therefore, this study offers the following hypothesis.

H3: There is a positive relationship between green relational capital and organizational learning capability.

3. Methodology

This study adopts quantitative research method. A seven-point Likert scale was used for all items in GIC constructs ranging from ‘1’ for ‘strongly disagree’ to ‘7’ for ‘strongly agree’. The questionnaire was adopted from Huang and Kung [5] with 18 items. Meanwhile, the questionnaire for OLC was adopted from Gomez et al. [13] with 17 items in the measure and was measured using a 5 point Likert scale measurement. The summary of the key constructs is given in Table 1. The targeted respondents
consisting of the most knowledgeable individuals, including directors, human resource managers, production managers, research and development (R&D) managers, as well as assistant managers from SMEs manufacturing organisations in Malaysia. A total of 168 usable questionnaires were returned. All usable data were subsequently coded and analysed using Smart PLS 3.0 Structural Equation Modelling statistically techniques.

### Table 1. Summary of Key Constructs, Sources of Questions and the Number of Items

| Variable                                      | Dimension                          | No of Items | Source                  |
|------------------------------------------------|------------------------------------|-------------|-------------------------|
| Green Intellectual Capital (GIC)               | Green Human Capital (GHC)           | 5           | Huang and Kung (2011)   |
|                                                | Green Structural Capital (GSC)     | 8           |                         |
|                                                | Green Relational Capital (GRC)     | 5           |                         |
| Organisational Learning Capability (OLC)      | Managerial Commitment              | 5           | Gomez et al. (2005)     |
|                                                | System Perspective                | 3           |                         |
|                                                | Openness and Experimentation       | 5           |                         |
|                                                | Knowledge Transfer and Integration | 4           |                         |

### 4. Results

#### 4.1 Demographic profile of companies

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

#### 4.2 Measurement Model

The model developed included a second order factor for organizational learning capability (OLC). Thus, the validity and reliability of first order, followed by second order were tested. Factor loadings, average variance extracted (AVE) and composite reliability (CR) were used to examine the convergent validity followed by discriminant validity. Table 1 showed all factors loading for first and second order. The AVE values of all constructs exceeded 0.5 and the CR values of all constructs exceeded 0.7, indicates that the measures were valid and reliable. The three criteria’s also passed for second order factor; hence, convergent validity has been achieved. for both first and second order factors. One item was deleted from organizational learning capability construct (MC2) to ensure the AVE value above 0.5.

### Table 2. Convergent validity

| First Order | Second Order | Item | Loadings | CR  | AVE |
|-------------|--------------|------|----------|-----|-----|
| Green       |              | GH1  | 0.858    | 0.943 | 0.768 |
| Human Capital |          | GH2  | 0.912    |       |     |
|             |              | GH3  | 0.931    |       |     |
|             |              | GH4  | 0.891    |       |     |
|             |              | GH5  | 0.780    |       |     |
| Green       | Structural Capital | GSC1 | 0.844    | 0.963 | 0.766 |
|             |              | GSC2 | 0.795    |       |     |
|             |              | GSC3 | 0.897    |       |     |
|             |              | GSC4 | 0.891    |       |     |
|             |              | GSC5 | 0.918    |       |     |
|             |              | GSC6 | 0.918    |       |     |
Next, using Fornel and Larker [19], the discriminant validity was verified in comparing the correlations between constructs and the average variance extracted from the construct. Table 4 below shows that all values of the square root of average is greater indicating that the measures were discriminant.

Table 3. Discriminant Validity.

|               | GHC  | GRC  | GSC  | OLC  |
|---------------|------|------|------|------|
| GHC           | 0.879|      |      |      |
| GRC           | 0.748| 0.914|      |      |
| GSC           | 0.821| 0.808| 0.872|      |
| OLC           | 0.550| 0.625| 0.511| 0.713|

Note: The diagonals represent the square root of the AVE, while the off diagonals represent the correlations. GHC = Green Human Capital; GRC = Green Relational Capital; GSC = Green Structural Capital; OLC = Organizational Learning Capability

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. The closer the value to 1, means the strong positive relationship. Results shows that GRC (β = 0.659, p < 0.05) was positively related to organizational learning capability while GHC (β = 0.175 p > 0.05) and GSC (β = -0.246, p < 0.05) were positively associated to organizational learning capability. Thus, H3 was supported while H1 and H2
were not supported.

| Hypothesis | Path Coefficient | std Beta | Std error | t-value | p-value | Decision |
|------------|------------------|----------|-----------|---------|---------|----------|
| H1 GHC → OLC | 0.175 | 0.168 | 0.109 | 0.804 | 0.108 | Not Supported |
| H2 GSC → OLC | -0.246 | -0.239 | 0.118 | 1.041 | 0.037 | Not Supported |
| H3 GRC → OLC | 0.658 | 0.659 | 0.093 | 3.523 | 0.000 | Supported |

5. Discussion
The main objective of this study was to gain insight into the role played by GIC dimensions towards OLC. Three conclusions have been highlighted. Firstly, the empirical findings did not found an evidence to support the relationship between green human capital (GHC) and organizational learning capability (OLC). Thus, H1 was not supported. The results is similar with the study done by Omar, Mohd Yusoff and Kamarul Zaman [20] revealed that GHC-OLC link is not significant. However, the results is contradicted with other previous studies that acknowledge human capital as an important feature in intellectual capital. These can be seen from the study by [22,22] highlighted that human capital is the most critical factor of organisation’s success. Most prior researches noted that SME organizations lack resources and low interest in environmental management [23]. Moreover, the new concept of GHC that is usually ignored by most organizations, especially among SMEs. In this case, manufacturing SMEs have less competent with environmental knowledge and experience due to lack of adequate training for upgrading skills and competencies. These training are necessary to empower their human capital to be embedded with environmental knowledge. In fact, human capital is highly connected to OLC [15] and the more knowledge acquired by the employees, the more the better organizational learning capability will be generated [14].

Secondly, green structural capital (GSC) was found to have no relationship on organizational learning capability (OLC). Thus, H2 was not supported. This finding is in contradicted with a previous study [16]. One main problem faced by organisations to invest in structure and system is due to higher cost [24]. It was believed that manufacturing SMEs have poor information technology system and knowledge repositories related to green protection. In fact, in the high-technology era, an update technology and system is required to ease the business process. The way knowledge created and transferred through all members in the organization will improve organizational learning in the organization. This limitation prevents the employees in the organisation to share their useful green knowledge to be embedded into OLC.

Thirdly, the finding of the study show that GRC has positive influence on OLC. Thus, H3 was supported. The result is similar with the study done by Omar et al. [20] revealed that the GRC has positive relationship with OLC. In addition, the result is consistent with Hsu and Fang [20] found that relational capital is the greatest factor among three types of intellectual capital contribute to better OLC. In this context, realizing that manufacturing SMEs have little resources, knowledge and expertise, they seek knowledge from their green relationships with their stakeholder. It is believed that the rich green network connections enabled the knowledge sharing on environmentalism and enhance the knowledge development in the organization. In addition, business models nowadays are transforming in which product and services is designed to be environmental-friendly. By having environmental knowledge, through a stable green relationship, it will increase their OLC.

6. Conclusion
The topic of green intellectual capital (GIC) become plausible solution to solve the environmental issues nowadays. However, GIC alone is not enough without intervention of organizational learning capability (OLC). However, the connection of two links are very limited. Hence, this study intends to better
understanding the relationship between GIC and OLC in the context of manufacturing SMEs in Malaysia.

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