Key Factors Predicting Firm’s Technological Capability of Malaysian Manufacturing Industry from Technology Transfer Perspective.

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Abstract
The current global economy is being transformed into a knowledge-based economy where continuous updating of technology and improving firm’s technological capabilities are of major concern. As technologies capabilities go up, it translates into better performance. Malaysia was on track towards becoming a developing country in strategic industrial sectors such as electrics and electronics, automotive, technology information, and biotechnology. In fact, Malaysia faces daunting challenges to improve its technological capabilities and gear its economy on a path to higher growth, and transition it to a higher level of development. The objectives of this study is to identify the key factors contributing to the development of firm’s technological capabilities and enhancing firm’s technology transfer performance. The result of this study shows that 52% of the selected key factors predicting the firm’s technological capability, and indicates important means for Malaysian manufacturing firms to gain higher performance and competitive advantage.

Key Words: Technological Capabilities, Technology Transfer, Manufacturing Firms

1. Introduction
From the beginning of participation in technological development since 1960s, Malaysia has been aspired to move towards a technology-driven pattern of development. In fact, Malaysia has been categorized in the group of countries that have the potential to create new technologies on their own (Mani, 2000). However, for an organization to be a global competitor, continuous updating of technology and improving its technological capabilities are of major concern.

Various initiatives have been undertaken by the Malaysian government to develop and improve its technological capabilities in order to spur its technological performance. First National Science and Technology policy was introduced in 1986 by the Malaysian government to outline the framework to ensure the achievement of continuous science and technology development in Malaysia. In 1991, National Action Plan for industrial technology development was launched to strengthen science and technology capabilities. Furthermore, Malaysian Technology Development Corporation (MTDC) was set up in 1992 to spearhead the development of technology businesses in Malaysia. In 1992, Technology Park Malaysia was established Knowledge-based economy Master Plan was developed in 2002 to transform Malaysia from production-based to knowledge-based economy where the application and acquisition of science and technology are emphasize.

In addition, the Malaysian government has provided various incentives such as tax benefits, established Free Trade Zone areas and even amended the labour laws (Narayan and Rasiah, 1992) in order to spur technology transfer into Malaysia. In addition, Malaysia government has implemented and passed a few policies such as the National Economic Policy, the National Development Policy, and a Vision 2020, which encouraged local firms to engage in technology transfer. Furthermore, the National Automotive Policy, which was introduced on March 2006, has encouraged a sustained increase in value-added and developed local capability by encouraging the participation of local citizen to be more competitive and comprehensive in the national automotive sector (Department of Information Malaysia, 2006).

Malaysia has shown positive progress in technology transfer. Over the last several years there has been a steady trend in the imports of technology into the country. During the period of January to September 2010, total imports increased by 26.4% to RM389.89 billion mainly from three categories of imports; intermediate goods, capital goods and consumption goods (MATRADE, 2010). The composition of such imports reflects expanding investments in high value-added and technology intensive industries.

Recognizing the need for technology imports to accelerate industrial growth, the government has simplified the approval process for technology transfers by granting automatic approval for technology agreements (MITI, 2009). The Ministry of Trade and Industry approved a total of 779 Technical and Technology Agreements between January.
1995 and August 2001 (MITI, 2002) whereby 55.1 per cent of all agreements approved during the period were in the form of technical assistance agreements, while another 22.1 per cent in the form of licensing and patent agreements, reflects the pattern of technology transfer to Malaysian industries. In addition, Japan accounted for a substantial proportion (56.87 per cent) of all agreements signed between January 1995 and August 2001. The other countries that have been important in this context are United States and Germany, accounting for 15.4 per cent and 7.32 per cent, respectively. The increase in the number of agreements signed with Japanese technology providers has been particularly marked since 1980, perhaps partly due to the Malaysia government’s Look East policy as well as the increasing international role of Japan as an industrial technology exporter.

Although Malaysia’s technological performance is reasonably good compared to regional competitors and countries at the same level of development, World Bank (2009), however, reports it still lags behind more advanced economies such as Korea and Singapore. Moreover, the global competitiveness technology indicators as indicated in the Global Competitiveness Report (GCR) reveals that the government of Malaysia can improve their technological performance by increasing the level of technology availability to the Malaysian firms as well as the level of technology absorption (World Economic Forum (WEF, 2010, 2011, 2012). However, several general conditions affect the development of technological capabilities in Malaysian industries. As technology transfer involves the process of transmission and absorption of technology, the firm’s ability to absorb technology transferred depends on the degree of their technological capability (Sazali et al., 2009).

1.1 Statement of Problem

The ability of Malaysian firms to accumulate technological capabilities will determine the level of firm’s performance and economic growth. The objective of Malaysian government to become a knowledge-based economy will strengthen its capability to adapt and create indigenous technology and simultaneously will push Malaysia to achieve a level at par with industrial nations in terms of economic performance and technological capabilities (Mustapha and Abdullah, 2000).

In order to apply and manage technology effectively, Malaysian firms need to develop their technological capability that guides their utilization of technological resources. In addition, the increasing reliance on the application of latest knowledge intensive technologies requires Malaysian firms to improve their readiness to use new technologies. Currently, Malaysia’s technological competitiveness is on a downturn. In specific, Malaysia’s technological performance is not achieving up to the mark shows that most of the firms in Malaysia still lack of capabilities to make available and use of latest technology. Consequences of these situations caused Malaysian firms still at low level of technological activities, inability of firms to produce indigenous technology, and the reluctance of multinational companies to transfer their key technological knowledge to Malaysia impede Malaysian firms to improve and facilitate their technological performance to a higher level and inhibit Malaysia’s efforts to become a knowledge-based economy in 2020.

A number of studies in the field of technological capabilities have only been carried out in large companies in developed countries (Ortega, 2009) and little come from newly industrializing companies (Ernst and Kim, 2002; Rush et al., 2007; Panda and Ramanathan, 1996). In this sense, there is a gap in the literature about the analysis of the technological capabilities in micro, small and medium size companies in emerging economies such as Malaysia. Therefore, this study will be carry out to identify the key factors that will influence the development of firm’s technological capabilities in Malaysian manufacturing industry from technology transfer perspective.

1.2 Research Question

This study embarks on the following objectives:

1. To identify the key factors influencing technological capability development of manufacturing firms in Malaysia.

1.3 Research Objective

To address the aforementioned objectives and provide solutions to the research problem, four research questions were identified:
2. Literature Review

2.1 Firm-level Technological Capability

Technological capability is broadly regarded as a fundamental component and source of growth and wealth for the nations and the firms (Manopoloulos et al., 2009; Archibugi and Coco, 2004). Indeed, technological capability is a major contribution to the paradigm shift that occurred in the competitive countries and organizations. Various authors have contributed to describe technological capabilities. García-Muina and Navas-Lopez (2007) conceptualize technological capability as a tool for implementing competitive strategy and creating value in any given environment. They define technological capability as the ability to jointly mobilize different scientific and technical resources which enables a firm to successfully develop its innovative products or productive processes. Marjolein (2004) describe technological capability as the efforts and ability to make the right investment choices, increase production capacity, and engage in continuous upgrading of product quality with the aims to assimilate, adapt and improve existing technologies as well as to create new technologies through reverse engineering.

Furthermore, many authors also highlighted the main goal of technological capability is to have an impact on products and/or processes. For example, Ortega (2009) points out that technological capability is the firm’s ability to perform technical functions, develop new products and processes, and operate the firm’s facilities effectively whereas Panda and Ramanathan (1996) define technological capability as a set of functional abilities which reflected the firm’s performance through various technological activities and whose ultimate purpose is firm-level management by developing difficult-to-copy organizational abilities.

However, technological capability is not found entirely at the production plant level, but can also be found at various levels of the organization. Morrison et al. (2007), for instance, depict technological capability as a technical, managerial or organizational skills that firms need in order to utilize efficiently the hardware (equipment) and software (information) of technology as well as to accomplish any process of technological change. Kim (1998) defines technological capability as the ability of firm to make effective use of technical knowledge and skills in efforts to assimilate, use, adapt, and change existing technology, improve and develop products and processes, and also to generate new knowledge and skills in response to changing economic environment. Since this study is conducting at the firm level, therefore, the definition of technological capability must include the features that a firm has to confront in the use of technology. For this reason, this paper will follow the definition given by Rush et al. (2007) who refer technological capability as the process of accumulation of knowledge, experience, skills, and organizational base which enable a firm to acquire, develop and use technology in order achieve competitive advantage.

Over the past decade, technological capability is an important strategic resource enabling the firm to achieve competitive advantage within their industry, particularly in high-tech industries (Duysters and Hagedoorn, 2000). According to McEvily et. al (2004), firms with superior technological capability tend to be more innovative and can secure greater efficiency, thus perform at high levels.

2.2 Factors Influencing Firm’s Technological Capabilities Development

A firm’s technological capability is important for determining the performance of an organization. A growing literature stresses the difficult firm-specific aspect involved in building technological capabilities and argues that organizations have to undertake conscious investments to put technology to productive use (Wignaraja, 2002). The question raises here is what are the factors that might influence the growth of firm’s technological capabilities and simultaneously will give impact to the firm’s technology transfer performance. Zhuang and Lederer (2006) have applied a resource-based view theory in their study and assert that firm resources will foster organizational successful. Their research on 458 e-commerce retailers by using an e-mail and web-based survey shows that e-commerce capability and performance of the firm are predicted by the technology resources (interactivity, publishing applications, catalogue applications, community applications, transaction applications, network performance, user interface) and the complementary of business resources (partner relationships, customer relationships, IT-business relationships, process redesign, benchmarking, e-commerce planning). Human resources such as open organization, open communication, CEO commitment, and flexibility, however, do not significantly determine e-commerce and firm performance.
A study by Karaoz and Albeni (2005) on technological capabilities development of 28 Turkish manufacturing companies shows that most of the firms experienced ever-lowering levels of learning speeds on last 10 years due to lack of finding an experienced and trained workforce especially in intermediate and high level positions, financial insufficiently, managerial and organizational obstacles at the firm level, and utilization of old technologies. Likewise, a study carry out by Adam and Razli (2011) emphasize the importance of organizational learning on the success of firm’s technological innovation implementation. Moreover, a survey performed by Okejiri (2000) shows that 130 manufacturing firms in Nigeria can attain technological capabilities if such factors as macroeconomic environment, firm’s technology strategy, technical workforce capability, and R&D efforts are emphasize by the organizations. The cultivation of technological capabilities of 45 Indonesian manufacturing firms by Kumar et al. (1999) built upon six components including firm’s R&D spending, firm’s planning and control of the technology acquisition, technical personnel availability, duration of training programs, government role and mode of transfer used.

Furthermore, Isobe et al. (2008) have carried out a study on the relationship between technological capabilities and firm performance in Japan. As many as 302 presidents of the small and medium-sized manufacturing firms, who are the members of the Osaka Industrial Association, involve in their study. Their findings using LISREL analysis show that both internal and external factors such as technological volatility, inter-firm collaboration, firm age, and size are significantly associated with the level of refinement and reconfiguration capabilities possessed by a firm.

A study by Kumar et al. (2008) investigates the key elements that affect the ability of 62 Cuban hospitality organizations consisting of hotels, restaurants, travel agencies, transportation companies, tourist stores, and promotion and advertising agencies, to cultivate technological capability through innovation. They conceptualize that the extent to which technological capability is enhanced through innovation activity depends upon ten (10) key factors: leadership and employee support, knowledge and technical expertise, group management skills, project management skills, learning culture, systems and procedures, organizational structure, technological absorptive capacity, government support, and the technological complexity of the innovation.

Yukl (2002) states that employee’s work behaviour’s are strongly affected by their leaders. Leaders can directly decide to introduce new ideas in to organization, set specific goals, encourage subordinates for innovation and learning (Harbone and Johne, 2003; Aragon-Correa et al. 2007). Jung (2001) claims that leadership style is a key influential factor that impacts creativity behaviours and performance. In a study by McColl-Kennedy and Anderson (2002), Malaysian managers rated transformational leadership as a highly significant contributor to outstanding leadership. Moreover, Avolio and Bass (2002) found that transformational leadership is more effective than transactional leadership in generating extra effort, commitment, and satisfaction of those led. Furthermore, Jochen (2014) assert that transformational leaders sustain a culture that values creative and innovative work approaches in an intellectually stimulating work environment.

Furthermore, Rush et al. (2007) examine technological capabilities of 25 selected Korean firms covering a wide range of sector grouping such as electronics and automobiles by using nine (9) factors; 1) technology awareness, 2) technology search, 3) building of core competencies, 4) development of technology strategy, 5) the exploration and assessment of the range of technological options, 6) acquisition of the technology, 7) implementation, absorption and operation of the technology within the firm, 8) learning, and 9) exploiting external linkages. Rogers (1995) defined technology awareness as user’s knowledge, about the capabilities of a technology, its features, potential use, and cost and benefits which related to knowledge awareness. Ilesanmi (2012) claimed that the higher the awareness, the higher the penetration and diffusion of technology, and vice versa.

Firms can gain competitive advantage from their external counterparts and use related information for organizational success. Theoretical papers have argued that external actors represent sources of information and thus, a positive relationship between the external linkages and firm performance should exist (Chesbrough, 2003). Empirical research has instead looked at the nature of the linkages distinguishing between the role played by specific actors such as suppliers, customers, and universities as source of information (Laursen and Salter, 2004). Inter-firm collaboration, which is embedded in a firm’s close interactions with its suppliers, customers, and particular institutions, often brings new resources and opportunities, thus, can serve as a significant source of competitive advantage for a firm (Phan and Peridis, 2000; Peng and Delios, 2006). Baum et al. (2000) suggest that a firm can further develop and strengthen its internal competence by developing an external networking with other organizations, while Rothaermel (2001) and Lee et al. (2001) assert external learning through inter-firm network has a stronger impact on firm’s technological capability and performance. Furthermore, Varis and Hannu Littunen (2010) demonstrate that external sources of information are positively associated with the introduction of firm’s product innovations while a study conducted by
Nieminen and Kaukonen (2001) reveal significant various partners in contributing to firm’s innovation related activities.

2.3 Research Model

This study concentrates on the process of technological capability building, which have centred on analysing the impact of the capabilities in the business performance. Therefore, it is necessary to focus the attention on the factors that accelerate the development of the firm’s technological capability specifically in sectors that contribute to the great economic such as manufacturing industry.

Literature review and expert survey were used to determine the key factors that potentially may improve the technological capabilities at the firm level. A list of potential key factors was extracted. The extracted items were examined by subject matter experts, involving the academics and industrialists. A draft questionnaire was designed and the respondents were asked to specify the extent to which the factors have an effect to the development of technological capabilities in their company. Finally, six major factors as illustrated in Figure 1 contribute to the development of firm’s technological capabilities were recognized and proposed.

![Research model using PLS path modeling for important factors influencing technological capability of Malaysian manufacturing firms involved in technology transfer activities.](image)

From the review, hypotheses were formed in this study to examine the relationship between the factors and technological capability of the Malaysian manufacturing firms as follows:

**Hypothesis 1 (H1):** Higher level of firm’s technology awareness influence the development of firm’s technological capability.

**Hypothesis 2 (H2):** Transformational leadership style promote the development of technological capability of the manufacturing firms.

**Hypothesis 3 (H3):** Higher level of firm’s technological learning positively influence the development of firm’s technological capability.

**Hypothesis 4 (H4):** Collaborate with external sources of information/linkage positively influence the firm’s technological capability.

**Hypothesis 5 (H5):** Technology turbulence positively influence the development of firm’s technological capability.

**Hypothesis 6 (H6):** Higher organizational core competencies influence the development of firm’s technological capability.

3. Methodology

3.1 Sample and Data Collection
For the purpose of examining the conceptual model of this study, the data is collected from manufacturing companies listed in Federation of Malaysian Manufacturers (FMM) directory 2013 and manufacturing companies with the total number of employees less than 500 were selected for this study. Manufacturing industry was chosen because they are the leading industry in Malaysia’s economy, contributing significantly to the country’s manufacturing output, exports, and employment. Being the largest sector in the Malaysia, the manufacturing companies has developed significant technological capabilities and skills for the production of higher value-added products (MIDA, 2012). A survey research method is adopted to collect the data, where the instrument is adapted from previous studies.

By using face-to-face and mail survey approach, a total of 34 items was administrated randomly to 250 manufacturing companies. The unit of analysis of this study was represented by the top and middle management as the researcher convinced that those level of management have knowledge regarding the issue under study. Out of 250 distributed questionnaires, 121 usable questionnaires were returned, representing a response rate of 48.4%.

4. Analysis and Results

This study adopted a Structural Equation Modeling (SEM) using Partial Least Squares (PLS) in order to determine the most significant factors influencing the firm’s technological capability in manufacturing industry. SEM allows the simultaneous modeling of relationships among multiple independent and dependent constructs (Byrne, 2001) while PLS allows the analysis of both reflective and formative measures (Ringle et al., 2005).

4.1 Validity of the constructs

Construct validity indicate how well the results obtained from the use of the measure fit the theories around which the test is designed (Ramayah and Mohamad, 2010). An assessment was examined by using both convergent and discriminant analysis in order to determine that the instrument adopted the concept as theorized.

4.2 Convergent Validity

The convergent validity was carried out to examine whether the measures of the same construct are correlated highly (Sekaran, 2003). As suggested by Hair et al. (2013), the factor loadings, average variance extracted (AVE), and composite reliability (CR) were used to assess the convergent validity. Table 1 depicts loadings for all items greater than the recommended value of 0.5 indicating convergent validity at the indicator level (Hair et al., 2013). While, the AVE values ranged from 0.526 to 0.773 which exceeded the cut-off point of 0.5 indicating convergent validity at the construct level Hair et al., 2013). The CR values ranged from 0.814 to 0.902, which greater than the recommended value of 0.7 indicating acceptable reliability (Hair et al., 2013). Table 1 summarizes the results of the measurement model.
## Table 1: Measurement Model

<table>
<thead>
<tr>
<th>Construct</th>
<th>Item</th>
<th>Loading</th>
<th>AVE</th>
<th>CR</th>
<th>Cronbach’s α</th>
</tr>
</thead>
<tbody>
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<td>Core Competencies</td>
<td>CC1</td>
<td>0.897</td>
<td>0.829</td>
<td>0.960</td>
<td>0.953</td>
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<tr>
<td></td>
<td>CC2</td>
<td>0.911</td>
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<td></td>
<td>CC3</td>
<td>0.933</td>
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<tr>
<td></td>
<td>CC4</td>
<td>0.932</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>CC5</td>
<td>0.879</td>
<td></td>
<td></td>
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<tr>
<td>External Linkage</td>
<td>EX1</td>
<td>0.889</td>
<td>0.601</td>
<td>0.882</td>
<td>0.882</td>
</tr>
<tr>
<td></td>
<td>EX2</td>
<td>0.702</td>
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<td></td>
<td>EX3</td>
<td>0.820</td>
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<td></td>
<td>EX4</td>
<td>0.653</td>
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<tr>
<td></td>
<td>EX5</td>
<td>0.791</td>
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<tr>
<td>Transformational Leadership</td>
<td>L1</td>
<td>0.666</td>
<td>0.557</td>
<td>0.831</td>
<td>0.819</td>
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<td></td>
<td>L2</td>
<td>0.686</td>
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<td></td>
<td>L3</td>
<td>0.902</td>
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<td></td>
<td>L4</td>
<td>0.896</td>
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<td></td>
<td>L5</td>
<td>0.714</td>
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<td></td>
<td>L6</td>
<td>0.662</td>
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<tr>
<td>Technology Awareness</td>
<td>AW1</td>
<td>0.886</td>
<td>0.774</td>
<td>0.932</td>
<td>0.902</td>
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<tr>
<td></td>
<td>AW2</td>
<td>0.896</td>
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<td></td>
<td>AW3</td>
<td>0.895</td>
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<td></td>
<td>AW4</td>
<td>0.840</td>
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<tr>
<td>Technology Turbulence</td>
<td>TB1</td>
<td>0.691</td>
<td>0.621</td>
<td>0.867</td>
<td>0.796</td>
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<td></td>
<td>TB2</td>
<td>0.791</td>
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<td></td>
<td>TB3</td>
<td>0.859</td>
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<tr>
<td></td>
<td>TB4</td>
<td>0.802</td>
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<tr>
<td>Technological Learning</td>
<td>TL1</td>
<td>0.860</td>
<td>0.580</td>
<td>0.890</td>
<td>0.864</td>
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<tr>
<td></td>
<td>TL2</td>
<td>0.783</td>
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<td></td>
<td>TL3</td>
<td>0.613</td>
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<td></td>
<td>TL4</td>
<td>0.621</td>
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<td>TL5</td>
<td>0.579</td>
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<td></td>
<td>TL6</td>
<td>0.541</td>
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<tr>
<td>Technological Capability</td>
<td>INC1</td>
<td>0.778</td>
<td>0.704</td>
<td>0.905</td>
<td>0.859</td>
</tr>
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<td></td>
<td>INC2</td>
<td>0.894</td>
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<tr>
<td></td>
<td>INC3</td>
<td>0.825</td>
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<tr>
<td></td>
<td>INC4</td>
<td>0.855</td>
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</tbody>
</table>

### 4.3 Discriminant Validity

The discriminant validity was carried out to find out the extent to which the measures do not reflect other variables and it is indicated by low correlations between the measures of interest and of other constructs (Chow and Chan, 2008; Cheung and Lee, 2010). In addition, it was examined by comparing the square root of the AVE for the construct with the inter-construct correlations. As shown in Table 2, the correlations for each construct are less than the squared AVE indicating adequate discriminant validity for all the reflective constructs. Thus, the measurement model evaluation criteria have been met demonstrating adequate convergent and discriminant validities.
Table 2: Inter-construct Correlations

<table>
<thead>
<tr>
<th></th>
<th>Transformational Leadership</th>
<th>Technological Capability</th>
<th>Technology Awareness</th>
<th>Core Competencies</th>
<th>Technological Learning</th>
<th>External Linkage</th>
<th>Technology Turbulence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transformational</td>
<td>0.676</td>
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<tr>
<td>Leadership</td>
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<tr>
<td>Technological</td>
<td>0.154</td>
<td>0.839</td>
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<tr>
<td>Capability</td>
<td>0.115</td>
<td>0.533</td>
<td>0.879</td>
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<tr>
<td>Technology Awareness</td>
<td>0.043</td>
<td>0.047</td>
<td>0.054</td>
<td>0.911</td>
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<tr>
<td>Core Competencies</td>
<td>0.074</td>
<td>0.137</td>
<td>0.034</td>
<td>0.105</td>
<td>0.761</td>
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<tr>
<td>Technological Learning</td>
<td>0.158</td>
<td>0.047</td>
<td>0.235</td>
<td>0.046</td>
<td>0.775</td>
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<td>External Linkage</td>
<td>0.110</td>
<td>0.671</td>
<td>0.523</td>
<td>0.049</td>
<td>0.006</td>
<td>0.016</td>
<td>0.788</td>
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<tr>
<td>Technology Turbulence</td>
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</tbody>
</table>

Note: Values in the on diagonal represent the square root of the AVE (variance extracted) while the off diagonal represent the correlation.

4.4 Reliability Analysis

The cronbach’s alpha coefficients to assess the inter-item consistency in the measurement items were also analysed. Table 1 shows that the alpha values for all constructs ranged from 0.796 to 0.892 which exceeded the benchmark of 0.6 as suggested by Nunnally and Berstein (1994). Hence, the measurements are reliable.

4.5 Measuring Structural Model

Before examining the hypotheses, the predictive relevance of the model is tested. A non-parametrical test to determine the coefficient R² was applied to evaluate the quality of the structural model. The R² takes on values between 0 and 1. The higher the value, the larger the percentage of variance explained. The R² values was assessed based on the assessment criterion suggested by Cohen (1988) where the values of 0.02, 0.13, and 0.26 indicate the endogenous variable is considered has weak, moderate, and substantial influence on the particular exogenous variable, respectively.

An additional criterion to evaluate the quality of the model is through the use of Blindfolding procedure to assess the capability of the model to predict (Hair et al., 2013). The Q² value is obtained by using the blindfolding procedure which is only applied to endogenous constructs that have a reflective measurement model (Henseler et al., 2009). The Q² was obtained by computing the cross-validated redundancy to estimate both the structural and measurement models for data prediction (Hair et al., 2013). As proposed by Fornell and Cha (1994), the value of cross-validated redundancy (i.e Q²) should greater than zero, otherwise, it indicates less than zero represents a lack of predictive relevance. The following Table 3 shows the prediction relevance of the model.

Table 3: Prediction Relevance of the Model

<table>
<thead>
<tr>
<th>Endogenous Construct</th>
<th>R square (R²)</th>
<th>Cross-validated Redundancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technological Capability</td>
<td>0.524</td>
<td>0.108</td>
</tr>
</tbody>
</table>

The above Table 3 shows a R² value of 0.524 which indicates that 52.4% of the variability observed in the firm’s technological capability can be explained by the set of predictors (technology awareness, transformational leadership, technological learning, external linkage, technology turbulence, and core competencies.) Referring to Cohen (1988) criterion, the model of this study indicates that the endogenous variables (factors) have substantially influenced the exogenous variable (technological capability). Regarding the Q² value, as shown in Table 4, the cross-validated
redundancy value was found to be (0.108) more than zero resulted that the model of this study has an adequate prediction quality.

Furthermore, in order to test the six hypotheses generated earlier, path analysis was used. The path loadings between constructs was examined to identify significance using computed t-statistics. In order to test the significance, all the data were run using bootstrapping algorithm in SmartPLS 2.0. Table 4 presents the path coefficients (β), t-value, and significance for the structural model, and indicates the results of the hypotheses testing.

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Relationship</th>
<th>Path Coefficient (β)</th>
<th>Standard Error</th>
<th>t-value</th>
<th>p-value</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>Awareness - Technological Capability</td>
<td>0.250</td>
<td>0.082</td>
<td>3.044***</td>
<td>0.001</td>
<td>Supported</td>
</tr>
<tr>
<td>H2</td>
<td>Leadership - Capabilities -&gt; Technological Capability</td>
<td>0.048</td>
<td>0.121</td>
<td>0.401</td>
<td>0.344</td>
<td>Not Supported</td>
</tr>
<tr>
<td>H3</td>
<td>Learning - Technological Capability</td>
<td>0.149</td>
<td>0.104</td>
<td>1.993*</td>
<td>0.023</td>
<td>Supported</td>
</tr>
<tr>
<td>H4</td>
<td>Linkage - Technological Capability</td>
<td>0.047</td>
<td>0.096</td>
<td>0.489</td>
<td>0.312</td>
<td>Not Supported</td>
</tr>
<tr>
<td>H5</td>
<td>Turbulence - Technological Capability</td>
<td>0.536</td>
<td>0.064</td>
<td>8.435**</td>
<td>0.000</td>
<td>Supported</td>
</tr>
<tr>
<td>H6</td>
<td>Competencies - Technological Capability</td>
<td>0.014</td>
<td>0.086</td>
<td>0.162</td>
<td>0.435</td>
<td>Not Supported</td>
</tr>
</tbody>
</table>

** p<0.01, * p<0.05

The direct relationship between a set of predictors and firm’s technological capability was analysed and a significant relationship was found between technology awareness and the firm’s technological capability (β=0.250, t=3.044, p<0.01), technological learning and firm’s technological capability (β=0.149, t=1.993, p<0.05), technology turbulence and firm’s technological capability (β=0.536, t=8.435, p<0.01). Thus, supporting H1, H3, and H5 in this study.

Discussion and Conclusions

Technological capability is a fundamental component and source of growth for both the nations and the firms (Manopoloulos et al., 2009). Indeed, technological capability has been recognized as a major contribution to the paradigm shift that occurred in the competitive countries and organizations (Archibugi and Coco, 2004). Although Malaysia’s technological performance is reasonably good compared to regional competitors and countries at the same level of development, however, it still lags behind more advanced economies such as Korea and Singapore. Therefore, Malaysian firms need to develop their technological capability that guides their utilization of technological resources in order to accelerate technology performance effectively. The ability of Malaysian firms to accumulate technological capabilities will determine the level of firm’s performance and economic growth. Recently, the tendency of most of the studies concerned with firm’s technology activities are the investigation of factors that can be the antecedents of firm’s technological capability development and improvement. A number of studies in the field of technological capabilities have only been carried out in large companies in developed countries and little come from newly industrializing companies. In addition, there is a gap in the literature about the analysis of the technological capability in micro, small and medium size companies in emerging economies such as Malaysia. Therefore, this study will be carry out to identify the key factors that will influence the development of firm’s technological capability in Malaysian manufacturing industry.

This study proposed six major factors that will influence the development of firm’s technological capability in Malaysian manufacturing industry. The examination of the effect of these factors on the firm’s technological capability was performed. The finding shows that technology awareness has a positive and significant effect on firm’s technological capability. This result compatible with previous studies

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Next, the result also shows that technological learning has a positive and significant effect on firm’s technological capability. This result supported previous work by Rush et al. (2007) who have conducted an assessment on the technological strategies and capabilities of 25 selected Korean firms covering a wide range of sector grouping such as electronics and automobiles. According to them, learning forms an important part of the development of technological competencies. In addition, this study also supported Kumar et al. (2008) who found that technological learning affect the ability of 62 Cuban hospitality companies to cultivate technological capability through innovation projects.

Finally, the result of this study demonstrates that technology awareness has also a positive and significant effect on firm’s technological capability. This result is in line with previous studies of Rush et al. (2007) and Ilesanmi (2002) who claim that the higher the awareness, the higher the penetration and diffusion of technology in the organization.

The implications of this study are presented by providing the evidence that companies aiming to develop and improve their technological capability need to continuously enhance and focus on technology awareness, technological learning, and technology turbulence. Additionally, through this findings, it can be advised that companies involve in this study should boost up and continually improved their managerial aspects especially leadership style in order to sustain a competitive advantage. Furthermore, they should continually strengthen its internal competence by developing an external networking with other organizations, and given more attention on people in their companies. Employee’s readiness in terms of their skills and experience consider as an important component in order to enhance their firm’s core competencies.

References


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