A Study on the Relationship between Knowledge Management, Knowledge Absorption and Innovative Management Capabilities in Taiwan’s High-tech Industries

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Abstract

Technology development and the fast changing market have resulted in the life cycle of high-tech products becoming shorter. Enterprises must therefore continuously conduct innovative research to meet customer demand and increase industrial competitiveness. Innovative product research and management have become the most important activities in enterprise survival and sustainability. This study is aimed at analyzing and exploring the relationship between Knowledge Management (KM), Knowledge Absorption Capability and Innovation Management Capability in Taiwan high-tech industries. This study found: (1) a significant positive correlation between knowledge management capability and innovation management capability; (2) a significant positive correlation between knowledge management capability and knowledge absorption capability; and (3) a significant positive correlation between knowledge absorption capability and innovation management capability. Through analyses conducted using statistic methods, such as Factor Analysis, Correlation Analysis, Multiple-regression -analysis, LISREL Model Analysis, and t-Test, this study found a significant positive correlation between knowledge management capability, knowledge absorption capability and innovation management capability in Taiwan’s High-tech industries.

Keywords: Knowledge Management Capability, Knowledge Absorption Capability, Innovative Management Capability

1. Introduction

Since the “Innovation” and “Diffusion” theories proposed by Schumpeter in 1934, “Innovation” has become an important research subject. The research by Zahra & George (2002), indicated that although enterprises possess many methods to reach a competitive advantage, innovation and strategic flexibility are the two most important factors. Nonaka & Takeuchi (1995) proposed that knowledge creation results from the interaction between Tacit Knowledge and Explicit Knowledge. Through the Knowledge Conversion Model we are able to understand the organization of knowledge creation as the result of continuous interactions between
Tacit Knowledge and Explicit Knowledge. Holtshouse (1998) thought that Knowledge is a kind of “Flow” concept, i.e. knowledge is able to be exchanged between the knowledge providers and demanders. Nonaka et al. (2000) thought that irrespective of knowledge creation or innovation, the knowledge sharing activity between peoples and groups is the starting point for the next “Spiral of Knowledge” wave. Hendrike (1999) considered knowledge sharing to be formed through the knowledge transfer between knowledge owners and demanders. An individual may possess the double status of knowledge owner and demander, however, the motivation for knowledge sharing is different in knowledge owners and demanders.

Following the development of technology, the high-tech industry became important in the development of a global manufacturing industry. Shorter product lifecycles accelerated the importance of the new product development process. Confidence in attaining time-to-market goals became extraordinarily important. The mechanisms for promptly releasing new products and using knowledge and innovation management have become the operating core of present day enterprises. Under the pressure of facing a highly competitive business environment, accelerating the release of new products by shortening the product development and time-to-market for new products is the focal point of business operating strategies. Lin (2006) pointed out in his research that the influential factors for innovation management included adapting the attitudes of employees to the environmental uncertainty, changes and challenges to the organizational structure and culture. Cohen & Levinthal (1990) first proposed the absorption capability concept. They indicated in their research that absorption is the capability to evaluate, assimilate and utilize new information, external to the organization to form new or improved commercial products or activities.

This study conducted empirical research on the mutual relationship between knowledge management capability, knowledge absorption capability and innovation management capability. The research objects of this study were: (1) To explore the relationship between knowledge management capability and knowledge absorption capability; (2) To explore the relationship between knowledge management capability and innovation management capability; (3) To explore the relationship between knowledge absorption capability and innovation management capability.

2. Literature Review

2.1 Knowledge Management Capability

Knowledge Management is a set of clearly defined processes or approaches used to discover the critical knowledge necessary between different knowledge management operations. It is also necessary for determining new products and strategies that strengthen human resources management in achieving enterprise goals. From successful Knowledge Management case studies, Davenport (1996) found that the enterprises Knowledge Management system included: a knowledge database of talents and techniques (know-who and know-how), on-line assistant inquiry system; and that knowledge management success requires coordinated human and technology know-how. Davenport (1996) also pointed out that Knowledge Management is an information collection process that transfers the collected information to the right people. Each activity such as Knowledge Acquisition,
Knowledge Creation, Knowledge Storing and Sharing, can effectively improved the value of Knowledge Assets in organizations. This is called “Knowledge Management.” Clark & Fujimoto (1991) thought the integration of Knowledge Management needs the comprehensive and cross-functional. The new product development strategy also conducts comprehensive knowledge integration to achieve effectiveness. Within the Knowledge Management domain, Teece et al. (1997) emphasized the importance of Knowledge Integration. Harrison & Samaon (2002) thought that many companies started taking innovation as the key factor in forming competitive advantage, thus Knowledge will be the critical element in how to maintain sustainable innovation. Van den Hoooff & Van Weenen (2004) thought that Knowledge Sharing can be divided into the types of knowledge granted and knowledge collection. Lee (2001) believed that knowledge sharing is the activity of transferring or spreading knowledge to others from individuals, groups and organizations. Ryu et al. (2003) considered knowledge sharing as a transfer activity that allowed people in the organization to acquire knowledge from others. The research of Van den Hoooff & Van Weenen (2004) considered that knowledge sharing in the organization can be divided into the types of knowledge bestowed and collected. This study adopted Knowledge Acquisition, Creation, Storage and Sharing as the major facets of “Knowledge Management Capability”.

2.2 Knowledge Absorption Capability

The research of Cohen & Levinthal (1990) indicated that the absorption capability is the ability to use evaluate, assimilate and externalize new information to form a commercial product or service. This concept has been broadly emphasized by scholars (George et al., 2001; Minbaeva et al., 2003; Lenox & King, 2004) in the domains of high-tech management, international commerce and strategic management. Zahra & George (2002) proposed that the absorption capability is composed of potential and realizing capabilities. Minbaeva et al. (2003) thought that the Employee Learning Capability and Learning Motivation are the key facets in the absorption capability. The empirical results of Minbaeva et al. (2003) discovered a positive influence of certain human resource management activities to the development of absorption capability. The research of Lenox & King (2004) on absorption capability claimed that administrators shall directly provide information to the organization and such activities may increase the enterprise’s absorption capability. This study organized and arranged the above mentioned literature and documents and adopted Employee Learning Capability and Learning Motivation as the major facet of knowledge absorption capability.

2.3 Innovative Management Capability

Innovation is the key factor in the enterprises’ existence. Innovation management is the most important activity for enterprise survival. Therefore, the enterprise will strive for innovation in the development of new products. The viewpoints from scholars on innovation management are as follows:

Daft & Becker (1978) categorized innovation management activities into: (1) Innovation Management Structure Activities and (2) Innovation Technique Activities. Holt (1983) divided innovation activities into: (1) Technology Innovation Activities; (2) Management Innovation Activities; (3) Organizational Innovation Activities.
Activities; and (4) Regular Innovation Activities. Chacke (1988) also divided innovation activities into: (1) Product Innovation Activities; (2) Process Innovation Activities; and (3) Organization Innovation Activities. The research of Schumpeter (1934) indicated that innovation is a process that can be trained and learned. Marquis (1969) thought that innovation can be divided into the breakthrough, incremental and systematic innovations. Betz (1993) added a 4th type of innovation: Next Generation Technology Innovation. Cohen & Levinthal (1990) advocated innovations that included product, society and management innovations. Samson (1991) divided innovation into: product, process, management and system innovations.

Amabile (1988), Kanter (1988), Johannessen & Dolva (1994), Scott & Bruce (1994) etc. thought that innovation activities is a type of process, focused on a series of processes or phases to determine the innovation. Dougherty & Bowman (1995), Lumpkin & Dess (1996) considered that enterprises adopt product and process concepts to define the innovation activity, and integrate the results together with its processes. Damanpour (1991), Russell (1995), Robbins (1996) thought that innovation activities must not focus just on the “technical level” while neglecting the “management level”. As a result, they claimed the innovation activities shall contain technology innovation in products and processes. Knight (1967) categorized the innovation activities into: (1) Product or Service Innovation Activities; (2) Production Process Innovation Activities; (3) Organization Structure Innovation Activities; and (4) Personnel Innovation Activities. The research of Allan & Nik (1995) indicated that orderly arranged the innovation level from small to big by using the Nominal Scale, and the sorting is the gradual innovation, module innovation, structural innovation and breakthrough innovation. This study divides innovation activities into: Management Innovation, Technology Innovation, Market Innovation, and Culture Innovation and adopted these 4 innovations as the major facets of “innovation management”; their descriptions are as follows:

(1) Management Innovation Facet: the research of Cooper (1979) pointed that from the viewpoint of product technology and management to conduct a deeper research on the influence of product innovative achievement. The study of Rosenberg & Frischtkat (1985) indicated that enterprise’s technical capability is gradually accumulated from design and manufacturing activities, thus the well-collected and well-preserved information, the higher technical capability.

(2) Technology Innovation Facet: the research of Cooper & De Brentani (1991) indicated that the facets that influenced on whether the innovation activities will succeed in manufacturing industries including: exclusive advantaged product, implementing quality of technical activities, levels of market attraction, etc. Christopher & Gina (2002) adopted the strategic viewpoints, such as market, asset management and human resources to describe the main purpose of innovation and the challenge they will encounter. The research of Tatikonda & Stock (2003) pointed that divided the facets of innovation management that influenced on enterprise’s achievement into the internal viewpoint (included quality, unit cost, time to market) and external viewpoint (included product marketing, customer satisfaction, profit, etc).

(3) Market Innovation Facet: the study of Raudsepp (1987) pointed that innovation capability can only represent the capability to develop new products,
that is, when the enterprise engages in innovation activities, it must consider the related factors, such as market facet, etc. In many major traditional enterprises, the breakthrough innovation is more likely unable to obtain support, that internal company culture and pressure will shift the related recourses to the management of market innovation that possessed lower risks and faster retrieve.

(4) Culture Innovation Facet: the research of Kanter (1988) indicated that the Culture Innovation is the power resource of the continuously advancement for enterprises; with following the changes in environment, the organizational power will start elaborating its function. The research of McGrath (1993) proposed that through the Culture Innovation activities of its internal teams, as well as the initiation of teammates’ originality, enterprise is able to produce the customer-attractive products and obtain the competitive advantages that can be imitated by its competitors to improve their product innovative achievement. Cooper & Kleinschmidt (1996) adopted 161 enterprises as the sample. They thought that when discussing the correlation between new product and enterprise on the viewpoint of cultural characteristics, its influential facets are the strategy, culture and innovative atmosphere.

2.4 Knowledge Management and Innovative Management Capabilities

In an empirical research on the knowledge sharing behavior and the organizational information system outsourcing that conducted by Lee (2001) found that the knowledge management is the main predictive factor in whether the enterprise’s outsourcing activity will succeed or not. The research of Hong et al. (2004) pointed that it showed a significant positive correlation between the knowledge management and innovative R&D of new products.

2.5 Knowledge Absorption and Innovative Management Capabilities

The study of Zahra & George (2002) pointed out that most previous investigating researches on the absorption capability and innovation showed a significant positive correlation between them, and the organizational competitive advantage that established by the cooperation between them. The empirical study of Knudsen & Roman (2004) indicated that the absorption capability is an important factor in predicting the organizational innovation capability. Scholars, such as Minbaeva et al. (2003), proposed the absorption capability concept and proved that a significant positive correlation existed between absorption capability and innovation capability within the empirical models. While the empirical study of Knudsen & Roman (2004) on the role of absorption capability proposed the result of the absorption capability to predict the organizational innovation capability is a very important conclusion. The research of Nieto & Quevedo (2005) indicated that the knowledge absorption capability is able to determine the striving achievement of enterprise’s innovation.

2.6 Definition and Characteristics of High-tech Industries

In their research, Bleicher & Paul (1983) indicated that the High-tech industry is categorized as a capital-technology-intensive industry, which is particular about professional knowledge, focuses on the R&D and incubation of technology talents. Gould & Keeble (1984) thought that High-tech industry shall adopt the 3 indicators to
conduct the measurement, such as: the ratio of R&D expenses to the total yield; the speed of technology innovation; and the percentage of R&D personnel. Shanklin & Ryans (1984) considered that an enterprise shall possess a powerful and solid foundation of science and technology; where its new technology is able to replace the existing technology promptly; the application of such new technology can establish or change the market demands; and then it can be called as “High Technology”. The research of Chiu (2002) pointed out that characteristics of high-tech industry included intensive capitals, high technology levels, shorter product lifecycles, etc. This study has synthesized the organized literature above mentioned and divided Taiwan’s Industry into: (1) Integrated Circuit (IC) Industry; (2) Computer and Peripheral Industry; (3) Communication Industry; (4) Optoelectronics Industry; (5) Precision Machinery Industry; and (6) Biotechnology Industry, 6 major industries.

3. Research Methodology

3.1 Research Framework

This study is mainly probed into the relationship between the Knowledge Management Capability, Knowledge Absorption Capability and Innovation Management Capability, and the research framework is shown as in Figure 1.

![Figure 1: Research Framework Drawing of this Study](image-url)
3.2 Research Hypothesis

Based on the literature review, the research hypotheses that have been deduced from this study are shown as follows:

**Hypothesis H1**: Relationship between knowledge management capability and innovation management capability.

H1-1: There was a significant positive correlation between enterprise knowledge acquisition capability and innovation management capability.

H1-2: There was a significant positive correlation between enterprise knowledge creation capability and innovation management capability.

H1-3: There was a significant positive correlation between enterprise knowledge storage capability and innovation management capability.

H1-4: There was a significant positive correlation between enterprise knowledge sharing capability and innovation management capability.

**Hypothesis H2**: Relationship between knowledge management capability and knowledge absorption capability.

H2-1: There was a significant positive correlation between enterprise knowledge acquisition capability and knowledge absorption capability.

H2-2: There was a significant positive correlation between enterprise knowledge creation capability and knowledge absorption capability.

H2-3: There was a significant positive correlation between enterprise knowledge storage capability and knowledge absorption capability.

H2-4: There was a significant positive correlation between enterprise knowledge sharing capability and knowledge absorption capability.

**Hypothesis H3**: Relationship between knowledge absorption capability and innovation management capability.

H3-1: There was a significant positive correlation between employee learning capability and innovation management capability.

H3-2: There was a significant positive correlation between employee learning motivation and innovation management capability.

3.3 Research Object

This study adopted the Taiwan’s High-tech industries as the object of practical verification and test, and the research scope included 6 major industries, such as Integrated Circuit (IC) Industry, Computer and Peripheral Industry, Communication Industry, Optoelectronics Industry, Precision Machinery and Biotechnology Industry. The related information and data was collected using a questionnaire. The people asked to fill out the questionnaire comprehensively knew about knowledge management and innovation management, hence they were new product development managers, senior product planning personnel, senior R&D managers and knowledge management superintendents of industries are the major objects of filling up the questionnaire to increase the validity of the questionnaire. In this study that distributed 600 questionnaires in August 2007, 105 valid ones out of 125 returned questionnaires, and the valid return rate is 17.50%.

3.4 Questionnaire Design and Measurement

This questionnaire was divided into 4 major parts. The first three parts were measured using the Five-point Likert Scale. First Part: Knowledge Management Capability, which mainly includes: (1) Acquisition of Knowledge; (2) Creation of Knowledge; (3) Storage of Knowledge;
and (4) Sharing of Knowledge etc., 4 measuring items that designed for this questionnaire. Second Part: Knowledge Absorption Capability, which mainly includes: (1) Learning Capability of Employee; and (2) Learning Motivation of Employee. Third Part: Innovation Management Capability, which mainly includes: (1) Management Innovation; (2) Technology Innovation; (3) Market Innovation; and (4) Culture Innovation etc., 4 measuring items that designed for this questionnaire. Fourth Part: Collection of Basic Information in industrial characteristics and company’s capital, business volume, and number of employees, etc.

3.5 Methods of Data Analysis

This study adopted the Structured Close-ended Questionnaire approach in accordance with collecting and compiling literature to design a set of questionnaires. SPSS 12.0 for Windows software was used to implement the analytical information. The content analysis included Cronbach’s α Reliability Analysis, Validity Analysis and Confirmatory Factor Analysis (CFA), t-test, Multiple Regression Analysis.

3.6 Examination of Reliability and Validity

The object of this questionnaire was high-tech industry experts; this questionnaire was designed using the literature review and previous related research. A preliminary questionnaire content revision to verify the validity of the questionnaire content was conducted. Each question in this study was processed for the Cronbach’s α coefficient of reliability. The greater the Cronbach’s α value showed that the correlation between each question item contents was also greater, thus the internal consistency was higher. In general, in the basic research, scholar Nunnally (1978) thought: it is acceptable if the reliability is above 0.7. However, the reliabilities were above 0.7 on average in this study. Therefore the internal consistency of each measurement was reliable in this study.

4. Analysis of Research Result

4.1 Reliability, Validity and Confirmatory Factor Analysis (CFA) of Each Facet

This study conducted reliability, validity and Confirmatory Factor Analysis (CFA) on the knowledge management capability, knowledge absorption capability and innovation management capability to understand the optimum matching condition for the measurement table within the measurement models. The results are shown in Table 1. The Cronbach’s α value for each facet was higher than 0.7. The Composite Reliability (CR) was above 0.6 on average, which conformed to the viewpoint of Bagozzi & Yi (1988), emphasizing a CR value of at least higher than 0.6. The comparative fit index, the GFI and AGFI values (adjusted goodness of fit index) between 0.93~0.95 and 0.83~0.91, and the RMR value was always smaller than 0.05, which showed the questionnaire and measurement table to possess a certain level of consistency. The T value for all questions for each research facet was significantly higher than 2, which showed a find convergent validity.
A Study on the Relationship between Knowledge Management, Knowledge Absorption and Innovative Management Capabilities in Taiwan’s High-tech Industries

Table 1: Reliability, Validity and Confirmatory Factor Analysis (CFA) of Each Facet

<table>
<thead>
<tr>
<th>Variable / Facet</th>
<th>Cronbach’s α</th>
<th>GFI</th>
<th>AGFI</th>
<th>RMR</th>
<th>CR</th>
<th>T Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge Management Capability</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge Acquisition</td>
<td>0.88</td>
<td></td>
<td>0.95</td>
<td></td>
<td>0.04</td>
<td>13.83–18.89</td>
</tr>
<tr>
<td>Knowledge Innovation</td>
<td>0.86</td>
<td></td>
<td>0.83</td>
<td></td>
<td>0.04</td>
<td>13.11–18.14</td>
</tr>
<tr>
<td>Knowledge Storage</td>
<td>0.89</td>
<td></td>
<td></td>
<td></td>
<td>0.04</td>
<td>15.12–18.43</td>
</tr>
<tr>
<td>Knowledge Sharing</td>
<td>0.90</td>
<td></td>
<td></td>
<td></td>
<td>0.04</td>
<td>13.22–19.05</td>
</tr>
<tr>
<td>Knowledge Absorption Capability</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning Capability</td>
<td>0.87</td>
<td></td>
<td>0.93</td>
<td></td>
<td>0.03</td>
<td>15.17–18.55</td>
</tr>
<tr>
<td>Learning Motivation</td>
<td>0.86</td>
<td></td>
<td></td>
<td></td>
<td>0.03</td>
<td>12.35–18.87</td>
</tr>
<tr>
<td>Innovative Management Capability</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management Innovation</td>
<td>0.85</td>
<td></td>
<td>0.94</td>
<td></td>
<td>0.02</td>
<td>16.98–19.89</td>
</tr>
<tr>
<td>Technology Innovation</td>
<td>0.84</td>
<td></td>
<td>0.86</td>
<td></td>
<td>0.02</td>
<td>16.75–19.83</td>
</tr>
<tr>
<td>Market Innovation</td>
<td>0.88</td>
<td></td>
<td></td>
<td></td>
<td>0.02</td>
<td>16.35–19.75</td>
</tr>
<tr>
<td>Culture Innovation</td>
<td>0.91</td>
<td></td>
<td></td>
<td></td>
<td>0.02</td>
<td>16.33–19.45</td>
</tr>
</tbody>
</table>

4.2 Relationship between Knowledge Management and Innovative Management Capabilities

According to the observation of the integrated mean to conduct t-Test on the innovation management capability, the influence of each facet of knowledge management capability on the innovation management capability showed the significant effectiveness, as shown in Table 2. Among which, Acquisition of Knowledge (P= 0.005), Creation of Knowledge (P= 0.007), Storage of Knowledge (P= 0.003) and Sharing of Knowledge (P= 0.001) showed the significance, thus Hypotheses H1, H1-1, H1-2, H1-3, H1-4 can be verified.

Table 2: The t-Test of Knowledge Management and Innovation Management Capabilities

<table>
<thead>
<tr>
<th>Knowledge Management Capability</th>
<th>Innovation Management Capability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>t Value</td>
</tr>
<tr>
<td>Acquisition of Knowledge</td>
<td>1.565</td>
</tr>
<tr>
<td>Creation of Knowledge</td>
<td>0.395</td>
</tr>
<tr>
<td>Storage of Knowledge</td>
<td>1.736</td>
</tr>
<tr>
<td>Sharing of Knowledge</td>
<td>1.310</td>
</tr>
</tbody>
</table>

Note: * indicates p<0.1, ** indicates p<0.05, *** indicates p<0.01

4.3 Relationship between Knowledge Management and Knowledge Absorption Capabilities

The relationship between each facet of the knowledge management capability and knowledge absorption capability, where Acquisition of Knowledge (P= 0.002), Creation of Knowledge (P= 0.001), Storage of Knowledge (P= 0.000) and Sharing of Knowledge (P= 0.005) showed the significance, as shown in Table 3. Thus, Hypotheses H2-1 and H2-2, H2-3, H2-4 can be verified.

Table 3: t-Test of Knowledge Management and Knowledge Absorption Capabilities

<table>
<thead>
<tr>
<th>Knowledge Management Capability</th>
<th>Knowledge Absorption Capability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T Value</td>
</tr>
<tr>
<td>Acquisition of Knowledge</td>
<td>2.149</td>
</tr>
<tr>
<td>Creation of Knowledge</td>
<td>1.826</td>
</tr>
<tr>
<td>Storage of Knowledge</td>
<td>2.472</td>
</tr>
<tr>
<td>Sharing of Knowledge</td>
<td>2.861</td>
</tr>
</tbody>
</table>

Note: * indicates p<0.1, ** indicates p<0.05, *** indicates p<0.01
4.4 The t-Test of Knowledge Absorption and Innovation Management Capabilities

As for the relationship between each facet of the knowledge absorption capability and the innovation management capability, where both Learning Capability of Employee (P=0.000) and Learning Motivation of Employee (P=0.005) showed the significance, as shown in Table 4. Thus, Hypotheses H3-1, H3-2, H3-3 can be verified.

Table 4: t-Test of Knowledge Absorption and Innovation Management Capabilities

<table>
<thead>
<tr>
<th>Knowledge Absorption Capability</th>
<th>Innovation Management Capability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T Value</td>
</tr>
<tr>
<td>Learning Capability of Employee</td>
<td>-3.322</td>
</tr>
<tr>
<td>Learning Motivation of Employee</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Note: * indicates p<0.1, ** indicates p<0.05, *** indicates p<0.01

4.5 Relevant Analysis

From the results indicated in Table 5, it found the averaged score of knowledge management capability is between 3.92~3.96; absorption capability is between 3.86~3.88; and innovation management capability is between 3.76~3.86. Entirely speaking, the average score of knowledge management capability is higher, which showed the knowledge management capability of research objective has better performance. Next, in terms of the related analysis of each variable: first, from Table 5 it found a significant positive correlation that existed between the facet of knowledge management capability and the facet of innovation management capability; that is, the more active employee knowledge management will possess a positive correlation to the innovation management capability. In addition, a significant positive correlation that also existed between both 2 facets of knowledge absorption capability and the facets of innovation management capability; that is, the better employee knowledge absorption capability will has the positive correlation to the innovation management capability.

Table 5: Related Coefficient Matrix of Research Variable

<table>
<thead>
<tr>
<th>Facet</th>
<th>Ave.</th>
<th>Std. Dev.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.Knowledge Acquisition</td>
<td>3.95</td>
<td>0.55</td>
<td>(0.88)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>2.Knowledge Creation</td>
<td>3.94</td>
<td>0.51</td>
<td>0.73 (0.86)</td>
<td>(0.89)</td>
<td></td>
<td></td>
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<tr>
<td>3.Knowledge Storage</td>
<td>3.92</td>
<td>0.62</td>
<td>0.38 0.33</td>
<td>(0.90)</td>
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<td></td>
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<tr>
<td>4.Knowledge Sharing</td>
<td>3.96</td>
<td>0.61</td>
<td>0.36 0.35 0.61</td>
<td>(0.90)</td>
<td>0.51 (0.87)</td>
<td></td>
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<tr>
<td>5.Leanning Capability</td>
<td>3.88</td>
<td>0.72</td>
<td>0.37 0.36 0.62 0.51</td>
<td>(0.87)</td>
<td></td>
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<tr>
<td>6.Learning Motivation</td>
<td>3.86</td>
<td>0.73</td>
<td>0.35 0.33 0.66 0.50 0.51</td>
<td>(0.86)</td>
<td></td>
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<tr>
<td>7.Management Innovation</td>
<td>3.76</td>
<td>0.68</td>
<td>0.34 0.35 0.68 0.51 0.62 0.66</td>
<td>(0.85)</td>
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<td></td>
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<tr>
<td>8.Technology Innovation</td>
<td>3.78</td>
<td>0.66</td>
<td>0.35 0.36 0.61 0.55 0.63 0.63 0.66</td>
<td>(0.84)</td>
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<td></td>
</tr>
<tr>
<td>9.Market Innovation</td>
<td>3.80</td>
<td>0.63</td>
<td>0.38 0.38 0.60 0.53 0.65 0.65 0.63 0.61</td>
<td>(0.88)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.culture Innovation</td>
<td>3.86</td>
<td>0.61</td>
<td>0.39 0.33 0.63 0.54 0.63 0.63 0.67 0.62 0.91</td>
<td>(0.91)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: P < 0.05, ( ) part is the Cronbach’s α coefficient of each facet.
4.6 Multiple Regression Analysis of Knowledge Management, Knowledge Absorption and Innovation Management Capabilities

Multiple-regression-analysis is a simple and related extensional application, it mainly used to understand the linear relationship between a set of predictor variables and a criterion-variable; the Multiple-regression-analysis of this study is shown as in Table 6 and Table. From the data indicated in Table 6 and Table 7, all Hypotheses, such as B value, Beta value, and t value were achieved the positive level of significance. Beta values of Model 1 (Table 6) are 0.181, 0.238, 0.145, and 0.329 respectively, and its model is \( y_1 = 0.329x_1 + 0.237x_2 + 0.159x_3 + 0.289x_4 + e_1 \), (where Acquisition of Knowledge is \( x_1 \); Creation of Knowledge is \( x_2 \); Storage of Knowledge is \( x_3 \); Sharing of Knowledge is \( x_4 \)) showed a positive significant relationship; Adjusted R is 0.796, and the interpretation of all variables are excellent. Beta values of Model 2 (Table 7) are 0.187 and 0.629, and its model is \( y_2 = 0.129x_5 + 0.608x_6 + e_2 \), (where Learning Capability of Employee is \( x_5 \); Learning Motivation of Employee is \( x_6 \)) were showed a positive significant relationship; Adjusted R is 0.786, and the interpretation of all variables are excellent. As a result, the correlation among the knowledge management, knowledge absorption and innovation management capabilities in this study can be verified.

Table 6: Multiple Regression Analysis of Knowledge Management and Innovation Management Capabilities

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquisition of Knowledge</td>
<td>0.329</td>
<td>0.108</td>
<td>0.181</td>
<td>1.306</td>
</tr>
<tr>
<td>Creation of Knowledge</td>
<td>0.237</td>
<td>0.125</td>
<td>0.238</td>
<td>1.931</td>
</tr>
<tr>
<td>Storage of Knowledge</td>
<td>0.159</td>
<td>0.107</td>
<td>0.145</td>
<td>1.030</td>
</tr>
<tr>
<td>Sharing of Knowledge</td>
<td>0.289</td>
<td>0.101</td>
<td>0.329</td>
<td>2.833</td>
</tr>
<tr>
<td>Adjusted R</td>
<td></td>
<td></td>
<td>0.796</td>
<td></td>
</tr>
</tbody>
</table>

Table 7: Multiple Regression Analysis of Knowledge Absorption and Innovation Management Capabilities

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 2</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning Capability of Employee</td>
<td>0.129</td>
<td>0.079</td>
<td>0.187</td>
<td>1.581</td>
</tr>
<tr>
<td>Learning Motivation of Employee</td>
<td>0.608</td>
<td>0.082</td>
<td>0.629</td>
<td>7.382</td>
</tr>
<tr>
<td>Adjusted R</td>
<td></td>
<td></td>
<td>0.786</td>
<td></td>
</tr>
</tbody>
</table>

4.7 Analysis of LISREL Model

As for whether the macro model possesses the goodness of fit (GF) or not, many scholars have proposed many indicators and criteria; Bagozzi & Yi (1988) pointed that: GFI > 0.9, NFI > 0.9, CFI > 0.9, RMR > 0.05, RMSEA < 0.05, etc. are the reference indicators. The purpose of this study is to explore the relationship that existed between different facets. The research structure was setup...
using the first-order model. The research structure (partial intermediate model) is shown as in Table 8. Indicators of its goodness of fit are: GFI = 0.91, NFI = 0.9, CFI = 0.92, RMR = 0.07 and RMSEA = 0.04; in terms of the condition of GFI, which all values of GFI achieved the standard that proposed by abovementioned scholars. In fact, a set of research data can possess many GF models, and one GF model is unable to guarantee the optimum model. This study adopted the competitive model, which identified 2 complete intermediate and direct effective models of competitive and hypothetic models to conduct the comparison; the result found that the Complete Mediating Model is the optimum route, among which, GFI = 0.98, NFI = 0.97, CFI = 0.95, RMR = 0.06 and RMSEA = 0.00; and the relationship between facets of the optimum route is shown as in Figure 2.

<table>
<thead>
<tr>
<th>MODEL</th>
<th>GFI</th>
<th>NFI</th>
<th>CFI</th>
<th>RMR</th>
<th>RMSEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partial Intermediate Model</td>
<td>0.91</td>
<td>0.90</td>
<td>0.92</td>
<td>0.07</td>
<td>0.04</td>
</tr>
<tr>
<td>Complete Mediating Model</td>
<td>0.98</td>
<td>0.97</td>
<td>0.95</td>
<td>0.04</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Figure 2: The Optimum Model Route (Complete Mediating Model)
4.8 Verification Test Result for the Optimum Model Route

(1) Knowledge Management Capability and Knowledge Absorption Capability

Knowledge management capability has a significant influence on Employee Learning and Motivation, as shown in Figure 2; \( \gamma_{11} = 0.326; \gamma_{12} = 0.311; \gamma_{21} = 0.305; \gamma_{22} = 0.315; \gamma_{31} = 0.375; \gamma_{32} = 0.325; \gamma_{41} = 0.355; \gamma_{42} = 0.361 \). The knowledge granting behavior between employees and colleagues is more frequent, which increases Employee Learning Capability and learning motivation. The study found that: when employees actively provide the self knowledge sharing to the colleagues, it may upgrade the capability of related technology and operation for the acceptor. In addition, if the knowledge granting behavior between colleagues that become the organizational culture or trend, through this learning trend that employees caught may further upgrade their learning motivation. Thus, Hypothesis H2 can be verified.

(2) Influence of Knowledge Absorption Capability and Innovation Management Capability

Employee learning capability has a significant influence on Innovation Management Capabilities of Management Innovation, Technology Innovation, Market Innovation, and Culture Innovation, which is shown in Figure 2; \( \beta_{11} = 0.434; \beta_{12} = 0.368; \beta_{13} = 0.345; \beta_{14} = 0.349 \). The better the learning capability possessed by the employees, the greater their performance on Management Innovation, Technology Innovation, Market Innovation and Culture Innovation for the enterprise. Employee Learning Motivation also has a significant influence on the Innovation Management Capabilities of Management Innovation, Technology Innovation, Market Innovation, and Culture Innovation; \( \beta_{21} = 0.251; \beta_{22} = 0.253; \beta_{23} = 0.388; \beta_{24} = 0.383 \); that is, the better learning motivation possessed by the employees, the greater their performance on Management Innovation, Technology Innovation, Market Innovation and Culture Innovation for the enterprise. Thus, Hypothesis H3 is verified.

5. Conclusion

5.1 Conclusion

This study adopted the knowledge management capability, knowledge absorption capability and innovation management capability as the study facets. Statistical analysis was used to understand the correlation among the knowledge management capability, knowledge absorption capability and innovation management capability and to conduct the empirical research. Through the theory and literature review to develop the theoretical model of the influential relationship, as well as conduct the questionnaire survey of empirical analysis for Taiwan’s high-tech industries. The research results found that: knowledge management capability, knowledge absorption capability and innovation management capability possesses the substantially positive influence. Therefore, in order to seek for existence and sustainable operation, enterprise shall emphasize its internal knowledge management capability and knowledge absorption capability to increase its innovation management capability.

1. Knowledge Management Capability and Innovation Management Capability: the research results found that if an
employee is willing to make own techniques available to another employee that has a need, this act will increase the enterprise’s innovation capability. If an employee is able to manage share knowledge management information that may directly help the enterprise’s operation management and innovation management.

2. Knowledge Absorption Capability and Innovation Management Capability: the research results found that the employee’s knowledge absorption capability plays a key role to innovation management for enterprise, which also has the significant positive influence on the organizational innovation management.

3. Knowledge Management Capability and Knowledge Absorption Capability: the research results found that knowledge management capability can significantly help in the development of enterprise’s knowledge absorption capability. Absorbing external knowledge is beneficial for enterprise. Transforming information is beneficial to business development and creating advantages for sustainable enterprise operations.

5.2 Practical Management

The research result presented clear verification on the entire cause-effect relationship for increasing innovation management capability while an enterprise is implementing knowledge management. This study organized the practical management factors. The explanation is shown as follows:

1. An enterprise’s knowledge management capability is able is helped by increasing its knowledge absorption capability. The enterprise must encourage its employees to share information to increase its competitiveness.

2. The knowledge absorption capability is able to influence an enterprise’s innovation management capability. The enterprise shall encourage its employees to voluntarily provide their business techniques and knowledge to the organization to create a better enterprise.

3. The employee’s knowledge granting behavior and enterprise’s knowledge management and absorption capability occurs through active knowledge and technique granting between employees. This will advance the employee strive for production, and will improve the enterprise’s continuous innovative performance and organizational achievement.

Knowledge granting and management is very helpful to the flourishing development in Taiwan’s high-tech industries. The administrators of Taiwan’s High-tech industries shall encourage their employees to actively grant knowledge through a reward system to advance the employee’s knowledge absorption capability and the innovation management capability of Taiwan’s High-tech industries.

References


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