

THE INFLUENCE OF KNOWLEDGE MANAGEMENT ON ORGANIZATIONAL PERFORMANCE OF TAIWAN'S MACHINE TOOL INDUSTRY



Jui-Lung Chen¹

¹Department of Business Administration, National Chin-Yi University of Technology, Taiwan, R.O.C.



ABSTRACT

Article History

Received: 9 August 2017
Revised: 5 September 2017
Accepted: 14 September 2017
Published: 28 September 2017

Keywords

Industry 4.0
Internet of things
Service network
Machine tool industry
Knowledge management
Organizational performance.

JEL Classification

L25, M15.

Industry 4.0 is primarily based on big data, Internet of Things (IoT), service network and network security, has won widespread resonance and response from the global manufacturing and production areas and also fueled the development of machine tool industry. Meanwhile, knowledge management has become one of the important tools for organizations to enhance competitiveness and survival, and has become a significant research field in recent years. This study is designed to explore the impact of knowledge management of Taiwan's machine tool industry on organizational performance. The results of this study can provide relevant recommendations and references of operating management to the industry, government and academia concerning machine tools.

Contribution/ Originality: This study aims to probe into the impact of knowledge management of Taiwan's machine tool industry on organizational performance, conduct in-depth research into empirical knowledge management by consulting relevant literature, and summarize the relationship between knowledge management and operating performance of the machine tool industry. This study is one of very few studies which have investigated the impact of knowledge management of machine tool industry on organizational performance. The paper help operators of the machine tool industry to carry out knowledge creation and management in order to achieve direct and indirect business performance in terms of promoting knowledge management and based on their needs and status.

1. INTRODUCTION

Because of the rapid development of information technology, the traditional business models must be constantly changed to meet the changing business environment and thus to survive. Knowledge management is a process of creating, acquiring and applying knowledge in order to improve learning and enhance performance. Therefore, effective knowledge management can help organizations to accumulate core knowledge, obtain

information and gain a competitive edge (Scarborough *et al.*, 1999; Kanagasabapathy *et al.*, 2006). Knowledge management needs to take into account tons of internal and external organizational information. Collection of considerable external information for their own use and accurate search for the right knowledge enable organizations to be improved internally and externally, thereby driving creation and innovation and strengthening the core competitiveness, which is the ideal knowledge management system. As a result, if the operators of the machine tool industry can master the new management trends and thinking and use convenient information tools to enhance the management efficiency, this will be the key to success. In the era of knowledge-based economy, knowledge is an important asset of organizations, because knowledge management can help create the value of organizations and is also one of competitive tools for organizations to optimize management processes and boost operation efficiency (Bahra, 2001; Hallin and Marnburg, 2008). Knowledge is the important resource of enterprises. How to encourage employees, the subject of knowledges, to share knowledge is a key issue of knowledge management (Chiu, 2015). Therefore, this study aims to probe into the impact of knowledge management of Taiwan's machine tool industry on organizational performance, conduct in-depth research into empirical knowledge management by consulting relevant literature, and summarize the relationship between knowledge management and operating performance of the machine tool industry. Finally, this study is expected to help operators of the machine tool industry to carry out knowledge creation and management in order to achieve direct and indirect business performance in terms of promoting knowledge management and based on their needs and status. Moreover, this study, in accordance with the research results, puts forward conclusions and provides specific, substantial recommendations on business improvement and policy formulation to relevant government authorities and academic research.

2. LITERATURE REVIEW

2.1. Knowledge Management

Davenport and Prusak (1998) believed that knowledge was a mobile complex, including structured experience, value, textual information as well as experts' insights and wise men's thinking. In respect of organizations, not only did knowledge exist in the documents and storage systems, but also in the routine work, processes, implementation and regulations and certainly were stored in the minds of experts and wise men. Ulka Toro and Joshi (2013) emphasized that knowledge was the driving force for people to continually upgrade and grow so as to meet new challenges and opportunities. Knowledge was also one of the most valuable resources of enterprises, and allowed organizations to form obstacles to competition (Alavi and Leidner, 2001). Holsapple and Joshi (2002) proposed that knowledge consisted of knowledge acquisition, knowledge selection, knowledge internalization, knowledge use, knowledge generation and explicit knowledge. Stewart (1997) held that knowledge was characterized by invisibility, extendibility, mobility, and sharing. Polanyi (1962) classified knowledge into explicit knowledge and tacit knowledge. Explicit knowledge can be transmitted through structured, textual knowledge and through formalized, institutionalized language, whereas tacit knowledge was hidden in a person's brain and more difficult to be formalized and communicated. Knowledge management witnessed a rapid development in the mid-1990s. O'Dell and Grayson (1998) pointed out that knowledge management was a continuous process where knowledge was offered to members in need to help them to take right actions in a bid to improve the continuity of organizational performance. This process involved knowledge creation, confirmation, collection, classified storage, sharing and access, use, improvement, elimination and other steps. The resource-based theory mainly emphasized that enterprises should identify and use the most valuable assets and try to maximize the value created by such assets in order to maximize the companies' value (Barney and Baysinger, 1990). From this viewpoint, the ideal objective of knowledge management was to provide appropriate knowledge to the appropriate people at the right time so that such people can make the best decision (Petrash, 1996). Wiig (1997) argued that knowledge management meant that an organization systematically, clearly and adequately explored and applied its knowledge asset in order to

knowledge-related job performance and maximize rewards within the organization. Gartner Group (2002) held that knowledge management created, collected, organized, accessed and used information assets of enterprises in the ways of cooperation and integration. Such assets included databases and documents, but most importantly, implicit expertise and individual staff's experience. Nonetheless, some arguments about knowledge management mislead organization members into believing that the circulation of human knowledge was nothing but search and capture, but in fact it is not the case. Hewlett-Packard wanted to improve the quality of its plants around the world by exploring and distributing good practices within the company. Yet, after the implementation, it found that it was uncertain about whether the good practices could be successfully distributed within the company. This was because different units had different environments and conditions, and hence it was difficult to use the institutionalized practice to address all problems, even though the problems and conditions were seemingly similar. It can be observed that although the search for knowledge is not difficult, it is exceedingly difficult to capture its meaning. As a result, learning is the greatest challenge to knowledge management, and maintenance of intellectual property, generation and collection of information and use of intellectual capital are important issues of knowledge management. However, all this must be based on learning, without which it is difficult to take advantage of intellectual property, capital and assets (Brown and Duguid, 2001). Alavi and Leidner (2001) summarized research into different viewpoints on knowledge management, sorted out viewpoints on knowledge and meaning of knowledge management and proposed that the current research focuses of knowledge management were as follows: to enhance employees' work skills, to establish a rich and useful knowledge base in enterprises, to develop effective knowledge management processes, to devise effective information retrieval and to hone enterprises' core competitiveness. It can be learned from Alavi and Leidner (2001) research into knowledge management that knowledge is of great importance to personal growth and corporate competitiveness, but we cannot grasp what type of knowledge and knowledge structure will affect organizational performance. Consequently, knowledge management is not only a passive search and retrieval of knowledge, but also involves sharing, transferring and active learning. This study maintains that knowledge management is an organization's collective garnering and learning of knowledge. Such knowledge and skills, regardless of where they are, can be effectively defined, acquired, stored, shared, used and created. The objective of knowledge management is to provide appropriate knowledge to the appropriate people at the right time so that such people can make the best decision.

2.2. Knowledge Management Infrastructure

Chait (1999) emphasized that knowledge management required the effective cooperation of culture, content, processes and infrastructure. Andrew *et al.* (2001); Almeida (1996); Appleyard (1996) and Grant (1996) believed that knowledge management, from the perspective of organizational ability, can be divided into knowledge management infrastructure and knowledge management capability (Andrew *et al.*, 2001). Knowledge management should include organizational culture, organizational structure, information technology support and application and knowledge strategies that other work environments that support employees' knowledge activities. Such environments can be referred to as knowledge management infrastructure. Knowledge management infrastructure was first proposed by Arthur Andersen and APQC (The American Productivity and Quality Center) in 1996, Arthur and APQC (1996) believed that knowledge management infrastructure was affected by four main factors, namely, leadership, culture, assessment and technology. Good information technology support and application help business communication, and facilitate quick collection and flexible use of information. The way in which the relevant information is collected must be determined by the need for information and the purpose of application. von Krogh *et al.* (2001) believed that knowledge management infrastructure was the organizational mechanism that constantly created knowledge for an organization, and included five factors, namely, knowledge generation, employee communication, organizational structure, relationship between employees and human resources. Becerra-Fernandez and Sabherwal (2001) considered that knowledge management infrastructure should include five parts, namely, organizational culture,

organizational structure, information technology structure of organization, general knowledge and physical environment. Holsapple and Joshi (2002) believed that knowledge management infrastructure consisted of employees, organizational culture, infrastructure and strategies. Sarvary (1999) proposed that the infrastructure required by an enterprise to promote knowledge management activities included: 1) information technology infrastructure, such as database, computer network and software; 2) knowledge management infrastructure, including organizational culture, incentive measures, knowledge management team and policies. Gold *et al.* (2001) held that knowledge management infrastructure capacities included technology, framework and culture. Gibbons *et al.* (2010) argued that successful knowledge management infrastructure included infrastructure of human resources, knowledge transfer network, business intelligence infrastructure and infrastructure coordination.

This study, by means of integrating, analyzing and classifying related literature, believes that knowledge management should create a work environment that includes information technology, organizational structure, culture and other work environments that can support employees' knowledge activities. Such environments can be referred to as knowledge management infrastructure (Almeida, 1996; Appleyard, 1996; Grant, 1996; Andrew *et al.*, 2001). This study, based on the viewpoints of Andrew *et al.* (2001) summarizes the definitions of infrastructure elements in related research, and defines the four components of knowledge management infrastructure as follows:

1. Organizational culture: a culture of willingness to share knowledge, effective communication and sharing of different perspectives, and especially management of tacit knowledge. The vision of an organization must be clear to influence the generation of relevant knowledge and thus to form organizational culture. In particular, the sharing organizational culture can encourage the members of the organization to be willing to share knowledge with others. Through the sharing of knowledge, members can achieve professional growth and the performance of the organization can be further enhanced (Arthur and APQC, 1996). Therefore, the most important factor in the success of knowledge management projects is to create a positive idea of knowledge among members of the organization who do not reject sharing of knowledge and to match knowledge management and the organization's existing culture (Davenport *et al.*, 1998).
2. Organizational structure: Organizational structure must have a flexible structure to adapt to external changes in the environment, and can support the sharing and creation of knowledge.
3. Information technology support and application: Information technology is the links of an organization's internal information systems, and support cross-organizational knowledge flow. A comprehensive information system exchanges different knowledge, and even external information. It is more likely to succeed if knowledge management is widely built on the basis of information technology, creating a generally feasible environment in which knowledge can be shared within an organization (Davenport *et al.*, 1998).
4. Knowledge strategies: Knowledge strategies mean that the members of an organization integrate their goals and organizational goals by understanding organizational knowledge strategies, to fulfill personal best performance and organizational goals.

2.3. Knowledge Management Capability

Knowledge resources are the most important competitive resources of an organization. In order to keep the competitive edge in the market, the most important thing for an organization is that the organization itself must have more resources and more remarkable abilities than other competitors. Amid enormous resources, knowledge resources are currently one of the most important competitive resources, and the organization's ability is also a representation of organizational knowledge. The main theoretical basis for such opinion is derived from resource-based theory and core competence theory. The resource-based theory advocates integrating an organization's resources and capabilities and making effective use of such resources and abilities to form the organization's competitive edge in order to achieve organizational performance (Grant, 1996). When an organization has a wealth

of strategic resources and capabilities, the organization will find it easier to survive, grow and profit in the competitive market. The resource-based theory emphasizes that enterprises are a combination of many resources, and primarily probes into developing manufacturers' core capability, maintaining competitive edge, linking manufacturers' growth decisions and other related issues. The knowledge management strategies based on the resource-based theory believe that the current competitive industry environment and organization's knowledge resources are the most important resources in business operation. In order to maintain its competitive performance, an enterprise must continuously maintain the relative advantages of its knowledge assets (Bharadwaj, 2000; Billinifer and Smith, 2001). Arthur and APQC (1996) put forward, from the perspective of program, a model involving 7 knowledge management activities which included creation, confirmation, collection, introduction, organization, application and sharing. After the enterprise completed the knowledge management programs of acquisition and transfer, it has built the knowledge assets. Therefore, the establishment of a retrieval mechanism enables the organization to quickly access and apply the knowledge resources, which will help interpretation of problems and knowledge creation and decision-making so as to improve the competitive advantage (Choo, 1998). Sarvary (1999) maintained that knowledge management should include three processes, namely, organizational learning, knowledge generation and knowledge dissemination. Alavi and Leidner (2001) held that the knowledge creation process involved creation, storage, transfer and application, which usually coexisted rather than being linear. The reason is that knowledge creation was continuous, and the explicit and tacit knowledge can be continuously shared by individuals, groups or companies. Gold *et al.* (2001) after summarizing different perspectives, proposed put forward representative arguments about knowledge management capability, and advocated examining knowledge management from the viewpoint of an organization's ability. Andrew *et al.* (2001) held that knowledge management capability included knowledge acquisition, transformation, application and protection. Freeze and Kulkarni (2007) divided knowledge management capability divided into four types, namely, professional ability, experience learning, policies and procedures, as well as data and knowledge files. Liu *et al.* (2004) argued that knowledge management capability was not only all-encompassing information and knowledge, but also was a tool for maintaining information that helped improve work efficiency. In accordance with the above discussions, an organization's effective implementation of knowledge management should include knowledge management capability. Therefore, this study adopts Gold *et al.* (2001) viewpoints on knowledge management capability, and summarizes the knowledge management capability as follows: 1) knowledge acquisition; 2) knowledge transfer; 3) knowledge application and 4) knowledge protection.

2.4. Organizational Performance

The measurement of an organization's business performance can be divided into assessment of subjective and objective information. Dess and Robinson (1984) maintained that accurate access to information was not easy. Especially some performance-related information was exceedingly sensitive, and even if the objective information can be accessed, errors in information may occur due to differences in accounting procedures of companies. Therefore, the subjective assessment method can be used to replace the assessment method of objective information. In the meantime, Dess and Robinson (1984) proved that subjective return on assets and sales growth rate were significantly correlated with the objective information. Hence, it is recommended that in case of no access to objective information, industry competitors can be compared in subjective ways. Nevertheless, if the objective information is accessible, the measurement should be based on such information. There are no theories about organizational performance, so scholars use a number of scientific methods and models, such as production management, psychology and economics, to identify measurement methods of organizational performance. To measure the performance, Venkatraman and Ramanujam (1986) proposed that the conceptual scope and framework of performance should include 1) financial performance; 2) business performance; 3) organization effectiveness. Delaney and Huselid (1996) employed the measurement of relative performance with other competitors in the same

industry and uses two major parts to measure organizational performance: the first part was perceived organizational performance and the second part was perceived market performance. Lee and Choi (2003) also made use of comparison with other companies in the same industry, and used five items including other companies' success, market share, growth rate, profitability and innovation to measure organizational performance. Kaplan and Norton (1992) published Balanced Score Card, and hoped to strike a balance between short-term and long-term goals, between financial and non-financial measurement, between backward and leading indicators, as well as between external and internal performance dimensions. Therefore, Kaplan and Norton (1992) believed that an organization's overall performance should be measured from four dimensions like finance, customers, internal status as well as learning and growth. At the same time, these four dimensions were also an enterprise's thinking directions to implement its vision and strategies. Kaplan and Norton (1992) listed the problems considered by each dimension and the general measurement indicators used by most enterprises.

3. RESEARCH AND ANALYSIS

3.1. Relationship between Knowledge Management Infrastructure and Knowledge Management Capability

Pandey and Dutta (2013) research verified the role of knowledge management capability within an organization, and suggested that the organizational structure play an important and guiding role in developing knowledge and culture. Kulkarni *et al.* (2007) study found that organizational supporting structure was a contributor to the successful implementation of knowledge management systems. Rosenzweig and Roth (2000) regarded the speed of decision-making and implementation, information system and organizational learning ability as the important factors for knowledge management capability. Hong *et al.* (2004) found that an organization's ability to acquire knowledge significantly affected the development and operation of its knowledge management system. Keen (1991) pointed out that application of information technology was one of an organization's main resources as well as the key to gaining long-term competitive advantage. Strack *et al.* (2008) mentioned that the problem of knowledge gap of employees within an organization may not immediately exposed. However, as employees retired or resigned, the organization lost valuable knowledge along with brain drain. Therefore, the organization should develop policies on knowledge transfer. Popper and Lipshitz (2000) proposed that organizational learning was supported by culture. Liao *et al.* (2007) found that knowledge acquisition was an intermediary variable between knowledge sharing and innovation. Greengard (1998) recommended that developing a culture conducive to knowledge sharing was a key factor in the success of knowledge management. Palanisamy (2008) found that organizational culture would affect the production and storage of knowledge, and thus affected the use and effectiveness of knowledge transfer and knowledge management. Rhodes *et al.* (2008) indicated that a good information system could help employees to implement knowledge transfer, and hence to avoid the loss of valuable work experience and expertise. Wu and Hu (2012) found from the study on hospitals that the interaction between knowledge assets and abilities, program abilities and performance would significantly affect the performance of implementing knowledge management. Chau *et al.* (2011) learned that technical and cultural capabilities would affect the interrelationship of markets through innovative business processes. As a result, this study infers that the better the knowledge management infrastructure is, the more greatly can the knowledge management capability be improved.

3.2. Relationship between Knowledge Management Infrastructure and Organizational Performance

The impact of knowledge management infrastructure on organizational performance may be different in different areas or long and short-term interests. However, creating higher-quality goods or services are the main purpose of knowledge management. Wiig (1997) proposed that knowledge management could bright the following three major competitive edges including: 1) rapidly responding to customer inquiries and needs with the right information or appropriate behaviors in order to improve direct customer service; 2) improving the speed of

response to customers and redesigning products and services based on customers' needs and 3) improving consistency and quality of products and services. This study attempts to deduce the relationship between knowledge management infrastructure and organizational performance. It is found from [Andrew *et al.* \(2001\)](#) research taking American enterprises as empirical objects that there is a positive relationship between knowledge management infrastructure and organizational performance. Other researchers also found that it was more likely to succeed if knowledge management was widely built on the basis of information technology, creating a generally feasible environment in which knowledge can be shared within an organization ([Davenport and Prusak, 1998](#)). Furthermore, by means of integrating, sharing and disseminating rich knowledge resources, employees and customers can feel the same growth, helping to achieve an organization's operation goals and improve organizational effectiveness ([VanderMerwe, 1999](#)). [Lierni and Ribiere \(2008\)](#) thought that if knowledge could be effectively managed and applied, an organization's additional losses could be cut while the employees' service behaviors could be improved. [Yang *et al.* \(2011\)](#) explored the impact of hospitals' knowledge management infrastructure and market performance, and found that technical and cultural capabilities would affect the interrelationship of markets through innovative business processes. Cultural capabilities and market performance were related. [Chen and Cheng \(2011\)](#) study found that knowledge transfer within an enterprise could improve individual customer service guidance and enhance the overall performance of the organization. [Lee and Choi \(2003\)](#) put forward an integrated framework, and explained that knowledge creation activities involved lots of knowledge management infrastructure, including organizational culture, organizational structure, human factors and information technology support and application. Such knowledge management infrastructure resulted in more frequent knowledge creation activities within the organization. Additionally, knowledge creation activities could also boost organizational creativity, which in turn affected organizational performance. Basically, the business environment of enterprises is changing rapidly. In order to cater to the diverse needs of customers and respond to the threats of competitors, enterprises should develop more flexible structures that support knowledge sharing and exchange. To achieve this goal, enterprises must also make use of information technology to create an environment that facilitates the exchange of knowledge between employees and organizations. Therefore, this study infers that the better the knowledge management infrastructure is, the more greatly can the organizational performance be improved.

3.3. Relationship between Knowledge Management Capability and Organizational Performance

[Grant \(1996\)](#) pointed out that knowledge management was the core competence management. If organizations had more knowledge resources with different heterogeneity, value and exclusiveness, highly skilled knowledge workers should skillfully integrate organizational expertise, internal and external resources and management capabilities to help the organizations to resolve problems, to provide customers with new products or new services and hence to bring low-cost or differentiated advantages to the organizations ([Afuah, 1998](#)). [Rothwell *et al.* \(2005\)](#) proposed that the original work experience and professional knowledge of senior employees should be passed on to the less experienced employees through knowledge transfer procedures, so as not to hinder business promotion. [Slater and Narver \(2002\)](#) deemed that correcting organizational behaviors or improving organizational performance through the development of new knowledge and new knowledge was known as organizational learning. Moreover, organizational learning orientation would affect organizational characteristics, so that organizations could continue creating new knowledge and using existing knowledge within the organization. Also, knowledge could effectively enhance organizational performance in the course of creation and use ([Baker and Sinkula, 1999](#)). [Hunt and Morgan \(1996\)](#) held that learning was a very important and complex resource of an organization and that competitive edges could be created via organizational learning. In addition, [De Geus \(1988\)](#) also stated that the competitive edges could only be maintained by learning more quickly than competitors. By means of organizational learning, new products or new services could be quickly developed, customer satisfaction could be increased, operating processes

within an organization could be improved and the organization's profitability can be enhanced, which was the ultimate goal. Slater and Narver (2002) believed that organizational learning was valuable to customers, since through learning, an organization could more easily understand and meet the potential needs of customers, thereby enhancing organizational performance. Chen and Cheng (2011) study found that knowledge transfer within an enterprise could enhance organizational performance. Chung (2003) findings indicated that organizational knowledge management in Taiwan's hospital industry produced a positive impact on business performance, particularly "internal learning", "external learning", "progressive learning", and "learning speed". Hung and Liao (2007) investigated the relationship between knowledge management abilities and status of organizational effectiveness of medical institutions and examined the relationship between knowledge management abilities and organizational effectiveness of medical institutions. The results showed that among the knowledge management abilities, the organizational culture supporting knowledge sharing and the ability to acquire and apply knowledge produced the greatest impact on organizational effectiveness, followed by flexible organizational structure and knowledge conversion ability. Talisayon (2002) deemed that sophistication of knowledge management produced a positive impact on organizational performance. Yen *et al.* (2014) study found that knowledge transfer could indirectly affect organizational performance through service capabilities. Yamin *et al.* (1999) explored the relationship between innovation indicators and performance, and found that the dimensions of organizational innovation such as management innovation, technological innovation and product innovation were significantly correlated to performance. Ahmadi *et al.* (2014) study found that knowledge creation in the knowledge management system exerted a positive impact on the empowerment of employees. Additionally, the mechanism for knowledge management activities within an enterprise mechanism also produced a positive impact on improving service quality. Damanpour and Evan (1984) studied the impact of the dimensions of organizational innovation on organizational performance. The research results were as follows: organizational innovation was classified into technological innovation and management innovation, and it was confirmed that the performance of an organization implementing technological innovation and management innovation was higher. Andrew *et al.* (2001) study found that knowledge management capability exerted a positive effect on organizational performance, and Gold *et al.* (2001) research also verified that knowledge management capability was the direct determinant of organizational performance. Lee and Choi (2003) empirical study found that knowledge management process and ability would positively affect organizational performance. Lee and Sukoco (2007) investigated 1000 major enterprises in Taiwan and found that knowledge management capability produced a positive impact on innovation and organizational effectiveness. Kiessling *et al.* (2009) research found that knowledge management capability positively influenced corporate innovations, product improvement, employee improvement and other organizational results. Therefore, this study infers that the better the knowledge management capability is, the more greatly can the organizational performance be improved.

4. CONCLUSIONS AND RECOMMENDATIONS

Industry 4.0 has been a very hot topic recently. It was first proposed at the world's largest industrial technology fair - Hannover Messe in 2011. The concept of industry 4.0, primarily based on big data, Internet of Things (IoT), service network and network security, covers a wide range of aspects. It has won widespread resonance and response from the global manufacturing and production areas but also fueled the development of machine tool industry. The demand market for machine tools has been continuously developed in recent years, from the early steam locomotive, home appliance industry, mold, aerospace and 3C industry, as well as recently emerging biomedical engineering, green energy, space and other industries. Among them, Information and communication technologies, optical laser, image processing, remote wireless monitoring and even cloud computing have been integrated into the technological application of machine tools, and play an important role in technological base and revenues and profits of the overall development of the country. Taiwan's machine tool industry is sound, and

continues to benefit from the trend of automation. It can forge towards the trend of industry 4.0, in case of effective virtual reality integration, perfect standardization, complex system management, communications infrastructure, network security and other elements. Coupled with the global advances in smart phones and intelligent machines, the future development of machine tool industry will remain optimistic.

Therefore, the expertise can be effectively enhanced and managed, the purpose of global planning and management and providing customer-driven services can be achieved, and the rapidly changing and diverse market demand can be satisfied in the model of virtual enterprise (VE) to enhance competitive advantage and business performance, if the operation of the machine tool industry can manage knowledge through knowledge creation, refining, storage, sharing and other aspects, actively promote activities related to knowledge management (such as management and sharing of core knowledge, promoting multiple practical communities, technological innovation and regularly organizing technical forums, reading sessions and community seminars), continuously formulate complete enterprise resource planning (ERP), supply chain management (SCM), customer relationship management (CRM) and other systems. Knowledge management has become one of the important tools for organizations to enhance competitiveness and survival, and has become a significant research field in recent years (Siau *et al.*, 2010). The machine tool industry is no exception. In accordance with the definition of the machine tool by the International Organization for Standardization (ISO) and the International Manufacturing Technology Show (IMTS), "The machine tool can be defined as any machine which is driven by power and cannot be carried by human beings, and fulfills the purpose of processing materials by using physical, chemical or other methods such as cutting and impact". Machine tool is the processing machinery used to manufacture various components of production machines and equipment, so it has been called as the "mother of machinery". The development of the machine tool industry is an important basis for the national industrial development, and is also an important lifeline of industry. In the intelligent and automatic development of global manufacturing industry, countries around the world have taken actions of intelligent manufacturing. Aside from Germany's enthusiastic promotion of the "Industrie 4.0 program", the United States also proposed the "AMP Plan" to digital manufacturing centers. Besides, China also proposed the specific practices in the "12th Five-Year Plan" formulated in 2011. Different countries put forward their ideas of automation of the manufacturing industry, suggesting its importance, while seeming to announce the beginning of Industry 4.0. The machine tool industry was, in the past, classified as a traditional industry in Taiwan, and received less attention and resource assistance from government policies when compared with the electronic information industry. In recent years, Taiwan's machine tool industry saw rapid development, and since its output value exceeded NTD100 billion in 2005, it has played a decisive role in the market outside Taiwan and has become one of Taiwan's key industries. With the progress of the times and the rise of the China market, Taiwan's machine tool industry must respond quickly to customer needs and develop the cross-strait business models, resulting in the complex management needs of multinational enterprises. The export of Taiwan's machine tool industry has been affected by the Asian Financial Crisis, contributing to short-term slowdown in trade growth. Yet, with the rapid development of high-tech industries and the opening up of the global market, coupled with the expansion of export industries and equipment export, the main market has gradually shifted from South-East Asia area to China market. Thanks to the concrete efforts of the industry, government and academia, Taiwan's machine tool industry gradually shifts to customization and precision production (Huang *et al.*, 2015). According to the data published by the Taiwan Machine Tool & Accessory Builders Association, the global total output value of Taiwan's machine tool industry reached approximately USD87.1 billion in 2014. Taiwan's output value was estimated to be USD4.84 billion, ranking seventh amount the world's eight major countries of machine tool production and sales. Its export amount stood at USD3.753 billion, up by 5.8% over 2013, and Taiwan became the world's fourth largest exporter of machine tools. In 2014, regarding Taiwan's export of machine tool, the top 10 countries, based on their export amounts, were China (Hong Kong included), United States, Turkey, Germany, Netherlands, Russia, Malaysia, Malaysia and India. In respect of the major export market, the biggest

export market was China (Hong Kong included), with an export value of USD1.285 billion in 2014, up 7.9% from last year. The second biggest exporter was United States, accounting for 11.1% of the export market, and with a cumulative amount of USD0.415 billion, up 3% over the same period last year. The third biggest exporter was Turkey, amounting to USD0.208 billion. Recently, due to the ECFA, Taiwan's machinery manufacturers faced competition from mainland China. Tons of China's low-priced products have broken into the Taiwan market, affecting the manufacturers of mid- and low-end machines in Taiwan. Therefore, Taiwan's manufacturers should be actively engaged in structural transformation, and manufacture more flexible, more customized, and more intelligent, automatic and efficient equipment. In recent years, China's economic development has slowed down, affecting Taiwan. Therefore, Taiwan cannot excessively rely on China, but should reinforce development with other countries. For instance, the market of South-East Asia quickly developed in recent years, so Taiwan's machinery and equipment can grasp tremendous development opportunities in the ASEAN countries. Besides, the other factor that will produce a significant impact on the future development of the Taiwan's machine tool industry is Trans-Pacific Partnership (TPP). In recent years, the Taiwan government has promoted the admission to TPP. Especially, the TPP countries accounted for more than 20% of the total exports of Taiwan's machine tool products in 2014. The major export markets included United States, Japan, Malaysia, Vietnam and Singapore. Among them, the United States accounted for nearly 10% of Taiwan's exports, the highest proportion. The tariff rate of most machine tool products in the United States was relatively high (between 4.2% and 5.1%), while that of some products in Vietnam was high, say, 11.67% of tariff on ball screws and roller-type linear slide imposed by Vietnam. If Taiwan can join TPP, the price of its machine tools, spare parts and other products will become more competitive in the future, preserving Taiwan's position in major overseas markets. In terms of other TPP members in developing countries such as Mexico and Peru, their average tariff on products related to machine tools exceeded 6%. If Taiwan is admitted to the TPP, the admission will help Taiwan to further link the world's major markets and expand to emerging markets to improve competitiveness of Taiwanese manufacturers ([The Bureau of Foreign Trade and MOEA Taiwan, 2015](#)).

There are large numbers of high-quality machine tool manufacturers in Taiwan, and more than half of them gather in central Taiwan, with the number of manufacturers exceeding 600 in Greater Taichung. In the supply chain of the machine tool industry, Taiwan is the world's only industrial cluster of machine tools and components. The important manufacturers include Hiwin Technologies Corp., Tongtai Machine & Tool Co., Ltd., Chin Fong Machine Industrial Co., Ltd., Goodway Machine Corp., Airtac International Group, Yeong Chin Machinery Industries Co., Ltd., Awea Mechantronic Co., Ltd., Goodway Machine Corp., Taiwan TAKISAWA Technology Co., Ltd., and Shieh Yih Machinery Industry Co., Ltd. The structure of Taiwan's machine tool industry is dominated by small-and-medium-sized enterprises. Owing to the high fund and technological threshold of machine tools, it is very difficult for the operators of machine tools in Taiwan to conduct vertical integration like those in Japan. Furthermore, due to differences of customers' industries and needs, the products are highly customized. Except for structural members, almost all components have shared modules, and can be obtained through outsourcing procurement, so Taiwan's precision machinery industry has long formed a complete division of labor network system. As a result, the entire machine tool industry is professionally specialized, and the support of third parties are available from casting, component manufacturing, processing to delivery, forming supply chain model of corporate synergy ([Chen et al., 2009](#)). Each link of the supply chain of Taiwan's machine tool industry is closely connected to geographical location. Furthermore, with external complete R&D institutions and universities and industrial areas, Taiwan has developed a sound satellite system framework clustering design and R&D of mechanical industry, substantially boosting the Taiwan's machine tool production efficiency, an advantage of Taiwan's machine tool industry. However, [The Bureau of Foreign Trade and MOEA Taiwan \(2014\)](#) pointed out that China has been able to independently produce low-end machine tools and meet its own needs, and gradually penetrates the global market. The coping strategies of Taiwan's machine tool plants should focus on developing and

manufacturing mid- and high-end machine tools (such as micro-machine tools and intelligent machine tools). In addition to greater automation capabilities, greater processing efficiency and better processing quality, artificial intelligence should be introduced to achieve the goal of unmanned processing. Additionally, aside from manufacturing machine tools, the related automation equipment required by mass production should be integrated. In case of providing automation required by flexible production, the machine tool manufacturers need to develop the machine tool products where a single machine can perform different types of processing, thereby reducing the replacement time and improving the level of processing accuracy. Finally, Taiwan should outperform the competitors' technology by developing machine tool products with multi-axis and composite functions in order to maintain Taiwan's competitive advantage in the global tool market, and should gain a comparative advantage in the highly competitive machine tool industry through participating in international trade fairs (Huang *et al.*, 2015).

According to the analysis of the Taiwan's Industrial Economic and Knowledge Net, Industrial Technology Research Institute, the current main challenges and opportunities of Taiwan's machine tool industry are as follows: 1) restructuring of China's machine tool industry; 2) the Abe administration's continued weak yen policy; 3) demands for machine tools in emerging markets of South-East Asia. In pursuit of innovation and competitiveness, the market demand of China industry mainly concentrates on mid- and high-end special machine tools. Taiwan's machine tool industry must still respond to the strategy of change in China's market demand, and enhance the processing accuracy of machine tools, to widen the technological gap with mainland China and to maintain Taiwan's competitive advantage in China market. Besides, Japan had implemented the weak yen policy prior to the Abe administration, with yen depreciating by more than 40% from 2012 to 2014. This move causes Taiwan to face fierce price competition with Japan in the common export countries of machine tools. The depreciation of the yen first affects Taiwan's high-end machines. It is recommended that operators in Taiwan first avoid the strengths of the Japanese machines, but emphasizing customization or after-sales service to improve the added value of products. In addition, the emerging markets in South-East Asia are the main markets explored by Taiwan in recent years. In 2009, the proportion of Taiwan's exports to South-East Asia countries (including Singapore, Indonesia, Malaysia, Thailand, and Vietnam) accounted for only 16.0% of its total exports, but soared to 20.1% in 2013. It is suggested that operators in Taiwan may actively seek cooperation with technology agency traders in Japan and Taiwan, and join the relevant supply chain of Japan's auto factories by providing high-quality machine tools whose price is only 85% of that of machine tools produced by Japan (namely, high-quality and inexpensive machines). Operators in Taiwan should also, based on the ability to produce standard machine tools, develop customized machine model system, which will be an important strategy to win orders from Southeast Asia. In the future, under the market trend of high processing efficiency and high precision (China's 12th Five-Year Plan and "Four Vertical and Four Horizontal" high-speed railway), the global demand for multi-axis, compound, large-scale, high-precision and high-efficiency machine tools will continue to increase. Taiwan's tool machine manufacturers are one of the few important industries marketing internationally with their own brands.

Taiwan's machine tool industry is highly competitive in technology integration, product management, marketing strategy and service. In recent years, with the enthusiastic support of the government and the industry's innovation research technology into improving precision machinery, the machine tool industry has constantly built up its high-end technological strength. Moreover, the manufacturers have a wealth of experience in the international market and marketing, so Taiwan's machine tool industry enjoys a bright prospect for development. The future development can integrate the industry, government and academia. Apart from enhancing the quality of their products, the operators may also work with relevant government marketing activities. For instance, in the world's major machine tool markets such as emerging markets, the EU market, the United States market and China, the government improved Taiwan's national image by media broadcast and publication of advertising about Taiwan's overall image, in an effort to enhance the brand image of Taiwan's machine tool products in the world's major machine tool markets and to widen the competitive gap with other competitors (The Bureau of Foreign

Trade and MOEA Taiwan, 2014). In particular, Taiwan has been actively promoting the development of exhibition industry in recent years. It has accumulated the international vision and energy of successful large-scale conventions and exhibitions, especially the large-scale international machine tool exhibitions like one of the world's top 5 machine tool exhibitions --Taipei International Machine Tool Show (TIMTOS) (Huang *et al.*, 2015).

Funding: This research is supported by the National Chin-Yi University of Technology, Taiwan, R.O.C. (under Project#: NCUT 17-R-MB-033).

Competing Interests: The author declares that there are no conflicts of interests regarding the publication of this paper.

REFERENCES

- Afuah, A., 1998. Innovation management: Strategies, implementation and profit. New York: Oxford University Press.
- Ahmadi, F., A. Hoseinipour and M. Ghahramani, 2014. Study the role of knowledge management in staff's empowerment (Case Study: Refah Bank's Branches of West Azerbaijan Province in Iran). *Interdisciplinary Journal of Contemporary Research in Business*, 5(12): 75-87.
- Alavi, M. and D.E. Leidner, 2001. Knowledge management and knowledge management systems: Conceptual foundations and research issues. *MIS Quarterly*, 25(1): 107-136. [View at Google Scholar](#)
- Almeida, P., 1996. Knowledge sourcing by foreign multinationals: Patent citation analysis in the U.S. semiconductor industry. *Strategic Management Journal*, 17(S2): 137-154. [View at Google Scholar](#) | [View at Publisher](#)
- Andrew, H.G., M. Arvind and H.S. Albert, 2001. Knowledge management: An organizational capabilities perspective. *Journal of Management Information Systems*, 18(1): 185-214. [View at Google Scholar](#) | [View at Publisher](#)
- Appleyard, M.M., 1996. How does knowledge flow? Interfirm patterns in the semiconductor industry. *Strategic Management Journal*, 17(S2): 137-154. [View at Google Scholar](#) | [View at Publisher](#)
- Arthur, A. and APQC, 1996. The knowledge-management assessment tool, prototype version, released at the knowledge imperative symposium. Texas: Arthur Anderson and the American Productivity and Quality Center.
- Bahra, N., 2001. Competitive knowledge management. Basingstoke: Palgrave.
- Baker, W.E. and J.M. Sinkula, 1999. The synergistic effect of market orientation and learning orientation on organizational performance. *Academy of Marketing Science*, 27(4): 411-427. [View at Google Scholar](#) | [View at Publisher](#)
- Barney, J.B. and B. Baysinger, 1990. Strategic management in high technology firms. Greenwich: JAI Press Inc.
- Becerra-Fernandez, I. and R. Sabherwal, 2001. Organizational knowledge management: A contingency perspective. *Journal of Management Information Systems*, 18(1): 23-55. [View at Google Scholar](#) | [View at Publisher](#)
- Bharadwaj, A.S., 2000. A resource-based perspective on information technology capability and firm performance: An empirical investigation. *MIS Quarterly*, 24(1): 169-196. [View at Google Scholar](#) | [View at Publisher](#)
- Billinger, A.S. and R.D. Smith, 2001. Managing organizational knowledge as a strategic asset. *Journal of Knowledge Management*, 5(1): 8-18. [View at Google Scholar](#) | [View at Publisher](#)
- Brown, J.S. and P. Duguid, 2001. Knowledge and organization: A social-practice perspective. *Organization Science*, 12(2): 198-213. [View at Google Scholar](#) | [View at Publisher](#)
- Chait, L.P., 1999. Creating a successful knowledge management system. *Journal of Business Strategy*, 20(2): 23-26. [View at Google Scholar](#) | [View at Publisher](#)
- Chau, Y.K., S. Hung and W. Lee, 2011. Influence of knowledge management infrastructure on innovative business processes and market-interrelationship performance: An empirical study of hospitals in Taiwan. *Journal of Global Information Management*, 19(2): 67-89. [View at Google Scholar](#) | [View at Publisher](#)
- Chen, H., C. Chiang, T. Sheu, Y. Liu and L. Lin, 2009. Planning ERP system in a service oriented architecture. *Journal of Information Management*, 16(4): 97-119.
- Chen, W.J. and H.Y. Cheng, 2011. Factors affecting the knowledge sharing attitude of hotel service personnel. *International Journal of Hospitality Management*, 31(2): 468-476.

- Chiu, H., 2015. Relational social capital, knowledge absorptive capacity, and attitudes toward knowledge sharing: The view of knowledge management. *Soochow Journal of Economics and Business*, 89(1): 1-34. [View at Google Scholar](#)
- Choo, C.W., 1998. *Create knowledge and make decisions*. New York: Oxford University Press.
- Chung, Y., 2003. An empirical study on the KM strategic groups, organizational learning and performance in Taiwan's healthcare industry. *Tunghai Management Review*, 5(1): 181-220.
- Damanpour, F. and W.M. Evan, 1984. Organizational innovation and performance: The problem of organizational lag. *Administrative Science Quarterly*, 29(3): 392-410. [View at Google Scholar](#) | [View at Publisher](#)
- Davenport, T., D. De Long and M. Beers, 1998. Successful knowledge management projects. *Sloan Management Review*, 39(2): 43-57. [View at Google Scholar](#)
- Davenport, T.H. and L. Prusak, 1998. *Working knowledge: How organizations manage what they know*. Boston: Harvard Business School Press.
- De Geus, A.P., 1988. Planning as learning. *Harvard Business Review*, 66(8): 70-74. [View at Google Scholar](#)
- Delaney, J.T. and M.A. Huselid, 1996. The impact of human resource management practices on perceptions of organizational performance. *Academy of Management Journal*, 39(4): 949-969. [View at Google Scholar](#) | [View at Publisher](#)
- Dess, G.G. and R. Robinson, 1984. Measuring organizational performance in the absence of objective measures: The case of the privately-held firm and conglomerate business unit. *Strategic Management Journal*, 5(13): 265-273. [View at Google Scholar](#) | [View at Publisher](#)
- Freeze, R. and U. Kulkarni, 2007. Knowledge management capability: Defining knowledge assets. *Journal of Knowledge Management*, 11(6): 94-109. [View at Google Scholar](#) | [View at Publisher](#)
- Gartner Group, 2002. Management update: The 2002 knowledge management hype cycle. *Inside Gartner This Week*, 58(4): 23-31.
- Gibbons, C.M., R.K. Bali, I.M. Marshall, R.N. Naguib and N. Wickramasinghe, 2010. *In perspectives of knowledge management in urban health*. London: Springer.
- Gold, A.H., A. Malhotra and A.H. Segars, 2001. Knowledge management: An organizational capabilities perspective. *Journal of Management Information Systems*, 18(1): 185-214. [View at Google Scholar](#) | [View at Publisher](#)
- Grant, M., 1996. Toward a knowledge-based theory of the firm. *Strategic Management Journal*, 17(S2): 109-122. [View at Google Scholar](#) | [View at Publisher](#)
- Greengard, S., 1998. Will your culture support KM? *Workforce*, 77(10): 93-95. [View at Google Scholar](#)
- Hallin, C.A. and E. Marnburg, 2008. Knowledge management in the hospitality industry: A review of empirical research. *Tourism Management*, 29(2): 366-381. [View at Google Scholar](#) | [View at Publisher](#)
- Holsapple, C. and K.D. Joshi, 2002. Knowledge management: A three-fold framework. *Information Society: An International Journal*, 18(1): 47-64. [View at Google Scholar](#)
- Hong, P., W.J. Doll, A.Y. Nahm and X. Li, 2004. Knowledge sharing in integrated product development. *European Journal of Innovation Management*, 7(2): 102-112. [View at Google Scholar](#) | [View at Publisher](#)
- Huang, S., C. Chiou, S. Chou and H. Liang, 2015. An application of marketing strategy for international exhibition: Taiwan's machine tool industry as an example. *Management Information Computing*, 4(2): 235-245.
- Hung, L. and M. Liao, 2007. The relations between knowledge management and organizational effectiveness in medical institutes. *Journal of Healthcare Management*, 8(1): 1-15.
- Hunt, S.D. and R.D. Morgan, 1996. The resource advantage theory of competition: Dynamic, path dependencies and evolutionary dimensions. *Journal of Marketing*, 60(3): 107-114. [View at Google Scholar](#) | [View at Publisher](#)
- Kanagasabapathy, K.A., R. Radhakrishnan and S. Balasubramanian, 2006. Empirical investigation of critical success factor and knowledge management structure for successful implementation of knowledge management system: A case study in process industry. Retrieved from <http://knowledgemanagement.ittoolbox.com>.
- Kaplan, R.S. and D.P. Norton, 1992. *The balance scorecard*. Boston: Harvard Business School Press.
- Keen, P.G.W., 1991. *Shaping the future: Business design through information technology*. Boston: Harvard School Press.

- Kiessling, T., R.G. Richey, J. Meng and M. Dabic, 2009. Exploring knowledge management to organizational performance outcomes in a transitional economy. *Journal of World Business*, 44(4): 421-433. [View at Google Scholar](#) | [View at Publisher](#)
- Kulkarni, U.R., S. Ravindran and R. Freeze, 2007. A knowledge management success model: Theoretical development and empirical validation. *Journal of Management Information Systems*, 23(3): 309-347. [View at Publisher](#)
- Lee, H. and B. Choi, 2003. Knowledge management enablers, processes and organizational performance: An integrative view and empirical examination. *Journal of Management Information Systems*, 20(1): 179-228. [View at Google Scholar](#) | [View at Publisher](#)
- Lee, T. and B. Sukoco, 2007. The effects of entrepreneurial orientation and knowledge management capability on organizational effectiveness in Taiwan: The moderating role of social capital. *International Journal of Management*, 24(3): 549-572. [View at Google Scholar](#)
- Liao, S.H., W.C. Fei and C.C. Chen, 2007. Knowledge sharing, knowledge absorptive capacity and innovation capability: An empirical study in Taiwan knowledge intensive industries. *Journal of Information Sciences*, 33(3): 1-20. [View at Google Scholar](#) | [View at Publisher](#)
- Lierni, P.C. and V.M. Ribiere, 2008. The relationship between improving the management of projects and the use of KM. *Journal of Information and Knowledge Management Systems*, 38(1): 133-146. [View at Google Scholar](#) | [View at Publisher](#)
- Liu, P.L., W.C. Chen and C.H. Tsai, 2004. An empirical study on the correlation between knowledge management capability and competitiveness in Taiwan's industries. *Technovation*, 24(12): 971-977. [View at Google Scholar](#) | [View at Publisher](#)
- O'Dell, C. and C.J. Grayson, 1998. *If only we knew what we know*. New York: The Free Press.
- Palanisamy, R., 2008. Organizational culture and knowledge management in ERP implementation: An empirical study. *Journal of Computer Information Systems*, 48(2): 100-120. [View at Google Scholar](#)
- Pandey, S.C. and A. Dutta, 2013. Role of knowledge infrastructure capabilities in knowledge management. *Journal of Knowledge Management*, 17(3): 435-453. [View at Google Scholar](#) | [View at Publisher](#)
- Petrash, G., 1996. Dow's journey to a knowledge value management culture. *European Management Journal*, 14(4): 365-373. [View at Google Scholar](#) | [View at Publisher](#)
- Polanyi, M., 1962. *Personal knowledge*. Chicago: The University of Chicago Press.
- Popper, M. and R. Lipshitz, 2000. Organizational learning: Mechanisms, culture, and feasibility. *Management Learning*, 31(2): 181-196. [View at Google Scholar](#) | [View at Publisher](#)
- Rhodes, J., R. Hung, P. Lok, B. Lien and C. Wu, 2008. Factors influencing organizational knowledge transfer: Implication for corporate performance. *Journal of Knowledge Management*, 12(3): 84-100. [View at Google Scholar](#) | [View at Publisher](#)
- Rosenzweig, E.D. and A.V. Roth, 2000. Testing competitive progression theory in hi-tech manufacturing. *Decision Science Institute, Proceeding*. pp: 1068-1070.
- Rothwell, W., R. Jackson, S. Knight, J. Lindholm, A. Wang and T. Payne, 2005. *Career planning and succession management: Developing your organization's talent—for today and tomorrow*. Westport: Greenwood Press.
- Sarvary, M., 1999. Knowledge management and competition in the consulting industry. *California Management Review*, 3(7): 95-10. [View at Google Scholar](#) | [View at Publisher](#)
- Scarborough, H., J. Swan and J. Preston, 1999. *Knowledge management: A literature review (Issues in People Management)*. London: Institute of Personnel and Development.
- Siau, K., X. Tan and H. Sheng, 2010. Important characteristics of software development team members: An empirical investigation using repertory grid. *Information Systems Journal*, 20(6): 563-580. [View at Google Scholar](#) | [View at Publisher](#)
- Slater, S.F. and J.C. Narver, 2002. Market orientation and the learning organization. *Journal of Marketing*, 59(3): 63-74.
- Stewart, T.A., 1997. *Intellectual capital: The new wealth of organizations*. Bantam: Doubleday Dell Publishing Group Inc.
- Strack, R., J. Baier and A. Fahlander, 2008. Managing demographic risk. *Harvard Business Review*, 86(2): 119-134. [View at Google Scholar](#)
- Talisayon, S.D., 2002. Knowledge and people. *Business World*, 2(3): 1-5. [View at Google Scholar](#)
- The Bureau of Foreign Trade and R.O.C. MOEA Taiwan, 2014. 2014 Annual Project Plan Report (Research Report): Analysis of Taiwan Machine Tool and Main Competitive Industry Development Status.

- The Bureau of Foreign Trade and R.O.C. MOEA Taiwan, 2015. Retrieved from http://www.moea.gov.tw/MNS/populace/news/News.aspx?kind=1&menu_id=40&news_id=42649.
- Ulka Toro, G. and M. Joshi, 2013. A review of literature on knowledge management using ICT in higher education. *International Journal of Computer Technology and Applications*, 4(1): 62-67. [View at Google Scholar](#)
- VanderMerwe, S., 1999. *Customer capitalism*. London: Nicholas Brealey Publishing Ltd.
- Venkatraman, N. and V. Ramanujam, 1986. Measurement of business performance on strategy. *Harvard Business Review*, 75(3): 237-351.
- von Krogh, G., I. Nonaka and M. Aben, 2001. Making the most of your company's knowledge: A strategic framework. *Long Range Planning*, 34(4): 421-439. [View at Google Scholar](#) | [View at Publisher](#)
- Wiig, K.M., 1997. Knowledge management: Where did it come from and where will it go? *Expert Systems with Applications*, 14(5): 67-78.
- Wu, I. and Y. Hu, 2012. Examining knowledge management enabled performance for hospital professionals: A dynamic capability view and the mediating role of process capability. *Journal of the Association for Information Systems*, 13(12): 976-999. [View at Google Scholar](#)
- Yamin, S., A. Gunasekaran and F.T. Mavondo, 1999. Innovation index and its implications on organizational performance: A study of Australian manufacturing companies. *International Journal of Technology Management*, 17(5): 495-503. [View at Google Scholar](#) | [View at Publisher](#)
- Yang, C., C. Ma and Y. Su, 2011. Evidence-based investigation for determining the characteristics of knowledge management on organizational innovation within Taiwanese teaching hospitals. *I-Business*, 3(1): 30-34. [View at Google Scholar](#) | [View at Publisher](#)
- Yen, W., S. Kuo and C. Lin, 2014. Knowledge transfer, service capabilities and organizational performance in the container shipping industry. *Maritime Quarterly*, 23(1): 1-24.

Views and opinions expressed in this article are the views and opinions of the author(s), Asian Economic and Financial Review shall not be responsible or answerable for any loss, damage or liability etc. caused in relation to/arising out of the use of the content.