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Information infrastructure capability and organisational competitive advantage:

Framework

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Information infrastructure capability and organisational competitive advantage

Framework

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Abstract

Purpose – The purpose of this paper is to propose an inclusive research model to overcome the single perspective issues of the previous research which were looking at either on knowledge management (KM) activity, information technology (IT) applications or information infrastructure capability (IIC) independently.

Design/methodology/approach – This paper reviewed and categorised five knowledge management (KM) frameworks: first, KM foundation studies; second, resource-based view studies; third, IIC studies; fourth, competitive advantage (CA) studies; fifth, organisational information processing theory studies to propose research model. Case studies based on face-to-face interviews were conducted to empirically analyse the proposed research model.

Findings – An inclusive research model was suggested to redress the key limitation of past studies in this research field.

Research limitations/implications – Since Asian countries are at present heading for the creation of a knowledge economy, the present study is important to assist government and researchers to develop the most suitable information infrastructure for effective KM in the organisation. The research model proposed by the present study can also become a key reference to the governments and researchers in other developing countries towards the creation of knowledge economy.

Practical implications – The model proposed by the present study will help organisations to examine the performance of their current information infrastructure towards developing new business processes, techniques and decisions for effective KM in the organisations.

Originality/value – The present study is one of the pioneer studies that integrating important IICs such as the integrating capability, data management capability, security capability, utility capability and collaborating capability in the research framework to assist knowledge-based companies to enhance current KM practices and attain long-term CA.

Keywords Asia, Knowledge management (KM), Competitive advantage (CA), Information infrastructure capability (IIC)

Paper type Research paper



1. Introduction

Knowledge management (KM) is an important determinant for the information infrastructure capability (IIC) and organisational competitive advantage (CA) (Chang and Chuang, 2011; Li *et al.*, 2012). This paper includes intensive reviews and

classification of different dimensions of KM research, which provides a richer overview of KM-IIC-CA literature, entailing the strengths, weaknesses, key indicators and contributions of each literature.

This paper has notable research contributions. First, it aims to propose and empirically analyse an inclusive KM research framework that examines how IIC influences the sustainable KM and CA of an organisation. Since Asian countries are currently proceeding into knowledge economy, the present study is important as it helps government and researchers to set up the most appropriate information infrastructure for effective KM in the organisation. The framework proposed by the present study can also become an important and valuable reference to the governments and researchers in other developing countries in escalating their movement towards the establishment of knowledge economy.

One of the practical contributions of this research is to help managers to distinguish the significance of information infrastructure to the organisation. The present study is one of the pioneer studies that integrates essential IICs such as the integrating capability, data management capability, security capability, utility capability and collaborating capability in the research framework to assist knowledge-and-technology-based organisations to enhance current KM practices in the organisations and attain long-term CA. Without well-built information infrastructures, organisations will not be accomplishing long-term CA through effective process management, database management, document management and performance management.

The framework proposed by the present study will also help senior executives to examine how well their current information infrastructure is encouraging effective KM to swiftly expand new business processes, techniques and decisions. When a knowledge-and-technology-based organisation can rapidly and easily establish new KM applications and adjust current applications, the organisation is on target of establishing long-term CA. The present study will help organisations in establishing an appropriate, sensible and adaptable IIC, which will assist the organisations to administer its assets to react to customer needs in sensible manner.

2. Review of important theoretical frameworks

It is important to review and explore previous related research and their interactions with technology and systems in order to have a deeper understanding on how IIC and organisational CA are associated. In this section, related and prominent research were reviewed and classified based on their research area:

- (1) KM foundation studies (Holsapple and Joshi, 2002; Nonaka, 1994; Zack, 1999);
- (2) Resource-based view (RBV) studies (Bharadwaj, 2000; Foss and Knudsen, 2000; Peteraf and Barney, 2003);
- (3) IIC studies (Sher and Lee, 2004; Tanriverdi, 2001);
- (4) CA studies (Bhatt *et al.*, 2010; Tallon, 2008; Wang *et al.*, 2007); and
- (5) Organisational information processing theory (OIPT) (Galbraith, 1973, 1974).

2.1 KM foundation studies

2.1.1 Organisational knowledge creation model. Nonaka (1994) built a theoretical framework on analytical dimension of knowledge creation. It was implemented in dynamic creation of appropriate organisational knowledge. This framework has been widely adopted by KM researchers specifically on tacit or explicit knowledge (Zack, 1999).

Nonaka (1994) generated organisational knowledge through a continuous exchange of ideas between tacit and explicit knowledge. Four modes of exchange of ideas between tacit and explicit knowledge are discussed in “SECI” model (Figure 1). “Socialisation” refers to the transformation from tacit knowledge into tacit knowledge via shared experience between individuals. “Combination” involves the integration of different explicit knowledge held by individuals. “Externalisation” is the transformation of tacit knowledge to explicit knowledge. This is the decisive goal of any KM initiatives. “Internalisation” is transforming explicit knowledge into tacit knowledge. This process is equivalent to “learning” in traditional circumstance. In sum, Nonaka’s (1994) model facilitates the conversion of the tacit and explicit knowledge in IT applications and IIC.

Research Gap 1. Nevertheless, the “SECI” model was initially used in product innovation activities in Japanese assembly lines and is unsuitable for knowledge-intensive organisations. The inappropriateness is mainly due to kind of business of production to knowledge-based organisations and cultural differences. The present study focuses on knowledge-based organisations, which will better expressing how knowledge-intensive organisations strengthen their IICs and CA.

Research Gap 2. Moreover, Nonaka’s (1994) framework solely concentrates on the dynamic capability of organisational knowledge creation in neglecting of other IIC components. The present study enhances Nonaka’s (1994) framework by focusing on all the IIC components, which provides a better representation on organisational CA.

2.1.2 *Corporate memories as KM tool.* According to Gertjan *et al.* (1997), knowledge in an organisation is explicitly kept in the corporate memory. The corporate memory is used to enhance organisational CA by allowing knowledge creation, distribution and protection in the organisation. The corporate memory will enhance self-learning for individual, direct learning using communication and in-direct learning using a knowledge repository (Gertjan *et al.*, 1997).

Research Gap 3. The limitation of Gertjan *et al.*’s (1997) framework is that none of the findings was either validated by experts/software developers. There was also no direct association between knowledge learning and organisational CA. Hence, suitable IIC

		To	
		Tacit knowledge	Explicit knowledge
From	Tacit knowledge	Socialisation	Externalisation
	Explicit knowledge	Internalisation	Combination

Figure 1.
Modes of
knowledge creation

Source: Nonaka (1994)

components are needed to resolve the limitation of this framework in order to achieve organisational CA.

2.1.3 Knowledge strategy model. Zack (1999) developed a model for evaluating an organisation's knowledge strategy. He concluded that knowledge is the fundamental asset for organisational CA. Organisations must strategically evaluate their knowledge strategies or ways to manage resources effectively to achieve organisational CA. The developed knowledge strategies must then be translated into an appropriate data management processes.

Research Gap 4. Given that knowledge strategies are critical organisational resource and must be transformed into the technical data management architecture for organisational CA, further investigation of the types of IIC is needed. However, all components of IIC for achieving organisational CA were not addressed in the framework of Zack (1999). This research gap will be filled in the present study. This study aims to propose a framework to examine the influence of all components of IIC on CA.

2.1.4 KM and KM system (KMS) model. Hahn and Subramani's (2000) framework discovered three deployment phases of a KMS: the initial setup, in progress and maintenance and continuing effect. The issues discussed were the amount and network diversity, the knowledge maintenance and the continuing effect of the KMS support. According to Hahn and Subramani (2000), KMS is successful "if the users of the tools succeed with the tool", which indicates that KMS may produce positive and negative outcomes in the long run. The dynamic nature was crucial in linking KMS to organisational CA and was required to ensure that the final outcome of KMS was always positive in a changing KM environment (Tallon, 2008; Wang *et al.*, 2007).

Research Gap 5. However, issues such as how knowledge-driven organisations utilise their KMS and what types of KMS are crucial to attain organisational CA were not addressed in the framework of Hahn and Subramani (2000). This study is therefore conducted to identify crucial KM activities for a knowledge-and-technology-based organisation to attain CA.

Another model, Alavi and Leidner's (2001) framework indicated that KMS could play a variety of roles such as: best practices sharing; corporate memories creation and knowledge network creation in support of organisational KM activities. Specific IT applications such as corporate intranets enhance dynamic capability which allows organisations to make speedy decision. Individual social networks and corporate memories also enhance collaborating capability and teamwork. Workflow automation systems ensure speedy integrating and data management capability by offering timely integrated and work-related documents and information.

Research Gap 6. The positive role of IT applications in supporting of the dynamic, collaborating, integrating and data management capabilities in KM activities was confirmed by Alavi and Leidner's (2001) framework. Nevertheless, there was no insightful link of the findings to the organisational CA. This study is therefore conducted to identify key association between IICs and CA.

A framework by Holsapple and Joshi (2002) highlighted the association of three components: knowledge resources; activity and KM impact. The knowledge resources were organisational knowledge storage, which was accessible and usable. Human or machine uses knowledge resources to perform activities which might have KM impact on an organisation.

Research Gap 7. The ultimate goal of businesses and organisational CA were not addressed by Holsapple and Joshi (2002). The three main components and their

relationships were not analysed in greater detail. Furthermore, since Holsapple and Joshi (2002) only examined the responses of 31 respondents, 13 researchers, 13 practitioners and five are both researchers and practitioners, it did not provide an empirical link of the developed KM framework to knowledge-intensive organisations. The present study addresses the limitation of Holsapple and Joshi (2002) by studying how IIC executes KM activity to achieve organisational CA.

Later, a study of early adopters of corporate portal was carried out by Benbya *et al.* (2004). Benbya *et al.* (2004) viewed KMS as technologies that supported KM in organisations to create, store and transfer knowledge.

According to Benbya *et al.* (2004), there were four categories of KMS:

- (1) general KMS provides an overall solution for a company's KM needs;
- (2) knowledge sharing systems support knowledge sharing between people or other agents;
- (3) content management systems integrate, classify and document knowledge from various sources; and
- (4) knowledge searching and retrieval systems allow search and retrieval and of organisational knowledge.

Benbya *et al.* (2004) revealed that corporate portal has integrating capability and collaborating capability for knowledge creation, retention and reutilisation. It integrates organisational information from different organisational departments and databases. By forming a shared community or online forum, collaboration among organisational participants is allowed. With these findings, integrating capability and collaborating capability will be further tested in the present study.

Research Gap 8. Benbya *et al.* (2004) categorised corporate portal as a beneficial KM tool. However, it did not provide further investigation of how the use of corporate portal led to organisational CA. The types of KM activities for achieving organisational CA were not addressed in Benbya *et al.* (2004) and thus would be accomplished in the present study.

2.2 Resource-based view (RBV) studies

RBV of CA was popular in early 2000s (Bharadwaj, 2000; Foss and Knudsen, 2000; Peteraf and Barney, 2003). Bharadwaj (2000) developed a model of IT infrastructure, human IT skills and capability to leverage IT for CA. Superior IT capability is positively associated with CA. IT capability is a resource that is not easily imitated or substituted by competitors. If an organisation can have the IT infrastructure as a platform to execute innovative IT applications, it will be having more CA. Similar situations applied to other capabilities such as human IT skills and capability to leverage IT.

Foss and Knudsen (2000) found that uncertainty and immobility affect CA. Demand and supply uncertainties such as market price can be resolved by having the unique product. Without having the uncertainty knowledge, repeated product is created and its uniqueness is ruined completely. With the absence of knowledge flows (immobility), competitions will equalise all profits across organisations. Based on the concepts of uncertainty and immobility, Peteraf and Barney (2003) discovered that imitable and heterogeneity could generate CA for an organisation.

RBV studies measure CA by organisational success relative to competitors (Foss and Knudsen, 2000). Thus, CA could be measured by differences among competitors on indirect impacts between organisations (Becerra-Fernandez *et al.*, 2004).

Research Gap 9. However, Bharadwaj's (2000) research was limited to the IT capability. IICs and clear metric to measure the IT capability was not studied by Bharadwaj (2000). These research gaps will be filled in the present study.

2.3 IIC studies

Kim (2001) found that an organisation can select and use the proper IT applications to support its KM initiatives as long as they understand the types of knowledge and services it uses. Subsequently, it will help the organisation to plan and implement KM projects effectively and efficiently. Kim (2001) further modelled the service and knowledge types used by an organisation into different dimensions.

There are two types of services: unique service and standardised service (Figure 2). When an organisation provides a highly personalised and high context-dependent service, it is an "unique" service. When an organisation provides a procedure-oriented service, which is low context-dependent, it is a standardised service.

There are two types of knowledge: exploitive and explorative knowledge. Exploitive knowledge is explicit knowledge, which can be easily shared informally and structurally (Abdel-Aziz and Kamel, 2012). Declarative knowledge and procedural knowledge are instances of exploitive knowledge which explain why something happens (Zack, 1999). In contrast, explorative knowledge is tacit and difficult to understand. Hence, training is required for the knowledge transfer (Yaghoubi *et al.*, 2011). Causal knowledge is an example of explorative knowledge. It explains the reason of doing something (Zack, 1999).

Knowledge is "exploitive" when an organisation captures explicit knowledge and must codify it before using. Knowledge is "explorative" when an organisation creates new knowledge from mostly tacit knowledge among collaborators.

Four distinct models named as Type I, Type II, Type III and Type IV were developed using the intersection of the four dimensions defined (Figure 3).

On top of the evaluations of knowledge and service types, the effectiveness of KM implementation depends on IICs that support its KM initiatives. The IICs in this framework include:

- (1) integrating capability;
- (2) collaborating capability;
- (3) data management capability;

		<i>Exploitive</i>	<i>Explorative</i>
Service Type	Unique	Type I	Type II
	Standardised	Type III	Type IV

Knowledge Type

Source: Kim (2001)

Figure 2.
KM model

- (4) security capability; and
- (5) utility capability.

Research Gap 10. The research did not explore the impact of IIC-organisational CA which was the main aim of the present study. It merely highlighted the critical role of mapping types of organisation to IIC. Kim's (2001) research was constrained with non-significant relationships between KM models and IIC. Therefore, this current study bridges the research gap. All IICs will be tested in this research.

A study was conducted by Sher and Lee (2004) to explore into the association between KM and organisational CA. Based on a survey of Taiwanese organisations Sher and Lee's (2004) findings discovered that new knowledge collection, knowledge codification and new and previous knowledge integration often increase dependence on the IT applications. The findings also showed that management of IT applications significantly enhanced dynamic capabilities.

Several IT applications such as enterprise resource planning (ERP) were found to support integrating capability in customer relationship management and supply chain management (Sher and Lee, 2004). Document management was found to enhance dynamic capabilities in where document sharing enhanced communication and coordination (Sher and Lee, 2004). Powerful search engine encouraged knowledge availability for fast decision making (Sher and Lee, 2004). Data warehousing enhanced dynamic capabilities by allowing speedy knowledge storage and retrieval (Sher and Lee, 2004). Sher and Lee (2004) also highlighted the importance of the security and accessibility of the KMS in achieving organisational CA. From these notations, IT applications, integrating capability, dynamic capability and security capability will be adopted in developing the current research framework.

Research Gap 11. Despite the above-mentioned strengths, Sher and Lee's (2004) framework had limitation. The findings were only focused on dynamic capability, without assessing other IICs. The present research will bridge this research gap by having a more comprehensive way by adding the entire IICs (integrating capability, collaborating capability, data management capability, security capability and utility capability) from past research.

Tanriverdi (2005) derived a better way of understanding knowledge strategies from Zack's (1999) framework. Tanriverdi's (2005) framework revealed that IT applications were crucial in enhancing multi-business organisational CA.

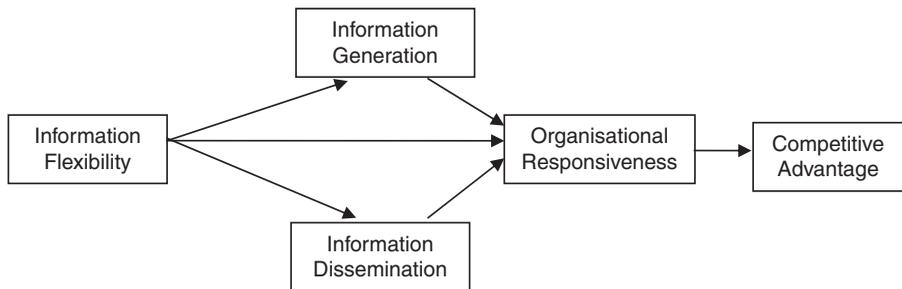


Figure 3.
IT infrastructure flexibility, organisational responsiveness and CA

Source: Bhatt *et al.* (2010)

Research gap 12. Although the positive impact of KM to organisational CA was proven in Chang and Chuang's (2011) research, there was no direct association of KM shown in Tanriverdi's (2005) research. IT applications were found to mediate KM and organisational CA by Tanriverdi (2005). Hence, the role of IT applications will be investigated in the current research to confirm its contribution in this research stream. In addition, Tanriverdi's (2005) framework focused on large multi-business organisations and small and medium enterprises (SMEs) were excluded. As the framework was highly related to knowledge and information infrastructure, knowledge-based organisations would be a more appropriate target instead of multi-business organisations.

2.4 CA studies

Bixler (2000) justified the value of KM to an organisation in terms of its capability to solve enterprise-wide challenges. In Bixler's (2000) framework, organisational resources and the perceived advantages of a KMS were investigated. The top three of the perceived advantages were "establishing a formalised knowledge transfer system, providing an enhanced transfer of tacit knowledge from one employee to another and an improved ability of an enterprise to sustain a CA". The perceived advantages in terms of organisational CA are adopted in the present study.

Bixler's (2000) study served as a validated foundation for a comprehensive and extensive research framework in achieving organisational CA.

Research Gap 13. However, the reason why a type of KMS was selected was not highlighted. Second, the pre-condition of IIC, right IT applications to enable the organisational CA, was not investigated. Third, the KMS was not examined from the perspective of their knowledge processes which might result in improper selection of IIC. Therefore, the present study will bridge this research gap by proposing a comprehensive framework that incorporating IICs, KM activities and CA.

The significance of KM activities using IT for organisational CA was examined by Rajiv and Sanjiv (2005). They studied the short term effect of KM on organisation's value by conducting a previous research on cumulative abnormal return (CAR) with a public announcement as the dependent construct.

Research Gap 14. Rajiv and Sanjiv's (2005) study was conducted based on public announcements and market perceptions of performance, without examining the relationship of organisational KM efforts, prior organisational KM practices and private information in knowledge sharing, creation or utilisation. When organisational CA was achieved from right IIC, appropriate IT applications should be identified. A detailed study on how IT applications supported IIC to achieve organisational CA should therefore be carried out in the present research to obtain a more comprehensive framework.

Burca *et al.* (2006) found positive relationships among information technology (IT) sophistication, service practices and business performance.

An empirical study of Bhatt *et al.* (2010) exhibited that information infrastructure flexibility could empower organisational information building. Hence, organisations could exploit the organisational information to have quick access to market opportunities and attain CA (Bhatt *et al.*, 2010). Figure 3 showed that information infrastructure flexibility could be rapidly adopted in dynamic phenomenon. The IT applications were classified as infrastructure resources, human resources and IT-enabled intangibles.

Research Gap 15. Although the Bhatt *et al.*'s (2010) framework indicated that superior IIC improved organisational CA, the underlying IT applications were not

identified based on KM perspective. Burca *et al.* (2006) did not study how to categorise the need of the service type. Hence, to enable concise achievement of organisational CA, the right IT applications for the right organisations would be identified in this research.

Due to the aforementioned shortcomings, in this present research, the right IIC based on KM perspectives will be identified and the association among the right IT applications, IIC and organisational CA will be studied.

Wang *et al.* (2007) demonstrated that manufacturing organisations benefited indirectly from the IT support of KM. Wang *et al.* (2007) also suggested organisations to prudently align the KM IT support to strategic needs. As shown in Figure 4, knowledge-based dynamic capability mediated IT support for KM and organisational performance.

Research Gap 16. However, Wang *et al.* (2007) only focused on dynamic capability only without considering other prominent IICs. The present research will bridge this research gap by having a more comprehensive way by adding the entire IICs (integrating capability, collaborating capability, data management capability, security capability and utility capability) from past research.

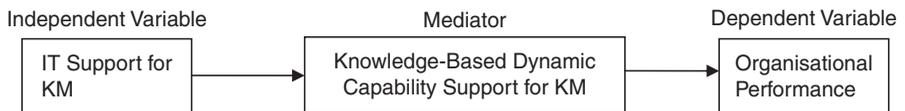
Another study was carried out by Tallon (2008), who discovered that managerial and technical capabilities were essential positive determinants for organisational dynamic capabilities and CA. The framework is shown in Figure 5 below.

Evers's (2011) framework required managers to use dynamic capability as a means to respond fast to international marketplaces. The expected benefits in terms of organisational CA are adopted in this research.

A conceptual model of IIC developed by Qi *et al.* (2008) showed that IIC affected CA. An empirical relationship could also be derived from Qi *et al.*'s (2008) findings: Better organisational IIC contributed to better organisational CA.

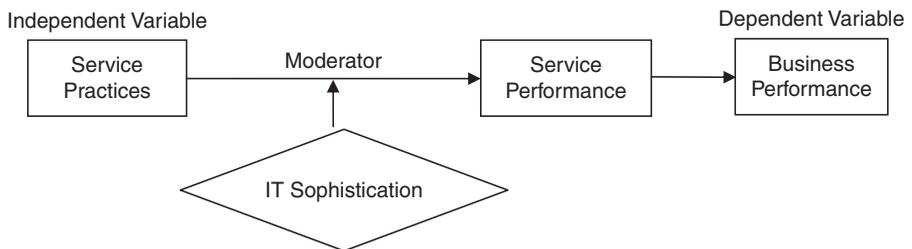
Conforming to past research (Benbya *et al.*, 2004; Hahn and Subramani, 2000; Tanriverdi, 2005), Lawson and Potter (2012) advocated KM as a major determinant of organisational CA.

Research Gap 17. Tallon (2008) derived the types of IIC based on managerial and technical IT perspectives and not from KM perspectives as required by knowledge intensive organisations. The identification of the right IT applications for IIC was not



Source: Wang *et al.* (2007)

Figure 4.
IT support for KM



Source: Tallon (2008)

Figure 5.
Moderating effects of
IT sophistication

carried out in Evers (2011), Lawson and Potter (2012) and Qi *et al.* (2008). The present study will address the shortcoming of these past studies by identifying right IT applications for IIC from KM perspectives.

2.5 OIPT

Galbraith (1973) identified three important concepts of OIPT: information processing needs, information processing capability and the information fit to obtain optimal performance. Organisations need quality information to cope with uncertainties resulted from missing required information (Galbraith, 1973, 1974; Premkumar *et al.*, 2005). Therefore, appropriate information is needed to overcome environmental uncertainties.

Organisations adopt two key strategies to overcome environmental uncertainties and increased information needs: buffers development and implement structural mechanisms to enhance information processing capability. With these strategies, the effects of uncertainties will be reduced. Inventory buffers are developed to reduce the effect of unpredictable market demand or supply, safety buffers are built for the uncertainty of product working conditions. In addition to buffers development, generating better information flow among organisations by redesigning current business processes and integrating current information system can also reduce uncertainties in the supply chain (Galbraith, 1973, 1974; Nemutanzhela and Tiko, 2011).

The concept of OIPT has been developed four decades ago (Galbraith, 1973, 1974; Premkumar *et al.*, 2005) and has been applied in the field of IT (Mathiassen and Sorensen, 2008). OIPT model regarded IT resources as information source whereas essential information processing requirements and capabilities are enabled by people and IT applications (Nemutanzhela and Tiko, 2011).

Research Gap 18. However, neither earlier nor more recent work has directly examined the IIC as information processing capability. With respect to the present study, IIC is conceived as organisational information processing capability which will lead to the organisational CA. Hence, a framework to examine the association between IIC and CA will be proposed by the present study.

3. Development of proposed research framework of the current study

3.1 Review of past studies

KM studies were dominant in organisational performance in 1990s. They were merely on single perspective such as dynamic capability (Nonaka, 1994), corporate memory (Gertjan *et al.*, 1997) and data management capability (Zack, 1999). Later in 2000s, IT appeared as a tool in KM as KMS (Benbya *et al.*, 2004). KMS is considered as a source of organisational competitiveness (Wang *et al.*, 2011).

Past prominent studies were explored and reviewed using systematic literature review (Kitchenham *et al.*, 2007). Research questions are first identified as:

- RQ1. What are the IIC for achieving organisational CA?
- RQ2. What are the strengths and weaknesses of the existing frameworks of IIC for CA?
- RQ3. What are the value(s) retrieved from the existing frameworks that could be incorporated into this present study?

Keyword searching was conducted as a research strategy to select the relevant literature (Wen *et al.*, 2011). Boolean AND and OR were used to create search strings. The search strings are (Information Infrastructure Capability and competitive

advantage) or (Knowledge and management and competitive advantage) or (Knowledge and competitive advantage) or (Knowledge and management and Information Infrastructure Capability). Research selection criteria and quality assessment are then identified to find relevant studies which adequately address the research questions. Online databases such as Science Direct, Pro Quest and Web of Knowledge were searched to collect the relevant literature. Finally, a data extraction form was adopted for data extraction and data synthesis (Wen, *et al.*, 2011). These six quality assessment questions are:

- (1) Are the aims of the research clearly defined?
- (2) Is the estimation context adequately described?
- (3) Are the estimation methods well-defined and deliberate?
- (4) Are the findings of study clearly stated and supported by reporting results?
- (5) Are the limitations of study analysed explicitly? and
- (6) Does the study add value to academia or industry community?

Further from the KM foundation studies, IT applications as information infrastructures were found supporting capabilities (Tanriverdi, 2005). Suitable KM models were mapped to organisations in order to have effective IIC to support its KM initiatives (Kim, 2001).

In this highly competitive and rapidly changing century, businesses are seeking an overall solution to serve their markets effectively. Bixler's (2000) CA findings contributed a set of KMS benefits as organisational CA measurement in implementing KM. Additionally, KM (Lawson and Potter, 2012), IT applications (Burca *et al.*, 2006; Tallon, 2008), IICs (Bhatt *et al.*, 2010; Qi *et al.*, 2008), dynamic capability (Evers, 2011; Tallon, 2008; Wang *et al.*, 2011) were proven to have positive impact on CA. However, insightful measurement of CA to link organisations was still undetermined and empirical link was not found in the developed KM framework to knowledge-intensive organisations (Kim, 2001; Holsapple and Joshi, 2002; Sher and Lee, 2004).

On the other hand, RBV of CA was popular in 2000s (Bharadwaj, 2000; Foss and Knudsen, 2000; Peteraf and Barney, 2003). Information infrastructures were analysed as resources to organisations for IIC and superior IIC was found positively associated with CA (Bhatt *et al.*, 2010).

The concept of OIPT has a long tradition in organisational research (Galbraith, 1973, 1974; Premkumar, *et al.*, 2005) and has been applied in the field of IT (Mathiassen and Sorensen, 2008). In line with CA studies (Bhatt *et al.*, 2010; Burca *et al.*, 2006; Tallon, 2008), OIPT recognised IT resources as knowledge source for organisations. Hence, the source is fundamental to process information which was enabled by KM activities (Nemutanzhela and Tiko, 2011). For this reason, OIPT has been identified as important upon performing KM activities using IIC in achieving CA which the present research is based on.

There is still a lack of understanding as to which IIC is specifically important to consistently contribute to CA from the review of different theoretical approaches and concepts of IIC and organisational CA. Basically, past research only determined if IIC had positive impact on organisational CA without studying how IIC contributed to organisational CA. Besides, there was also no past research that specified which IIC was important and also, none of the past research investigated IIC from the perspective of KM activities. Thus, it is difficult for IT and knowledge practitioners to fully utilise their IT applications effectively for organisational CA.

3.2 Summary of research gaps

The 18 research gaps from Section 2 were summarised into five major research gaps in Table I.

3.3 Proposed research framework

In order to fill the research gaps that highlighted in the past research, the present study aims to develop a comprehensive framework to investigate how effective IIC and KM measures can contribute to organisational CA.

In the proposed framework of the present study, IIC is considered as a group of components, namely dynamic capability (Hipkins, 2001; Lew *et al.*, 2014; Rajiv and Sanjiv, 2005; Tallon, 2008; Wang *et al.*, 2007), integrating capability (Benbya *et al.*, 2004; Christopher, 2006; Sher and Lee, 2004), data management capability (Alavi and Leidner, 2001; Zack, 1999), security capability (Sher and Lee, 2004), utility capability (Hahn and Subramani, 2000; Kim, 2001; Lew *et al.*, 2014) and collaborating capability (Alavi and Leidner, 2001).

Individual social networks and corporate memories will enhance collaborating capability among organisational units and dynamic capabilities for fast decision making. Workflow automation systems will improve data management capability (Alavi and Leidner, 2001). Furthermore, corporate portal will allow integrating capability and collaborating capabilities from combining different departments and databases (Benbya *et al.*, 2004). Document management tools with data management capability will be improved by dynamic capabilities. Communication and coordination tools that enhance collaborating capability also encourage dynamic capability among organisational participants (Sher and Lee, 2004).

Therefore, in this study, IIC are considered as the base for knowledge-based organisations in achieving organisational CA (Figure 6). Each component of the IIC is unique but they interrelated with each other.

4. Research design

4.1 Data collection methods

Primary data was derived from case studies, which used open-ended questions as suggested by Cooper and Schindler (2006). Case studies were developed based on the face-to-face interviews. Each interview for the case study was conducted on-site at the organisation concerned. Each interview lasted between one-and-a-half to two hours. The interviews were conducted based on the interview questions adopted from past

Major Research Gaps	Source
1 Lack of empirical link of the developed KM framework to knowledge-intensive organisations	Research Gaps 1, 5, 6, 7, 12
2 Limited components of IIC for achieving organisational CA were addressed	Research Gaps 2, 4, 9, 10, 11, 16
3 The findings were not validated by experts; leading a doubtful validity content	Research Gap 3
4 IT applications and knowledge management system (KMS) to enable the organisational CA were not identified based on KM perspective	Research Gaps 8, 13, 14, 15, 17
5 Neither earlier nor more recent work has directly examined the IIC as information processing capability	Research Gap 18

Table I.
Major research gaps

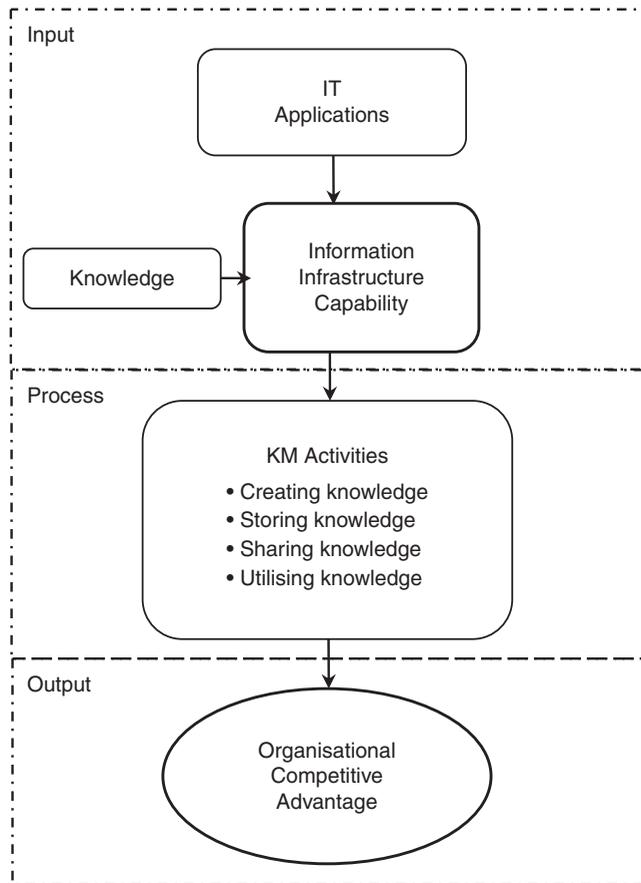


Figure 6.
Proposed framework

research (Bixler, 2000; Chang and Chuang, 2011; Dunk, 2004; Perera, 2012). The interviews were recorded in field notes. The subjects' permission was obtained before the interview and they were assured of confidentiality of their interviews. Responses to the interview questions were edited and case study reports were created.

The questions were developed based on relevant prior studies (Bixler, 2000; Chang and Chuang, 2011; Dunk, 2004; Perera, 2012) and tested for reliability and validity. The questionnaire was a 28-item IIC scale, consisting of a three-item dynamic scale, a three-item integrating scale, an eight-item data management scale, a three-item security scale, a six-item utility scale and a five-item collaborating scale. There was also an 18-item CA scale. Fourteen of the 18 items were adapted from Bixler's (2000) study. Four additional items were added for responsiveness and flexibility (Bhatt *et al.*, 2010; Chang and Chuang, 2011; Paul, 2008), product development life cycle (Alting and Jørgensen, 1993; Dunk, 2004) and decision-making process (Perera, 2012; Tseng, 2010).

4.2 Questionnaire design

Wording, planning and the general appearance of the questionnaire are three important issues focused in questionnaire design (Sekaran, 2003). Therefore, good practices and

design principles were adopted in designing the survey questionnaire to minimise biases in this research (Sekaran, 2003). The questionnaire was assessed by professionals who are KM experts to ensure the items and measurements used for the constructs are appropriate. Hence, content validity was first confirmed before any other theoretical analyses (Hair *et al.*, 2010).

The pilot survey was conducted using a selected group of five middle managers from knowledge intensive organisations in Malaysia (MSC Malaysia). The pilot results, suggestions and comments were evaluated, and those found to be valid were corrected accordingly. Hence, the questionnaire was developed, reviewed and pilot tested prior to final dissemination to ensure the questions were understood by the respondents.

4.3 Sample selection

The respondents were selected using purposive sampling, where managers who were knowledgeable about information infrastructural capability in their organisations were identified as respondents (Cooper and Schindler, 2006).

Eight organisations were randomly selected for use in the development of case studies conducted via face-to-face interviews for this research. The eight organisations consisted of two international and large organisations, three local and large organisations and three local and SME organisations. The details of the interview, such as scale and nature of business and their positions are as shown in Table II. Next section contains the case studies reports.

5. Results

5.1 Case study 1

Organisation A is a global management organisation which provides consulting, technology and outsourcing services. It collaborates with clients to help them become high-performance businesses and governments by combining unparalleled experience, comprehensive capabilities across all industries and business functions, and extensive research on the world's most successful organisations.

No.	Scale	Nature	Position(s)
Case 1	International and large	Software Development and Consulting	Manager
Case 2	Local and large	Software Development and Consulting	Contact Centre Manager
Case 3	Local and SME	Software Development and Consulting	Operation Manager
Case 4	Local and SME	Medical Biotechnology Research	Senior Administration & Human Resource Executive
Case 5	Local and SME	Software Development and Consulting	Human Resource Manager
Case 6	International and large	Software Development and Consulting	IT Manager
Case 7	Local and large	Software Development and Consulting	IT Manager
Case 8	Local and large	Deployment of wireless mobility over WiFi and WiMAX	Manager (IT and Communications)

Table II.
Details of
organisations
interviewed

The services offered are in the following fields:

- automotive;
- chemicals;
- communications and high tech;
- consumer goods and services;
- energy;
- financial services;
- government;
- industrial equipment; and
- utilities.

Organisation A has an information repository that contains useful information for all employees. It is accessible by all employees. It has virtual training system which contains trainings for the employees. It is not clear who proposed the system, but it has been in use for some time and it has become more user friendly over the years.

IT applications are to ensure knowledge is shared and its utilisation is maximised by all employees for the benefits of the organisation and its clients. The IT applications mainly address the problem of maximising, utilisation of information and accelerating effectiveness by obtaining utility capability. For instance, time required for searching for external sources is reduced. These IT applications are managed by a team of technical experts, and used by employees at all levels.

All employees contribute to the tacit and explicit knowledge in repository. This shows that all employees are open to the KM activities and management is very supportive of the IT applications. Communication in the organisation is through e-mails which are sent whenever there is a knowledge sharing session for specific platforms.

5.1.1 Practical implications of this study. The model proposed by the present study will help organisation A to integrate their current utility capabilities with other important IICs such as the integrating capability, data management capability, security capability, and collaborating capability to enhance current KM practices and attain long-term CA.

5.2 Case study 2

Organisation B offers its expertise in IT solutions for healthcare industry like IT integrated solution provider, specialising in world class IT outsourcing and consultancy services.

The services offered are e-technology, hosting and outsourcing which encompasses four main components as follows:

- infrastructure management services;
- asset inventory management services;
- hosting and data warehousing services; and
- virtual private network (VPN) and network redundancy

Organisation B implements a KMS called K-Base which was proposed by the Contact Centre Manager. It is a knowledge portal which was built to address day to day IT

troubleshooting problems. It covers IT call centre projects. Since the information is centralised, it is easily accessible by everyone in the organisation.

The KMS is managed by the Centre Manager and all the employees are the end users. The knowledge covered by this KMS includes system details such as data management capability in IT outsourcing agreement with the organisation's clients. The knowledge provided and used by all employees and management, hence both parties are very open and supportive to the system.

5.2.1 Practical implications of this study. The model proposed by the present study will help organisation B to examine the performance of their current K-Base KMS towards developing new business processes, techniques and decisions for effective KM in the organisations. The enterprise wide compatibility of servers and databases need to be examined so that K-Base KMS can be assessed and used effectively by employees across the organisation.

5.3 Case study 3

The core business of Organisation C is the provider of IT management and technology services, such as Systems Integration, Application Development, Managed Services and IT Resource Management, across a broad range of professions and industries including oil and gas, education, insurance, banking and retail. They primarily specialise in Java, J2EE, Web and Oracle technologies, but are currently beginning to venture into the .NET development.

Files are shared through the server, hardcopy documentation, online file repository (e.g. wiki), online discussion board (e.g. jforum), source control system (e.g. svn), and project portal (e.g. trac). This current approach is not considered to be very effective because the knowledge sources are not centralised.

Training is conducted during briefing sessions by the immediate supervisors before joining a project. In case of resignation and retirement, the manager/supervisor arranges knowledge transfer sessions between the departing staff and the replacement staff during the transition period. This arrangement is applicable because most of the information is project related. However, its weakness is some information is lost when staff leaves unexpectedly.

Organisation C has slowly prioritised the implementation of KMSs using IT applications. It is currently in the process of setting up a central wiki repository as its first version of knowledge base. It is believed that most of the employees will welcome the initiative.

5.3.1 Practical implications of this study. The model proposed by the present study will help organisation C to have proper planning on their IT management and technology resources. It will also assist organisation C to provide adequate training, education to their new and existing employees to enhance their customer services and supports.

5.4 Case study 4

Organisation D was established in 2002. It is a medical biotechnology organisation specialising in Cord Blood Banking and Stem Cell Research which involves collection of cord blood stem cells and freezing them for future research and development.

It has standard of practices (SOP) for all the work procedures. The details are stored in the organisation server and are backed up every week. This is considered to be a sufficient system for managing their information through an IT application and would also be useful to the organisation.

New employees are given training and SOP manuals to help them get familiar with the international and organisation's standard practices. The employees often share knowledge among themselves.

5.4.1 Practical implications of this study. The model proposed by the present study will help organisation D to enhance its capability to manage the data, store the data inside databases or online repository, track and analyse the data so that the data can be organised and processed to turn into useful information that provide a better insight into the organisation's current experience and expertise.

5.5 Case study 5

The core focus of Organisation E is software engineering with strong technical and non-technical support staff to supply the highest quality software and best business practices in the industry. Its regional shared services centre offers software development services, technology and research development, network operations and support, technical KM and technical business intelligence globally.

Their employees are constantly trained in order to update their knowledge while new employees are trained by those people who are resigning or retiring before they leave the organisation. Training involves both in-house and external trainings. IT applications are useful for the organisation.

5.5.1 Practical implications of this study. The model proposed by the present study will help organisation E to have proper planning on their software development services, technology and research development, network operations and support, technical KM and technical business intelligence to provide adequate training, education to new employees.

5.6 Case study 6

Organisation F is an international and large organisation which can be described as an established organisation. For instance, it is the largest business software organisation in the world with more than 320,000 customers, listed in the Fortune Global 100. They support customers in more than 145 countries globally.

It is an international software development and consulting organisation that embarked on KM system and make use of its IT applications. The goal is to improve the organisational CA as well as its clients' organisations.

Employees are very supportive and both tacit and explicit knowledge are captured in several ways. The knowledge capturing techniques include:

- on-site observation;
- brainstorming;
- consensus decision making;
- nominal group technique (NGT);
- Delphi method; and
- the repertory grid.

This organisation is wholly adopting KM using IT applications. Knowledge sharing is a must for them to survive in today's competitive world. Locations of physical offices all over the world are not a barrier for implementing KM.

5.6.1 Practical implications of this study. The model proposed by the present study will help organisation F to enhance the collaborations among employees by allowing

geographically dispersed professionals to create a shared community for knowledge creation by utilising online collaboration tools such as instant messaging, SMS, e-mail, discussion groups, project workspaces, document sharing and corporate portals.

5.7 Case study 7

Organisation G is in the early stage of implementing KM practices due to their young age and limited scope of KM activities. They focus on system integration using IT applications.

Both tacit and explicit knowledge are captured from meetings with managers, professional experts and reports. The tacit knowledge such as experiences from experts is stored into a knowledge repository. Hence, employees can share knowledge using the knowledge repository. Their employees are supportive to the KM activities and the management is also very supportive.

The knowledge repository is also used for planning a new project to obtain the best solution learned from previous experience. For instance, time, cost and human capitals can be easily forecasted for the new project. Therefore, IT applications are important in improving their organisational CA.

5.7.1 Practical implications of this study. The model proposed by the present study will help Organisation G to have proper planning on their IT management and technology resources. It will also assist Organisation G to provide adequate training, education, customer service and support to their new and existing employees.

5.8 Case study 8

Organisation H provides services on wireless mobility over WiFi and WiMAX. It deploys large scale wireless networks and had built wireless broadband infrastructure across Perak and Melaka under the mandate given by the two states.

The IT applications are mainly for services of data communication and networking products. The knowledge by an expert or networking professional is regarded as an asset and will be captured and codified in a form of documentation.

The management is very supportive in creating knowledge culture in the organisation. They immensely support and encourage team work among the employees. The knowledge captured is both tacit and explicit as past experience from experts and the knowledge they acquired in the course of training is being captured and documented for use when needed.

The knowledge capturing techniques are as follows:

- on-site observation;
- brainstorming; and
- consensus decision making as a tool, it follows brainstorming.

Knowledge transfer is achieved through internally organised workshops, library and Internet. They have changed management process which consists of preparation, assessment and strategy development, detailed planning and change management implementation, data gathering, corrective action and recognition. It is a knowledge-based organisation. They always try to invent new products and services in order to achieve organisational CA. Knowledge enhancement and sharing are highly valued.

5.8.1 Practical implications of this study. The model proposed by the present study will help Organisation H to collecting organisational knowledge, by using easy to use and easy to remember retrieval mechanisms such as search and retrieval

commands to provide timely and easy access to knowledge while avoiding a condition of information overload.

5.9 Case study discussion

The first, third and seventh case studies conclude that “Information technology (IT) applications such as information repository and email system support knowledge sharing among all employees and clients”. All levels of employees utilise these IT applications to perform business activities. The utilisation of these IT applications is favourable as users are benefited in many ways such as reducing searching time for external sources. The KM process takes place when the employees in these organisations utilise IT applications to gain new and existing knowledge. Hence, these results are in line with past research (Bhatt *et al.*, 2010; Chang and Chuang, 2011; Gonzalez and Martins, 2014; Jee-Hae *et al.*, 2012; Lew *et al.*, 2013; Paul, 2008), which discovered that the most innovative organisations are those with the greatest interest in the development of primary knowledge, with intensive processes of storage and distribution of explicit knowledge through IT.

With the technological advancement in business, most KM studies in 2000s included IT as a tool for organisations to implement KM (Benbya *et al.*, 2004; Hahn and Subramani, 2000). However, detailed types of KMS for achieving organisational CA are not discovered. Therefore, findings from the second case study support “KMS efficiently solves day to day IT troubleshooting problems”. Second, sixth and eighth case studies also outline details of “Contact Centre Manager” and “knowledge capturing technique” for KMS. The second case study also discovers that the success of the KMS is including but not limited to generating data management capability, but also positive attitudes such as openness and acceptance of the users.

Consequently, fourth and fifth case studies identify “IT applications enhance employee training” and “trainings improve employees”. These findings are in line with past research (Wang *et al.*, 2011). Training can be enhanced using ERP that lead to CA. Strategic human resource practices such as internal career opportunities, training opportunities, outcome-based performance ratings, employment security, employee participation, clear job description and profit sharing have emerged as sources in achieving CA (Wang *et al.*, 2011). Therefore, in this research, utility capability includes IT training, education, customer service and support are essential for achieving CA.

6. Research implications

This study has successfully addressed the following major research gaps:

6.1 Major Research Gap 1: lack of empirical link of the developed KM framework to knowledge-intensive organisations

The present study focuses on knowledge-based organisations (MSC Malaysia), which is better expressing how knowledge-intensive organisations strengthen their IICs and CA.

As the proposed framework is highly related to knowledge and information infrastructure, knowledge-based organisations would be a more appropriate target instead of multi-business organisations.

6.2 Major Research Gap 2: limited components of IIC for achieving organisational CA were addressed

This study has proposed a framework to examine the influence of all components of IIC on CA. The present research has bridged this research gap by having a more

comprehensive way by adding the entire IICs (integrating capability, collaborating capability, data management capability, security capability and utility capability) from past research. Furthermore, among all the IIC components, utility capability appears as priority for strategic human resource practices based on the findings of fourth and fifth case studies such as internal career opportunities, training opportunities, outcome-based performance ratings, employment security, employee participation, clear job description and profit sharing.

6.3 Major Research Gap 3: the findings were not validated by experts; leading a doubtful content validity

The questionnaire was developed based on past prominent research and assessed by professionals who are KM experts to ensure content validity. Pilot survey was also conducted prior the actual survey to gather suggestions and comments and adopted to further ensure the items and measurements used for the constructs are appropriate. Therefore, the questionnaire was developed, reviewed and pilot tested prior to final dissemination.

6.4 Major Research Gap 4: IT applications and KM system (KMS) were not identified based on KM perspective

There was no insightful link of the IT applications in supporting of the dynamic, collaborating, and integrating and data management capabilities in KM activities to the organisational CA. This study is therefore conducted to identify key association between IICs and CA.

To enable concise achievement of organisational CA, the right IT applications such as “Contact Centre Manager” and “knowledge capturing technique” for the organisations F and H have been identified in this research. Furthermore, based on findings of case study 2, KMS has improved the efficiency and effectiveness of its day to day IT troubleshooting and generated data management capability.

6.5 Major Research Gap 5: neither earlier nor more recent work has directly examined the IIC as information processing capability

With respect to the present study, IIC is conceived as organisational information processing capability which will lead to the organisational CA. Hence, in this study, the proposed framework is in a view of information processing flow, showing the relationships in three phases with connected direction: input, process and output. Having IIC is first perceived as “input”; performing KM processes is perceived as “process” in the middle phase and achieving “organisational CA” is observed as output at last to examine the association between IIC and CA will be proposed by the present study. Note that in the information processing flow, one IIC capability can coexist with and enhance another capability. For instance, based on the findings of case study 2, IT troubleshooting tools, which contribute to security capability, are also enhanced utility capability, data management capability and dynamic capabilities. Each component of the IIC is distinct, but together they can greatly facilitate, reinforce, and interconnect with each other.

7. Direction for future research

Quantitative survey for knowledge-driven organisation is recommended for future research. Samples could be targeted to at least 500 organisations by using simple

random sampling method. By having an adequate quantity from the population, the chosen sample can represent properties of population elements (Sekaran, 2003). Hence, the results could be generalised to the whole population of knowledge-driven organisations.

References

- Abdel-Aziz, A.S. and Kamel, M.H. (2012), "The impact of organizational information on KM practices", *International Journal of Business and Social Science*, Vol. 3 No. 24, pp. 121-126.
- Alavi, M. and Leidner, D.E. (2001), "Review: KM and KM systems: conceptual foundations and research issues", *MIS Quarterly*, Vol. 25 No. 1, pp. 1-30.
- Alting, D.L. and Jogensen, D.J. (1993), "The lifecycle concept as a basis for sustainable industrial production", *CIRP Annals – Manufacturing Technology*, Vol. 42 No. 1, pp. 163-167.
- Becerra-Fernandez, I., Gonzalez, A. and Sabherwal, R. (2004), *KM: Challenges, Solutions, and Technologies*, Pearson Education Inc., Upper Saddle River, NJ.
- Benbya, H., Passiante, G. and AissaBelbaly, N. (2004), "Corporate portal: a tool for KM synchronization", *International Journal of Information Management*, Vol. 24 No. 3, pp. 201-220.
- Bharadwaj, A.S. (2000), "A resource-based perspective on information technology capability and firm performance: an empirical investigation", *MIS Quarterly*, Vol. 24 No. 1, pp. 169-196.
- Bhatt, G., Emdad, A., Roberts, N. and Grover, V. (2010), "Building and leveraging information in dynamic environments: the role of IT infrastructure flexibility as enabler of organizational responsiveness and CA", *Information & Management*, Vol. 47 No. 1, pp. 341-349.
- Bixler, C.H. (2000), "Creating a dynamic KM maturity continuum for increased enterprise performance and innovation", Unpublished doctoral dissertation, The George Washington University, Washington, DC.
- Burca, S.D., Fynes, B. and Brannick, T. (2006), "The moderating effects of information technology sophistication on services practice and performance", *Expert Systems with Applications*, Vol. 38 No. 5, pp. 6170-6178.
- Chang, T.C. and Chuang, S.H. (2011), "Performance implications of KM processes: examining the roles of infrastructure capability and business strategy", *International Journal of Operations & Production Management*, Vol. 26 No. 11, pp. 1240-1251.
- Christopher, H.-J. (2006), "Knowledge management past and future", *KM World*, Vol. 15 No. 1, pp. 20-21.
- Cooper, D.R. and Schindler, P.S. (2006), *Business Research Methods*, 9th ed., McGraw Hill, Boston.
- Dunk, A.S. (2004), "Product life cycle cost analysis: the impact of customer profiling, competitive advantage, and quality of IS information", *Management Accounting Research*, Vol. 15 No. 4, pp. 401-414.
- Evers, N. (2011), "International new ventures in 'low tech' sectors: a dynamic capabilities perspective", *Journal of Small Business and Enterprise Development*, Vol. 18 No. 3, pp. 502-528.
- Foss, N.J. and Knudsen, T. (2000), "The resource-based tangle: towards a sustainable explanation of CA", *Management and Decision Economics*, Vol. 24 No. 4, pp. 291-307.
- Galbraith, J.R. (1973), *Designing Complex Organizations*, Addison-Wesley Longman, Reading, MA.

- Galbraith, J.R. (1974), "Organization design: an information processing view", *Interfaces*, Vol. 4 No. 3, pp. 28-36.
- Gertjan, V.H., Rob, V.D.S. and Eelco, K. (1997), "Corporate memories as a tool for KM", *Expert Systems with Applications*, Vol. 13 No. 1, pp. 41-54.
- Gonzalez, R.V.D. and Martins, F.M. (2014), "Mapping the organizational factors that support knowledge management in the Brazilian automotive industry", *Journal of Knowledge Management*, Vol 18 No. 1, pp. 152-176.
- Hahn, J. and Subramani, M.R. (2000), "A framework of KM systems: Issues and challenging for theory and practice", *Proceedings of the International Conference on Information Systems (ICIS), 13-15 December, Brisbane*, pp. 302-312.
- Hair, J.F., Black, W.C., Babin, B.J. and Anderson, R.E. (2010), *Multivariate Data Analysis – A Global Perspective*, 7th ed., Pearson Prentice Hall, Upper Saddle River, NJ.
- Hipkins, I. (2001), "Knowledge and IS implementation: case studies in physical asset management", *International Journal of Operations & Production Management*, Vol. 21 No. 10, pp. 1358-1380.
- Holsapple, C.W. and Joshi, K.D. (2002), "KM: a threefold framework", *Information Society*, Vol. 18 No. 1, pp. 47-64.
- Jee-Hae, L., Stratopoulos, T.C. and Wirjanto, T.S. (2012), "Role of IT executive in the firm's ability to achieve competitive advantage through IT capability", *International Journal of Accounting Information Systems*, Vol. 13 No. 1, pp. 21-40.
- Kim, S.K. (2001), "An empirical study of the relationship between KM and information technology infrastructure capability in the management consulting industry", Unpublished doctoral dissertation, University of Nebraska, Lincoln, NE.
- Kitchenham, B., Charters S. and Budgen, D. (2007), "Guidelines for performing systematic literature reviews in software engineering", EBSE Technical Report.
- Lawson, B. and Potter, A. (2012), "Determinants of knowledge transfer in inter-firm new product development projects", *International Journal of Operations & Production Management*, Vol. 32 No. 10, pp. 1228-1247.
- Lew, S.L., Ong, P.T. and Eze, U.C. (2013), "The effects of information technology applications on collaborating capability in achieving organisational competitive advantages in Malaysia", *International Journal of Business & Management*, Vol. 8 No. 13, pp. 1-14.
- Lew, S.L., Ong, P.T. and Eze, U.C. (2014), "Conceptualizing knowledge management and information infrastructure capability for competitive advantage: a Malaysian perspective", *Journal of Global Information Technology Management*, Vol. 17 No. 2, pp. 117-138.
- Li, Y.L., Tarafdar, M. and Rao, S.S. (2012), "Collaborative KM practices: theoretical development and empirical analysis", *International Journal of Operations & Production Management*, Vol. 32 No. 4, pp. 398-422.
- Mathiassen, L. and Sorensen, C. (2008), "Towards a theory of organizational information services", *Journal of Information Technology*, Vol. 23 No. 4, pp. 313-329.
- Nemutanzhela, P. and Tiko, I. (2011), "A framework for enhancing the information systems innovation: using competitive intelligence", *Electronic Journal of Information Systems Evaluation*, Vol. 14 No. 2, pp. 242-253.
- Nonaka, I. (1994), "A dynamic theory of organizational knowledge creation", *Organization Science*, Vol. 5 No. 1, pp. 14-37.
- Paul, P.T. (2008), "Inside the adaptive enterprise: an information technology capabilities perspective on business process agility", *Inf Technol Manage*, Vol. 9 No. 1, pp. 21-36.

- Perera, M.U.S. (2012), "Decision making delays with regard to IT investments", *Procedia - Social and Behavioral Sciences*, Vol. 40 No. 2012, pp. 258-263.
- Peteraf, M.A. and Barney, J.B. (2003), "Unraveling the resource-based tangle", *Managerial and Decision Economics*, Vol. 24 No. 4, pp. 309-323.
- Premkumar, G., Ramamurthy, K. and Saunders, C.S. (2005), "Information processing view of organizations: an exploratory examination of fit in the context of interorganizational relationships", *Journal of Management Information Systems*, Vol. 22 No. 1, pp. 257-294.
- Qi, X., Lan, B. and Guo, Z. (2008), "Conceptual model of it infrastructure capability and its empirical justification", *Tsinghua Science & Technology*, Vol. 13 No. 3, pp. 390-394.
- Rajiv, S. and Sanjiv, S. (2005), "KM using information technology: determinants of short-term impact on firm value", *Decision Sciences*, Vol. 36 No. 4, pp. 531-567.
- Sekaran, U. (2003), *Research Methods for Business: A Skill Building Approach*, 4th ed., John Wiley & Sons Inc., Upper Saddle River, NJ.
- Sher, P.J. and Lee, V.C. (2004), "Information technology as a facilitator for enhancing dynamic capabilities through KM", *Information & Management*, Vol. 41 No. 8, pp. 933-945.
- Tallon, P.P. (2008), "Inside the adaptive enterprise: an information technology capabilities perspective on business process agility", *Information Technology Management*, Vol. 9 No. 1, pp. 21-36.
- Tanriverdi, H. (2011), "Performance effects of corporate diversification: roles of knowledge resources, knowledge management capability and information technology", Unpublished doctoral dissertation, Boston University, Massachusetts.
- Tanriverdi, H. (2005), "Information technology relatedness, knowledge management capability, and performance of multibusiness firms", *MIS Quarterly*, Vol. 29 No. 2, pp. 311-334.
- Tseng, M.L. (2010), "An assessment of cause and effect decision-making model for firm environmental knowledge management capacities in uncertainty", *Environmental Monitoring and Assessment*, Vol. 161 Nos 1-4, pp. 549-564.
- Wang, E., Klein, G. and Jiang, J.J. (2007), "IT support in manufacturing firms for a KM dynamic capability link to performance", *International Journal of Production Research*, Vol. 45 No. 11, pp. 2419-2434.
- Wang, W.C., Lin, C.H. and Chu, Y.C. (2011), "Types of competitive advantage and analysis", *International Journal of Business and Management*, Vol. 6 No. 5, pp. 100-104.
- Wen, J., Li, S., Lin, Z., Hu, Y. and Huang, C. (2011), "Systematic literature review of machine learning based software development effort estimation models", *Information and Software Technology*, Vol. 54 No. 1, pp. 41-59.
- Yaghoubi, N., Yazdani, B.O., Ahoorani, N. and Banihashemi, S.A. (2011), "Information technology infrastructures and KM: towards organizational excellence", *Computer and Information Science*, Vol. 4 No. 5, pp. 20-27.
- Zack, M.H. (1999), "Developing a knowledge strategy", *California Management Review*, Spring99, Vol. 41 No. 3, pp. 125-145.

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