Knowledge management and firm innovative performance with the moderating role of transformational leadership

Irene Wei Kiong Ting, Hai Juan Sui, Qian Long Kweh and Gusman Nawanir

Abstract

Purpose – *This study aims to examine the effect of knowledge management on firm innovative performance and the moderating effect of transformational leadership in the relationship between knowledge management and firm innovative performance.*

Design/methodology/approach – *In total, 200 managers of participating Malaysian public listed service companies responded to a self-report set of the survey questionnaire. Partial least squares-structural equation modelling technique is used to estimate the main effects of knowledge management, particularly its infrastructures and processes, on firm innovative performance and the moderating effects of transformational leadership on the relationship.*

Findings – *Knowledge management infrastructures and knowledge management processes both have statistically significant and positive effects on firm innovative performance. In addition, transformational leadership significantly and negatively moderates the relationships.*

Practical implications – *The findings of this study can be a reference for the Malaysian public listed service companies to understand how and why managing well knowledge management infrastructures and processes can improve firm innovative performance. Moreover, this study highlights the role of transformational leaders in the context of knowledge management.*

Originality/value – *This study brings about managerial viewpoints of the relationship between knowledge management and firm innovative performance, with the moderating role of transformational leadership.*

Keywords *Knowledge management processes, Knowledge management, Transformational leadership, Knowledge management infrastructures, Firm innovative performance*

Paper type *Research paper*

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1. Introduction

Globalisation has opened challenges for public listed service companies that strive to be competitive in the current knowledge-based economic and dynamic commercial environment because they face difficulties in understanding and responding to fast changes of competitive market trends (Fallatah, 2018). Companies that are knowledge-based have realised that organisational knowledge plays an important role in the innovation process as a basic element (Belawati *et al.*, 2019). Moreover, these companies tend to coordinate their unique knowledge stock with traditional resources, processes and capabilities in new and distinct ways to improve their innovative performance (Cho, 2011). Knowledge on information acquisition, knowledge generation and knowledge creation are, thus, key means of adding value to innovative performance, which is essential for service companies to attain competitive advantages (Bharadwaj *et al.*, 2015).

Received 20 August 2020
Revised 11 November 2020
23 December 2020
Accepted 20 January 2021

Authors would like to thank Universiti Malaysia Pahang, which financially supported this research (Postgraduate Research Grant Scheme PGRS200383).

In addition, national and organisational innovations are viewed as critical to economic development. However, the need for innovations pervades much political and corporate rhetoric (Jarmooka *et al.*, 2020). For instance, Malaysian service companies suffer from a shortage of skilled workers and weak productivity growth due to a lack of employee creativity and innovation (Muthuveloo *et al.*, 2017). There is a low percentage of innovation in Malaysian service companies [1]. Moreover, Malaysian service companies have poor innovative performance because companies only imitate existing products in the markets rather than being novel and creative [2]. Furthermore, how it should be orchestrated remains uncertain, while the argument for investment in firm innovation is universal (Jarmooka *et al.*, 2020).

Taken together, the knowledge resources of a firm are considered critical factors of the competitiveness and sustainability of most service companies (Muthuveloo *et al.*, 2017; Wang *et al.*, 2015). Therefore, service companies must effectively and efficiently manage their knowledge resources and capabilities to improve their innovative performance. In addition, 50%–90% of company successes arise from the management of knowledge resources and capabilities (Yokell, 2010). However, many service Malaysian companies are not effectively managing and using their knowledge resources and capabilities (Muthuveloo *et al.*, 2017). Moreover, most of the previous studies focus only on the effect of a segment of knowledge management (KM), rather than pay attention to both knowledge management infrastructure (KMI) and knowledge management processes (KMP) perspectives. As important as KM, transformational leadership (TL) is another key factor in firm innovative performance (Masa'deh *et al.*, 2016). Leaders play an important role in establishing companies' superiority for continuous progress and development and guiding employees to solve problems in the organisation. From this viewpoint, leaders play a role in managing knowledge which is important to companies (Singh, 2008). From the leadership behaviour perspective, behavioural thinkers generally agree that if managers seriously consider KM, then their subordinates automatically follow. However, the role of transformational leaders in managing knowledge is lacking in developing countries' service companies (Lakshman, 2007).

Given that Malaysia strives for developed nation status, Malaysian public listed service companies play a vital role in economic growth (Ting *et al.*, 2011). Over the past two decades, the Malaysian government started launching its Knowledge-based Economy Master Plan and transforming from relying on a production-based economy into a knowledge-based one. The implementation of KM began when the "Multimedia Super Corridor" brought their KM practices, processes and applications to Malaysia (Daud and Yusoff, 2010). Afterwards, many Malaysian service organisations applied it successfully by coordinating KM practices with their business activities. The formulation of strategies should enhance the competitiveness and resilience of service companies and promote transformation into value-added and knowledge-based service activities. Optimizing the innovative performance of the Malaysian service companies to become more knowledge-intensive and innovation-led to stay competitive in a fast-changing environment as drivers of economic growth and country competitiveness is, thus, the key. This study examines the effects of KM, particularly its KMI and KMP, on firm innovative performance. The moderating effect of transformational leadership in the above relationship is also explored.

This study has the following contributions. Firstly, this study brings about a different perspective of knowledge management resources and capabilities, which, in turn, can improve a firm innovative performance. It is important to note that the nature of the market structure in developing countries such as Malaysia differs from those in developed countries and KM practices at the company level are context-specific (Anning-Dorson, 2018; Ode and Ayavoo, 2020). Replicating studies from developed economies without a proper contextual delineation may substantially reduce the contributions of developing countries' service industry to research and the global economy. Thus, this study makes an

empirical contribution by testing the relationship between KM and the innovative performance of Malaysian public listed service companies. Secondly, this study includes transformational leadership as the most important influential variable moderating the relationship between knowledge management and firm innovative performance amongst Malaysian public listed service companies. By proposing the integrated model derived from resource-based, knowledge-based and leadership behaviour theories, this study contributes to the theoretical development of a conceptual model to explain the relationships amongst knowledge management, transformational leadership and firm innovative performance. Thirdly, this study extends literature in three broad areas: knowledge management, leadership and firm innovative performance. Specifically, the potential for integrating the transformational leadership literature with the KM literature is likely beneficial for theory and practice. This study, thus, contributes to the existing literature by adding integrated literature of KM and TL in developing countries, particularly in Malaysia.

The remainder of this paper is structured as follows. Section 2 presents relevant literature and research hypotheses, followed by Section 3 on research designs. Section 4 provides the empirical evidence and Section 5 presents a brief conclusion, including the discussion of findings, significant implications, research limitations and suggestions for future study.

2. Literature review and hypothesis development

2.1 Theoretical basis

2.1.1 Firm innovative performance. Innovation was traditionally viewed as an invention or discovery process. Presently, a variety of innovation literature tries to understand innovation activities from the perspectives of the knowledge-based view (KBV) and resource-based view (RBV) of the firm. Kogut and Zander (1992) introduced innovation as companies' capability to use knowledge resources and create new combinations of existing knowledge. Nonaka (1994) argued that companies' innovation is the result of extending their knowledge base or replacing the existed knowledge base by combining it with new knowledge. Thus, firm innovative performance is the outcome of effectuating the radically improved characteristics of products or processes, services, management and marketing practices and business models within a business firm, workplace and external environment (Tranfield *et al.*, 2006). Given this definition, this study focusses on companies' innovation activities, including research and development (R&D) activities, patents or patent citations and new product or process announcements to determine firm innovative performance. R&D pertaining to a series of systematic study activities conducted to use the results for improving materials, equipment, procedure and products or processes (Jiang and Li, 2009). In service companies, the focus of R&D is to develop the core competencies (e.g. discovering new knowledge about products or processes and services and using this knowledge) and organisational processes to facilitate the generation of the new and improved products or processes and services, as well as new capabilities, which, in turn, allow service companies to generate particular solutions to meet market needs (Gomezelj, 2016). Patents are regarded as an important indicator of a firm innovative performance (Jiang and Li, 2009).

2.1.2 Knowledge management. According to RBV theory, when companies implement strategies to exploit their resources and capabilities, they perform well and create value. The RBV of the firm focusses on strategic assets (i.e. resources) as the main source of competitive advantages when it comes to the adaptability of a company (Barney, 2001). Knowledge is the main strategic resource and when properly managed, it allows firms to create economic, social, intellectual and cultural value (Zack, 1999). The essence of RBV theory lies in its emphasis on the internal resources available to a firm to explain the profit and value of the organisation (Barney, 2001). In this sense, the RBV indicates that

information technology systems, organisational culture, policies, operational procedure, customer and managerial practices all play important roles in firm performance.

The main foundation of KBV is the RBV of the firm (Donate and de Pablo, 2015). According to KBV theory, knowledge is created, stored and used by individuals, which is translated into a knowledge stock of a firm through mechanisms like rules and directives, routines and problem-solving (Grant, 1988). The KBV holds that the role of a company is to acquire, generate and apply knowledge to encourage employees to use these abilities so that they can create knowledge and value for the company (Daud and Yusoff, 2010). Essentially, this view reflects KMP, including knowledge acquisition (KA), knowledge creation (KC) and knowledge utilisation (KU) and it argues that knowledge must be processed more effectively and efficiently (Intezari *et al.*, 2017).

KM is a work process or activity, a technological infrastructure or an organisational culture to manage companies' valuable tangible and intangible resources (Cho, 2011). Gold *et al.* (2001) argued that KM has two major components which are KMI and KMP. KMI is commonly used as organisational infrastructures because most organisations invest heavily in the technologies, structures and organisational culture to facilitate effective KM (Cho, 2011), thereby adding value to firm performance. In other words, companies are required to have infrastructures (i.e. technological infrastructures (TI), structural infrastructures (SI) and cultural infrastructures (CI)) to ensure the best use of their knowledge repositories (Intezari *et al.*, 2017). Therefore, KMI refers to a company's capabilities of focussing on technological, cultural and structural infrastructures to effectively acquire, create and use their tangible and intangible resources (Intezari *et al.*, 2017). KMP uses the tangible and intangible resources of a company anywhere in its business operations and activities (Sabherwal and Sabherwal, 2007). The focus of knowledge processes is to lead the organisational operations and activities to adopt a new market environment by reusing previous experiences and practices. Note that managing knowledge has limited consensus and KMPs have significant overlaps with each other (Intezari *et al.*, 2017). To focus only on the critical and essential KM, previous researchers believe that acquisition, creation and utilisation are its main processes (Duan *et al.*, 2020; Gold *et al.*, 2001; Intezari *et al.*, 2017). Therefore, this study focusses on KMI and KMP to measure KM.

2.1.3 Transformational leadership. Leadership behaviour theory provides invaluable insights into change actions (Bass and Steidlmeier, 1999). From the perspective of leading systems, leaders are hoped to build up trust, commitment and strong ownership of positive outcomes (Miltenberger, 2013). Regarding leading followers, leadership behaviour theory suggests that effective leaders can help subordinates by developing their competency and productivity and can construct frameworks to maximise high exchange relationships (Roman and McWeeney, 2017). High exchange relationships occur when the interaction between leaders and their subordinates is high; at this point, subordinates receive plentiful attention when then results in high levels of productivity (Van Wart, 2013). Moreover, leadership behaviour focusses on executive work as a relational, strategic and symbolic activity (Pettigrew *et al.*, 2001). Organisations with effective leadership are likely to adopt appropriate strategies; have a committed, supportive management team and develop and sustain competitive advantages.

Leadership is a person's ability to anticipate envision, maintain flexibility, think strategically and work with others to initiate changes that will create a viable future for an organisation (Barnett and McCormick, 2004). Transformational leadership (Erkutlu, 2008) seeks for positive transformations in employees and that achieve desired changes through the strategy and structure of the organisation. It is about renovating and transmuting the firm following a new vision which leads to the evolution of the organisation's culture (Tichy, 1983). TL is the style and behaviour of a leader in four classic categories, namely, idealised influence, individualised consideration, inspirational motivation and intellectual stimulation (Bass and Steidlmeier, 1999). Specifically, transformational leaders motivate subordinates

by presenting a clear vision, connecting with employees, understanding each employee's needs and helping and developing employees' strengths, thereby contributing to a good organisational outcome (Masa'deh *et al.*, 2016).

2.2 Hypothesis development

2.2.1 Knowledge management infrastructures and firm innovative performance. In particular, information technology includes the hardware infrastructure, software, search and retrieval engines; internet, intranet and web browsers; internal and knowledge repositories; content management systems; data warehouses; workflow systems; electronic news; and collaboration tools (Cho, 2011) that can support and enhance KM (Intezari *et al.*, 2017). These technologies can enable rapid search, assess and retrieve information and support internal and external collaboration and communication. Information technology also helps to distribute the knowledge vertically and horizontally within firms and makes searching for and using knowledge much easier. Given the fast-changing technology environment, the knowledge-based view advises that firms can improve their innovative performance (i.e. broaden their existing technology base and access new technology areas) by exploring and integrating specific knowledge areas through enhanced TI (Berchicci, 2013). The extension of company TI capabilities increases the opportunities to develop and release new products. In addition, TI can strengthen firm knowledge, enhance the knowledge stock and exploit external specialised resources, which, in turn, can enhance innovative performance in terms of product variety and time to market (Berchicci, 2013; Mitchell and Singh, 1996; Steensma and Corley, 2000).

CI of knowledge management, which deals with human factors, reflects that organisational learning and knowledge-sharing cultures can promote firm innovativeness (Jain and Jeppe Jeppesen, 2013). Firstly, employees continue learning and contribute to the company knowledge base (Jain and Jeppe Jeppesen, 2013). Continuous learning culture reflects the company's ability to acquire or generate the knowledge necessary to survive and compete in its environment (Wu, 2007). Such continuous learning culture strengthens and enriches the company knowledge stock, thereby providing technology sources for R&D activities, patents and new products for attaining innovative performance. As such, firm innovativeness can be enhanced by the capability of knowledge acquisition and generation. Secondly, in a knowledge-based economy, most companies promote a knowledge-sharing culture to enable their quick reactions to previously encountered issues (Cho, 2011). Moreover, knowledge-sharing culture can significantly contribute to company change either under stable conditions or in a fast-changing environment. Therefore, a company must enhance its culture and thereby achieve better new products and service innovation.

SI of knowledge management is strategically designed to support knowledge management processes and initiatives (Aujirapongpan *et al.*, 2010). In particular, a firm structure is reflected in its managerial practices, policies and process, which affect individual behaviour within a company (Aujirapongpan *et al.*, 2010). In this study, such practices are considered managerial knowledge, which refers to the knowledge required for governing the firm's business units (Grant, 1988). Managing this knowledge enables a firm to exploit related managerial practices, policies and processes across multiple business units and achieve efficient and effective business governance (Wu, 2007). By taking advantage of existing managerial knowledge, a firm can minimise resource waste, avoid repetitions of errors and prevent duplication of efforts (Wu, 2007). SI has an unintended downside of inhibiting cross-functional interaction and collaboration and knowledge sharing (Pandey and Dutta, 2013). A typical type of organisational structure is vertical information and knowledge flow within the company. However, this type of organisational structure presents difficulties in supporting effective KM. The structural infrastructure of knowledge management may avoid this problem and allows information and knowledge to flow both vertically and horizontally.

Encouraging horizontal communication and cross-functional teams while providing a reward system that recognises knowledge sharing can further enhance the effectiveness of knowledge transfer, thereby improving firm innovative performance. Thus, research *H1* is developed as follows:

H1. KMI significantly and positively affects firm innovative performance.

2.2.2 Knowledge management processes and firm innovative performance. KA plays a critical role in capturing external knowledge from customers, suppliers, competitors and partners while exploring internal knowledge through observation, experience, imitation, practice and interaction with others within the company. These processes or practices allow the company to enhance customer satisfaction, as its attributes all predict positive changes in organisational profit level ensuring on-time delivery and product and service quality (Aujirapongpan *et al.*, 2010). Furthermore, such processes can increase the knowledge stock available to the company, thereby enabling better and timely decision-making that is essential to superior company performance. KA is associated with innovative performance when innovation is viewed as a company's ability to generate new ideas, novel products, creative technologies or improved programmes. This ability requires acquiring and combining knowledge with existing ones to generate innovation.

KC refers to the ability to generate new knowledge, both tacit and explicit (Andreeva and Kianto, 2012) such as new ideas or solutions to an existing problem or a set of novel and appropriate mental representations regarding products, processes and service (Intezari *et al.*, 2017). At times, creation is viewed as an innovation. KC typically involves four processes, namely, socialisation, externalisation, combination and internalisation (Nonaka, 1994). Together, these processes are critical for knowledge creation efficiency and thereby facilitate companies to improve their expertise and efficiency by converting acquired knowledge into applicable organisational knowledge and distributing it where necessary (Ha *et al.*, 2016). KC processes with new ideas may enhance organisational innovation and motivate employees to solve problems. Moreover, KC enables companies to update their knowledge base and actively respond to environmental changes through interactions with and awareness of the business environment. Thus, new products and processes can be launched within a short time to market, thereby improving firm innovative performance and competitiveness (Sayyadi, 2019).

KU with outcomes ensures that the company effectively uses and exploits the inherent knowledge (Intezari *et al.*, 2017). Therefore, turning knowledge into new services and profitable products is a key process in a KM initiative. In particular, KU is the process wherein knowledge is applied to solve problems, produce novel ideas, develop new products and improve firm performance (Birasnav, 2014). These steps involve making knowledge more active and relevant to create greater value. Knowledge becomes useful to a company only when applied in action within the overall business operations (Sanchez, 2006), in which case a company can improve its efficiency and reduce costs (Davenport and Prusak, 1998). A firm that fails to locate the right knowledge to use in the right situation may lose its competitive advantage. Major activities associated with knowledge application are identification, storage, imitation, retrieval, dissemination, contribution, learning, sharing and creation of knowledge (Cho, 2011). Furthermore, KU can help transform knowledge from being a potential power tool into actual innovations that can enhance overall innovative performance (Ha *et al.*, 2016). Thus, *H2* is developed as follows:

H2. KMP significantly and positively affects firm innovative performance.

2.2.3 Transformational leadership and firm innovative performance. Leaders can create conditions that allow others to exercise and cultivate their knowledge skills, share their own individual knowledge resources or easily obtain and assess relevant knowledge. Transformational leaders can move and change things in a huge manner by articulating and communicating a clear vision to their followers. As such, TL serves as both developers and

facilitators of a strategy for improving firm innovative performance. TL is, thus, defined as a leadership style that involves presenting a clear organisational vision towards which employees are inspired to work. Establishing connections with employees, understanding their needs and helping them reach their potential contributes to good organisational outcomes. The most common characteristics of TL include idealised influence, inspiration, individualised consideration and intellectual stimulation (Humphreys and Einstein, 2003).

Idealised influence emphasises trust, values and ethics (Guay, 2013). These characteristics encourage followers to work hard and be innovative. Inspiration indicates leaders' enthusiasm and optimism in creating a vision of the future of a firm (Masa'deh *et al.*, 2016), which motivates and excites the followers to achieve organisational objectives. By practicing inspirational motivation, leaders shape the vision, gain optimistic commitment to that vision and encourage an appropriate environment for innovation. Individualised consideration takes good care of each follower's growth and development needs by acting as a mentor to develop followers' potential in a supportive climate (Berraies and El Abidine, 2019). By using individualised consideration, leaders build individual relationships with their followers and consider their needs, abilities and aspirations in such a way that facilitates innovation.

When TL provides support and coaching, followers are more willing to innovate (Bass and Riggio, 2012). Finally, intellectual stimulation prompts followers to question and improve the methods they use (Bass and Avolio, 1995). By providing intellectual stimulation, transformational leaders encourage imagination and creativity amongst their followers, who can then re-examine assumptions and old methods (Northouse, 2018). Individuals that are encouraged to re-think and know that their ideas are valued are more likely to generate innovative ideas (Jung *et al.*, 2003). In the early years, Redmond *et al.* (1993) prove that transformational leaders can create contexts that motivate followers to innovate, by defining group goals and controlling critical resources. Moreover, Chang *et al.* (2012) point out that leaders who coach, counsel and train their followers can enhance staff skills and encourage them to attempt new methods of innovation. Amundsen and Martinsen (2015) examine a Norwegian healthcare provider and identify strong links between TL facilitating self-leadership and the positive impact on employee innovation and creativity. Thus, *H3* is developed as follows:

H3. TL significantly and positively affects firm innovative performance.

2.2.4 Knowledge management infrastructure, transformational leadership and firm innovative performance. In a learning organisation, knowledge workers perceive leaders as activity engaging and committing to support them in TL practices (Donate and de Pablo, 2015). In such an organisation, TL plays the role of coaches, motivators, teachers and developers (Gaviria-Marin *et al.*, 2019). To attain employee and company innovative performance, these leaders inspire and motivate followers in the development and innovation of information resources and individual skills by learning (Ode and Ayavoo, 2020). The existing information technologies that work as the critical element of knowledge resources allow companies to efficiently capture information (e.g. feedback, market updates, business environment) from the external environment (Valdez-Juárez *et al.*, 2016) and then enhance their knowledge base for developing new products, processes or service, thereby enhancing innovative performance (Abualoush *et al.*, 2018). At this point, TL use individualised consideration to investing in technologies that support followers. Leadership support on technology and other specific needs motivate employees with strong confidence to achieve the company's collective objectives (Abualoush *et al.*, 2018).

Moreover, an open, trustful and sharing and learning culture that builds a knowledge-based environment allows workers to easily adapt to a working environment and enables companies to actively respond to business environment changes and provide more advanced services to customers, stakeholders and partners (Jurgen, 2009; Tseng and Lee, 2014). Consequently, companies increase their innovative performance and

competitiveness. Furthermore, TL deploys idealised influence with characteristics of respect and trust with timely admiration to make followers feel at ease working in such a knowledge-based environment (Berraies and El Abidine, 2019). This idealised influence from attributes and behaviour stimulates workers to generate more creative and novel ideas on new products and processes and provide good service to customers, thereby improving firm innovative performance. A learning climate that is a classic TL culture empowers employees to enable a firm to actively respond to environmental changes and also moves employees to see beyond themselves by linking individual interests to the collective company goals (Bass and Steidlmeier, 1999).

The companies' structures work as a knowledge-based environment comprising job responsibility, performance requirements and employee performance appraisal that influence KM efficiency, thereby improve company innovative performance (Alkatheeri, 2018). Valdez-Juárez *et al.* (2016) said that the KM structures such as strategies and policies, generate more innovative individuals. When a company sets policies based on the investment in intangible resources (i.e. human capital), the generation of top-quality ideas on products and services or scanning of opportunity fields are motived (Hussinki *et al.*, 2017). Furthermore, TL use individualised consideration to identify employee needs and show concern for both company needs and follower interests (Berraies and El Abidine, 2019). Concern for individual employee needs can, in turn, contribute to their increased organisational commitment that inspires extra effort exerted into their work, which improves the quality of products and processes or services and customer satisfaction; these attributes promote higher returns on investments and allow opportunities to increase sales or services to improve revenue (Sayyadi, 2019). Thus, *H4* is developed as follows:

H4. TL significantly moderates the relationship between KMI and firm innovative performance.

2.2.5 Knowledge management processes, transformational leadership and firm innovative performance. TL plays a determining role in the association of KMP and innovative performance. Specifically, acquiring external knowledge (e.g. from customers, partners, competitors) that works as a key KMP enables companies to gain more opportunities to promote themselves and their new or improved products and services to markets (Valdez-Juárez *et al.*, 2016), thereby enhancing firm innovative performance and competitive advantages. Such good outcomes for the organisation happen obviously when TL provides support by the use of inspirational motivation to present clear objectives on what external knowledge should be acquired for consistency with the company's vision (Donate and de Pablo, 2015).

Moreover, the knowledge creation that seems like an initial stage of innovation empowers companies through socialisation, externalisation, combination and internalisation. In this KC process that increases firm innovative performance, TL can use intellectual stimulation to facilitate subordinates to come out with new solutions by accessing the problem in all facets, thereby improving firm innovative performance (Erkutlu, 2008). To stimulate employees' novel thinking patterns, transformational leaders inspire their subordinates to question their own beliefs and learn to solve problems creatively by themselves (Alahmad, 2016). TL must advise subordinates so that they can recognise how KM practices can help solve their problems, thereby improving firm innovative performance efficiency (Donate and de Pablo, 2015).

As the most important KMP, KU helps companies transform knowledge from a potential power tool into actual innovations (Intezari *et al.*, 2017). In other words, turning knowledge into new services and profitable products is the key process in KM initiatives for enhancing overall firm innovative performance (Intezari *et al.*, 2017). At this time, by using individualised consideration, TL acts as a mentor and spend time to coach on how to use the specific knowledge for improving products and services quality, thereby promoting higher returns on investments and increasing firm innovative performance (Alahmad, 2016).

TL pays special attention to the opinions and feedback of their employees, thereby encouraging two-way communication and enhancing firm performance (Masa'deh *et al.*, 2016). The conceptual framework of this article is presented in Figure 1. Thus, *H5* is developed as follows.

H5. TL significantly moderates the relationship between KMP and firm innovative performance.

3. Research design

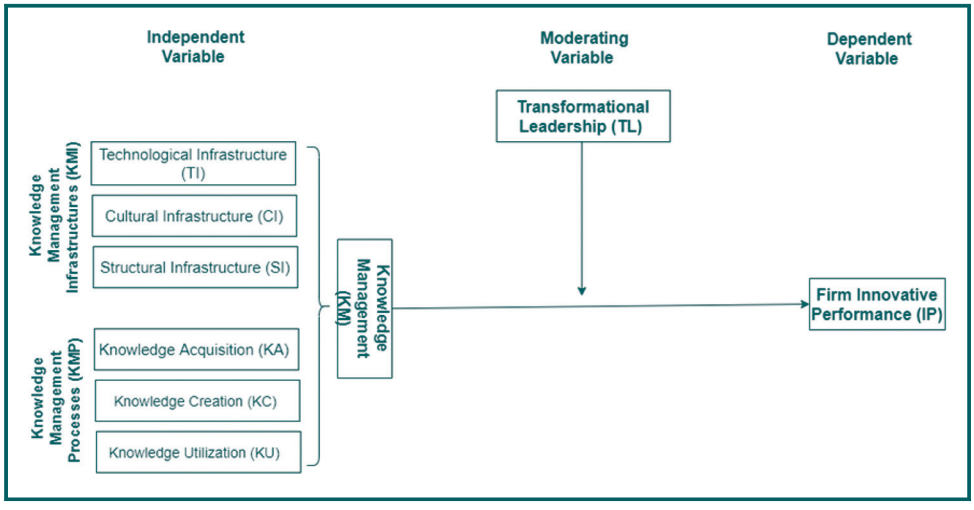
3.1 Research methodology

This study uses a self-report survey and data collected through surveys. The question items were pre-tested. The representativeness and suitability of the issues are evaluated by a group of experts and the questionnaire was improved based on the comments and suggestions given by the experts. Each question of KMI, KMP and innovative performance uses a five-point Likert Scale with "1" representing "strongly disagree" and "5" representing "strongly agree", while each question of TL uses a five-point Likert Scale with "1" representing "not at all" and "5" representing "frequently, if not always". The five-point Likert scale is selected as it is enough to point out reliable and valid measures of a question item rather than a longer or shorter scale point (Krosnick and Fabrigar, 1997). KMI was measured by 21 items that were adapted from previous studies including (Gold *et al.*, 2001; Intezari *et al.*, 2017; Lee and Choi, 2003), while KMP was measured by 15 items that were adapted from the previous studies including (Gold *et al.*, 2001; Muthuveloo *et al.*, 2017; Nonaka, 1994; Tseng and Lee, 2014). TL was measured by 9 items that were adopted from the multifactor leadership questionnaire by Bass and Avolio (1995) and innovative performance is measured by 11 developed items based on the existing literature (Beneito, 2006). A stratified random sampling technique was used in this study to ensure adequate representation.

3.2 Data collection procedures

This study examined the company as the unit of analysis and one response was solicited from each service company. Managers or department heads are responsible for planning, organising, leading and controlling the knowledge-based activities of an organisation to achieve the company's goals. The respondents are department managers from each

Figure 1 Conceptual framework



participating company, yielding 200 valid questionnaires to explore the relationships between variables. To sum up, the data collection processes of this study are online surveys through Google Forms and walk-in visits. A total of 351 questionnaires were sent out, 112 valid survey questionnaires were collected through online surveys and 88 valid survey questionnaires were collected through walk-in visits. A total of 200 completed questionnaires were collected from each type of services industry with a response rate of 56.9%. The details of data collection processes are presented in Table 1.

3.3 Pilot study

Confirmatory factor analysis (CFA) is used to test for measurement validity and reliability. The results show that all the factor loadings are greater than 0.50 and eigenvalues are greater than 1.0 for each variable. The Kaiser-Meyer-Olkin measure of sampling adequacy is greater than 0.50, indicating sufficient inter-correlations. Bartlett's Test of Sphericity is statistically significant ($p < 0.01$). The total variance explained for each variable is greater than 50%. All Cronbach's alpha values are greater than 0.70. Furthermore, the results also show that the coefficients of correlation between variables range from 0 to 1. Thus, the measurement of this study has sufficient construct and discriminant validity.

3.4 Partial least squares-structural equation modelling

This study applies the structural equation modelling (SEM)-based partial least squares (PLS) technique to simultaneously assess measurement and theoretical framework. Measurement model assessment aims to test the reliability and validity of measurement instrument, while structural model assessment tests the path relationships between variables in the conceptual framework of this study. In mathematical terms, SEM is formally defined by both inner and outer models (Hair *et al.*, 2010b). The inner model specifies the relationship between constructs or latent variables (i.e. KMI, KMP, TL, innovative performance) whereas the outer model specifies the relationships between constructs and their associated items [3] (Hair *et al.*, 2010b). Each of the first-order components is measured reflectively, this study uses a reflective–formative type of higher-order construct (Sarstedt *et al.*, 2019). Thus, the repeated indicators and two-stage approaches are used for model estimation. In the first step of PLS analysis, the model is estimated with item

Table 1 Summary of the data collection procedure

Service sector	*Population*	*Data collection method*		*Total sample of service sector*	*Response rates of the service sector (%)*
		Walked-in visits	*Online*		
Food and beverages	38	9	14	23	60.5
Travel, leisure and hospitality	29	10	8	18	62.0
Personal goods	29	3	12	15	51.7
Consumer services	19	2	10	12	63.1
Household goods	37	4	13	17	45.9
Retailers	15	11	0	11	73.3
Financial services (closed end funds)	35	19	2	21	60.0
Real estate investment trust	18	3	7	10	55.5
Health care	18	1	9	10	55.5
Industrial services	31	2	16	18	58.0
Telecommunications and media	33	11	7	18	54.5
Transport and logistics	35	9	11	20	57.1
Utility	14	4	3	7	50.0
Total	351	88	112	200	56.9

measures using the repeated indicators approach, also known as the hierarchical component model suggested by Wold (1985) and Chin *et al.* (2008). The two second-order constructs of KMI and KMP are then measured with three first-order constructs, respectively.

The first-order constructs are further measured with their associated items [4]. In the repeated indicators approach, the items are used twice: once for measuring the first-order constructs and then for the second-order constructs that are also measured by the first-order constructs (Hair *et al.*, 2010b). In the second step of the PLS analysis, the model is estimated using the computed first-order construct scores instead of raw item scores (Hair *et al.*, 2010a). The first-order constructs are the weighted average scores of the items measuring each first-order construct, with weights estimated in the first step (Hair *et al.*, 2011). The standardised latent variable scores of the first-order constructs are automatically computed in the PLS algorithm (Sarstedt *et al.*, 2014) and are copied into the PLS raw data file for further analysis.

4. Empirical results

4.1 Descriptive statistics

All question items were coded with numerical values. Variable distributions were inspected using skewness and kurtosis statistics and the values smaller than the absolute value of 2 and 7, respectively, demonstrate sufficient normality (Curran *et al.*, 1996). Statistics indicate that the normality assumption is violated and this is common with social science data (Wilson, 2010). However, PLS-SEM is less stringent when working with non-normal data (Wold, 1985). Table 2 provides the descriptive statistics of all constructs at the item level, including the mean, standard deviation, skewness and kurtosis figures.

Based on the results, the descriptive statistics present that the mean of TI is 4.793. Malaysian public listed service companies have been applying TI such as office information systems, infrastructure software, management information system, company webpage, e-meeting, messaging technologies and knowledge repositories. Regarding CI, the mean is 4.585, indicating that KM culture exists in the Malaysian public listed service companies. On average, the managers agreed that their company is operating in a knowledge-based environment and employees can learn new things and freely share opinions. Concerning SI, the mean value is 4.494. SI has been implemented in the Malaysian public listed service companies. Such a knowledge-based structure includes a recruitment system, open team-based design strategies, employee performance appraisal, training system and policy. All these are applied to improve KM.

The mean for KA processes is 4.563, implying that KA processes are implemented in the Malaysian public listed service companies. Regarding KC processes, the mean value is 4.605, indicating that KC processes are implemented in the Malaysian public listed service companies. In general, the managers agreed that their company encourages people

Table 2 Descriptive statistics and normality assessment

Item code	*Mean*	*SD*	*Kurtosis*	*Skewness*
TI	4.793	0.367	4.243	−2.080
CI	4.585	0.478	0.251	−1.039
SI	4.494	0.528	−0.091	−0.921
KA	4.563	0.462	3.736	−1.381
KC	4.605	0.501	0.470	−1.150
KU	4.622	0.450	0.759	−1.147
TL	4.173	0.564	−0.821	−0.075
Innovative performance	4.750	0.425	2.767	−1.836

Notes: $n = 200$ for all items. All items are measured using a five-point Likert scale

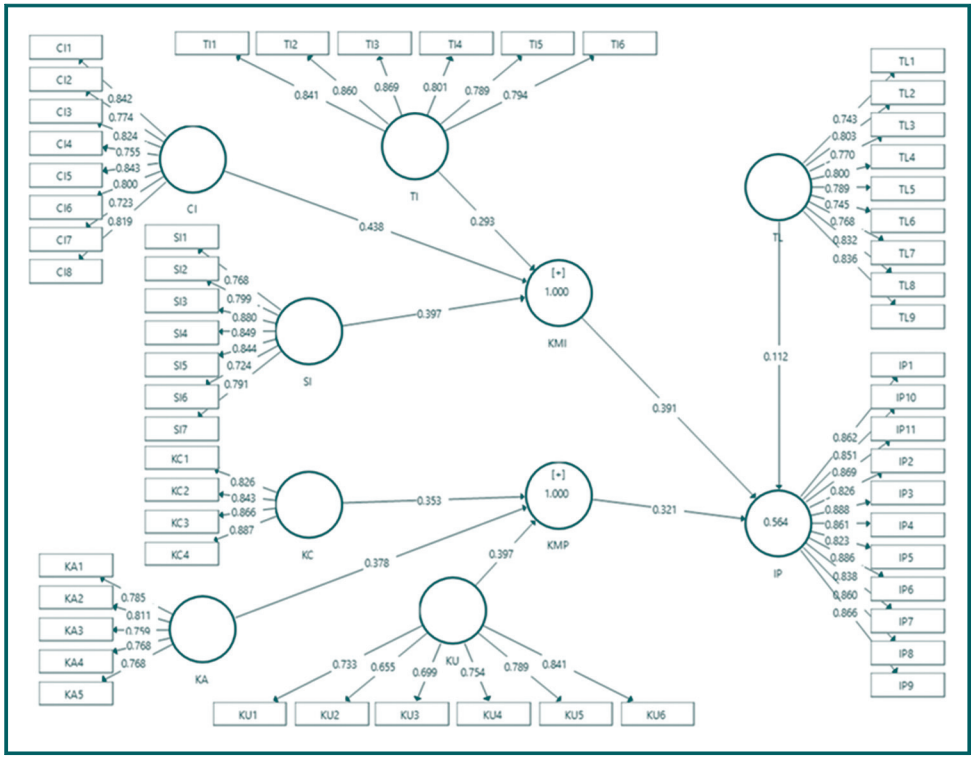
through the reward system to create new and creative ideas. In terms of the KU processes, the mean value is 4.622, which means that KU processes are implemented in the Malaysian public listed service companies.

As for TL, the mean value is 4.173, implying that Malaysian public listed service companies implement TL. On average, the results show that leaders have always articulated a vision of KM and communicated the mission of KM. They also inspire their subordinates to share, create and apply knowledge. Furthermore, managers spend time to help their subordinates in the different ways of identifying, using, recognising and managing knowledge. The mean value of innovative performance is 4.750, revealing that the innovative performance of the Malaysian public listed service companies in this study is good.

4.2 Assessment of measurement model – reliability and validity

The measurement model estimation for this study uses the basic PLS algorithm with default settings in the SmartPLS 3.0 software, including path weighting scheme, maximum of 300 iterations, stop criterion of 0.0000001(1×10–7) and equal indicator weights for the initialisation (Lohmöller, 1989; Wilson, 2010). To obtain a stable estimation, ensuring that the algorithm converges (i.e. the stop criterion is attained) and does not reach the maximum number of iterations is important. In this case, the PLS algorithm converges only after 8 iterations (instead of 300), confirming a good estimation (Wilson, 2010). Figure 2 shows the PLS path model with loadings and weights in a visual format. The numbers on the path relationships represent the loadings in reflective measurement models, whereas the numbers on the path relationships represent the weights in formative measurement models. Moreover, the number displayed in the circles of innovative performance represents the R^2 values. R^2 of 0.564 implies that 56.4% of the innovative performance variance of innovative performance can be explained by three predictors, namely, KMI, KMP and TL. The results

Figure 2 PLS-path model with loadings and weights



show that KMI has the strongest effect (0.391) on innovative performance, followed by KMP (0.321) and TL (0.112).

Table 3 provides the results of the measurement reliability, which show that outer loading ranges from 0.655 to 0.888 and that all the indicators exhibit a sufficient level of reliability. Furthermore, all AVE ranges from 0.559 to 0.735, providing evidence for the convergent validity of the measures. Thus, each identified indicator is significantly loaded on their respective latent variables (i.e. TI, CI, SI, KA, KC, KU, TL and innovative performance) and each latent variable (i.e. TI, CI, SI, KA, KC, KU, TL and innovative performance) adequately explains more than 50% of its indicator variance. Finally, the results of first-order reflective measurement models indicate strong internal consistency reliability of the instrument because TI (0.928), CI (0.934), SI (0.930), KA (0.885), KC (0.916), KU (0.883), TL (0.936) and innovative performance (0.968) have relatively high CR scores. In addition, Cronbach's alpha scores of TI (0.907), CI (0.918), SI (0.912), KA (0.837), KC (0.878), KU (0.841), TL (0.924) and innovative performance (0.964) are above 0.60. Thus, the results indicate that all reflective measurement models meet the relevant assessment criteria.

Table 4 shows that the VIF scores for TI (1.671), CI (3.198), SI (2.740), KA (2.856), KC (2.266) and KU (2.016) are well below the threshold value of 5.0, and thus indicate the lack of multicollinearity for the formative constructs KMI and KMP (Hair *et al.*, 2011). Testing the significance of indicator weight draws on the bootstrapping procedure (5,000 subsamples, BCa, one-tailed testing at 0.05 significance level) and produces the 95% BCa confidence intervals, as shown in Table 4. The results show that the indicator weights are sizable, significant and with the correct sign for a formative construct coefficient: TI → KMI (β = 0.293, t = 14.096, one-tailed $p < 0.001$), CI → KMI (β = 0.438, t = 26.970, one-tailed $p < 0.001$), SI → KMI (β = 0.397, t = 20.842, one-tailed $p < 0.001$), KA → KMP (β = 0.378, t = 20.287, one-tailed $p < 0.001$), KC → KMP (β = 0.353, t = 16.237, one-tailed $p < 0.001$), KU → KMP (β = 0.397, t = 17.025, one-tailed $p < 0.001$). Therefore, all first-order constructs absolutely contribute to their respective second-order constructs in the PLS path model. The results of reflective and formative measurement models assessment suggest that all construct measures exhibit satisfactory levels of reliability and validity.

4.3 Assessment of structural model – main effects analysis

Figure 3 shows the main effects model of this study, which is developed to verify the main *H1*, *H2* and *H3*. The bootstrap procedure with 5,000 subsamples for 200 cases is carried out to test significance. The structural model coefficient results for the main effects model specify the relationship between the latent variables (i.e. KMP, KMP, TL), as reported in Table 3.

All path coefficients considerably differ from zero with a 0.05 significance level, which indicates an acceptable model fit. The R^2 overall effect size of 0.556 (adjusted R^2 = 0.560) for the structural model indicates 55.6% of the variance in innovative performance is explained by the combined KMI, KMP and TL. Given that R^2 values are greater than 0.33, this model indicates moderate strength (Chin, 1998). All VIF values less than five indicate that the structural model is well-fitting (Ramayah *et al.*, 2018).

The standardised path coefficients for KMI → innovative performance (β = 0.391, t = 3.621, one-tailed $p = 0.000 < 0.01$) is statistically significant. KMI has a statistically significant and positive effect on innovative performance. Table 5 also documents that KMP → innovative performance (β = 0.321, t = 2.638, one-tailed $p = 0.007 < 0.01$) is statistically significant, implying that KMP has a statistically significant and positive effect on innovative performance. Table 5 also illustrates that TL → innovative performance (β = 0.109, t = 1.674, one-tailed $p = 0.047 < 0.05$) is statistically significant, implying that TL has a statistically significant and positive effect on innovative performance.

Table 3 Convergent validity of the first order-reflective constructs

Construct	*Item code*	*Item*	*Outer loading*	*AVE*	*CR*	*Cronbach's alpha*
TI	TI1	The office information system of our company records data and information on a real-time basis	0.841	0.683	0.928	0.907
	TI2	We use infrastructure software for organisational operations in improving competitive advantage	0.860			
	TI3	The management information system of our company enhances intellectual property rights management	0.869			
	TI4	Our company's webpage improves customer focus (i.e. placing the customer at the centre of all business development and management decisions)	0.801			
	TI5	We use e-meeting and messaging technologies for faster information delivery	0.789			
	TI6	The knowledge repositories of our company help employees to capture relevant data or information easily	0.794			
CI	CI1	The knowledge-based environment of our company helps us to learn new things	0.842	0.638	0.934	0.918
	CI2	Employees are free to share their opinions in the knowledge-based environment of our company	0.774			
	CI3	Our company's knowledge-based culture and atmosphere are supportive in generating novel ideas	0.824			
	CI4	The knowledge-based culture of our company assists excellent decision-making	0.755			
	CI5	The knowledge-based environment of our company encourages the analysis, design and implementation of knowledge management	0.843			
	CI6	The continuous learning culture of our company attracts and retains talented workers	0.800			
	CI7	The knowledge-based training environment of our company improves employees' working skills	0.723			
	CI8	The knowledge-based environment of our company improves the quality of knowledge repositories	0.819			
SI	SI1	The open team-based design of our company promotes faster knowledge delivery	0.768	0.655	0.930	0.912
	SI2	Our company's recruitment system helps in hiring more creative and talented workers	0.799			
	SI3	Employee performance appraisal is structured based on the knowledge sharing, creating and applying	0.880			
	SI4	Diversified project team strategy improves the capability of knowledge creation	0.849			
	SI5	The job responsibility of our company enhances workers' awareness in knowledge sharing and creation	0.844			
	SI6	The training system of our company helps in the utilisation of information management	0.724			
	SI7	The policy of our company encourages employees to enhance their knowledge further	0.791			
KA	KA1	We organise internal workshops to improve accurate decision-making	0.785	0.606	0.885	0.837
	KA2	We obtain knowledge through participation in project teams with external experts	0.811			
	KA3	Our company's new or less experienced workers are trained and educated by experts to acquire knowledge	0.759			
	KA4	Communication and sharing of knowledge amongst different departments in our organisation are effective	0.768			
	KA5	We form teams to conduct experiments and share results to propose corrective and preventive actions	0.768			
KC	KC1	We reward our employees with new and creative ideas	0.826	0.733	0.916	0.878
	KC2	We allow ideas to flow through from employees for new knowledge sharing	0.843			

(*continued*)

Table 3

Construct	*Item code*	*Item*	*Outer loading*	*AVE*	*CR*	*Cronbach's alpha*
	KC3	We conduct self-development training to enhance new knowledge creation	0.866			
	KC4	We conduct group training to enhance new knowledge creation	0.887			
KU	KU1	We often encourage and manage employees to learn from their mistakes to solve current problems	0.733	0.559	0.883	0.841
	KU2	We capitalise on our customers' wants and needs by continually striving to satisfy them	0.655			
	KU3	We apply customers' feedback to the design of new products, processes and services	0.699			
	KU4	We apply the lessons learned from previous experiences	0.754			
	KU5	We use the improved knowledge management procedures	0.789			
	KU6	We quickly find innovative solutions for critical competitive needs	0.841			
TL	TL1	We clearly communicate the importance of knowledge management missions	0.743	0.621	0.936	0.924
	TL2	We always articulate a compelling vision of knowledge management in the future	0.803			
	TL3	We develop, articulate and inspire employees to apply knowledge effectively	0.770			
	TL4	We inspire a shared vision on sharing knowledge	0.800			
	TL5	We spend time to teach and coach our staff on managing knowledge	0.789			
	TL6	We help others to develop their strengths in using resources	0.745			
	TL7	We challenge the staff to examine some of their assumptions about their work	0.768			
	TL8	We encourage the staff to reconsider some of their ideas	0.832			
	TL9	We help the staff to recognise their problems	0.836			
Innovative performance	IP1	The knowledge-based management of our company help employees learn and come up with novel ideas	0.862	0.735	0.968	0.964
	IP2	Managing knowledge in the workplace enables employees to work more effectively and ultimately improve innovative performance	0.826			
	IP3	The speed of developing new or improved products, processes or services is increasing because of appropriate knowledge management	0.888			
	IP4	Our company's innovative performance has been improved by adapting to new business practices or methods	0.861			
	IP5	Empowering employees to make smart business decisions improves business performance efficiently	0.823			
	IP6	Managing knowledge enables our company's newly patented product volume to increase	0.886			
	IP7	Knowledge management capabilities increase the success rate of our company's new products, processes and services	0.838			
	IP8	Knowledge management practices enable our company to perform better in the introduction of new productions, processes and services	0.860			
	IP9	Effective knowledge management system has improved our company's overall innovation of new products, processes and services	0.866			
	IP10	Learning and creating a knowledge-based culture in our company helps us to adopt new products and processes launch within a short period	0.851			
	IP11	Knowledge processes and infrastructure in our company help us to increase the number of new or improved products, processes and service launch	0.869			

Table 4 Construct validity of second order-formative constructs

Second-order construct	*First-order construct*	*Outer weight*	*VIF*	*T-value*
KMI	TI	0.293	1.671	14.096***
	CI	0.438	3.198	26.970***
	SI	0.397	2.740	20.842***
KMP	KA	0.378	2.856	20.287***
	KC	0.353	2.266	16.237***
	KU	0.397	2.016	17.025***

Note: ***denotes statistical significance at the 0.01 level (one-tailed)

Figure 3 PLS-path main effect model

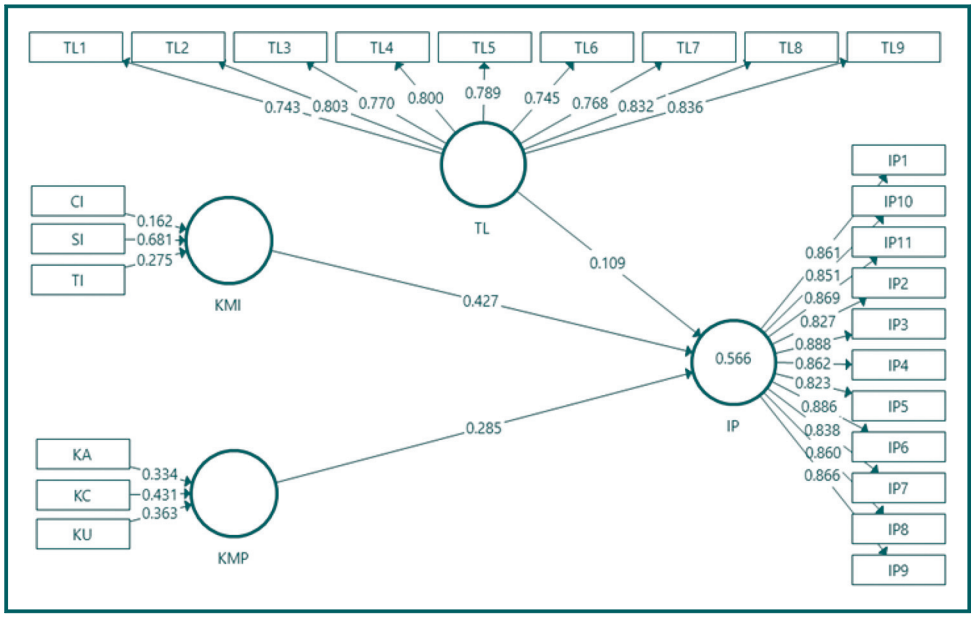


Table 5 Main effects model results

Path	*Path coefficient*	*SD*	*T-value*	*p-value*	*R square*	*VIF*
KMI → innovative performance	0.427	0.109	3.910	0.000	0.556	3.453
KMP → innovative performance	0.285	0.118	2.416	0.008		3.529
TL → innovative performance	0.109	0.065	1.674	0.047		1.527

4.4 Assessment of structural model – moderating effects analysis

A moderator variable affects the relationship between two other variables and thereby the direction and strength of the main effects according to the level or value of the moderator (Hair *et al.*, 2010b). In this study, TL is hypothesised as a moderator variable. The moderator effect of the interaction model is evaluated by applying the two-stage approach wherein the independent variables (i.e. KMI, KMP) are multiplied with the moderating variable (Erkutlu, 2008) to create the interaction terms (i.e. KMI*TL, KMP*TL) (Sarstedt *et al.*, 2014). The hypothesised moderating model with the above interaction terms is developed separately to verify *H4* and *H5*, as shown in Figures 3 and 4, respectively.

Table 6 demonstrates the results of the standardised beta coefficients for KMI (β = 0.391), KMP (β = 0.321) and TL (β = 0.112) with an R^2 of 0.566 (adjusted R^2 = 0.560) for innovative performance. The inclusion of the interaction term KMI*TL shows a negative beta of 0.287, increasing the R^2 to 0.628 (adjusted R^2 = 0.620). The R^2 change of 0.060 indicates an approximate 6.0% adjustment with the addition of one interaction term. The adjusted R^2 are both high, indicating the predictive capacity of the model. To determine the merit of the interaction term added into the model, the effect size is calculated by inputting R^2 of the main effects and interactions model using the Cohen (2013) effect size formula:

$$f^2 = [0.620 - 0.560] / [1 - 0.620] = 0.157.$$

Based on the results, the effect size of this path model is considered medium (0.157). As the results show in Table 5, the interaction between KMI and TL shows a significant effect on the innovative performance strength. Moreover, the significant moderating effect of KMI*TL on the relationship between KMI and innovative performance is further evaluated by

Figure 4 PLS-path interaction model with moderator KMI*TL

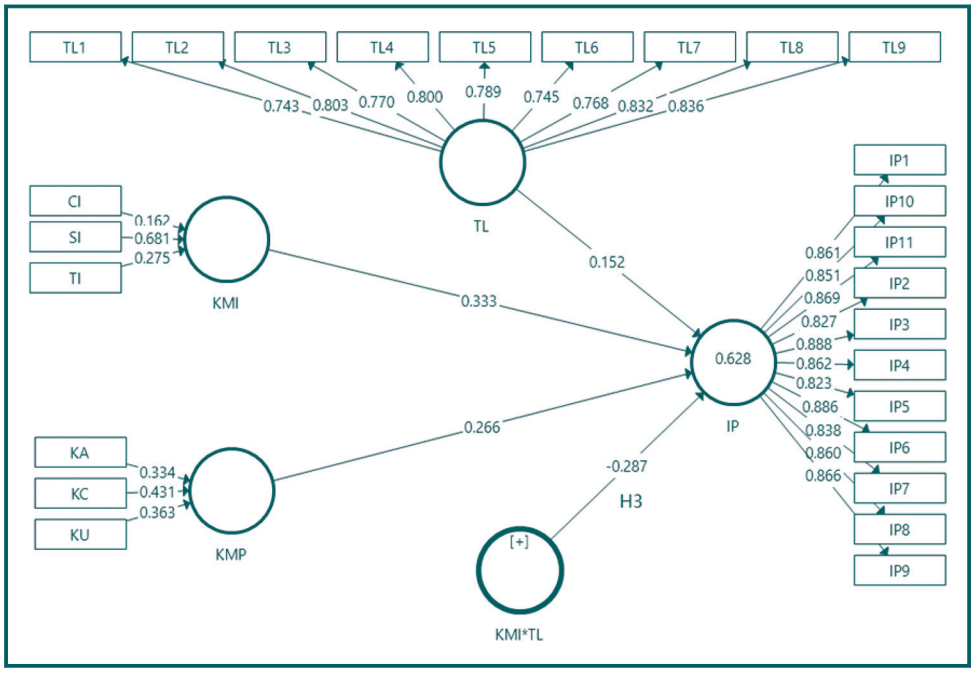


Table 6 Moderating effects: Model 1 results

	Main effect model		*Interaction model*	
Path	*Path coefficient*	*p-value*	*Path coefficient*	*p-value*
KMI → innovative performance	0.427***	0.000	0.333***	0.003
KMP → innovative performance	0.285***	0.008	0.266***	0.008
TL → innovative performance	0.109**	0.047	0.152**	0.013
KMI*TL → innovative performance			−0.287***	0.000
R square	0.566		0.628	
R^2 adjusted	0.560		0.620	

Note: **and *** denote statistical significance at the 0.05 and 0.01 levels (two-tailed), respectively

using the graph in Figure 4. Based on the results, the positive effect of KMI on innovative performance decreases when TL is high. As such, the positive effect of KMI on innovative performance increases when TL is low.

Table 7 demonstrates the results of the standardised beta coefficients for KMI (β = 0.391), KMP (β = 0.321) and TL (β = 0.112) with an R^2 of 0.566 (adjusted R^2 = 0.560) for innovative performance. The inclusion of the interaction term KMP*TL shows a negative beta of 0.282, increasing the R^2 to 0.629 (adjusted R^2 = 0.622). The R^2 change of 0.062 indicates an approximate 6.2% adjustment with the addition of one interaction term. The adjusted R^2 are both high, indicating the predictive capacity of the model. The effect size is calculated based on the (Cohen, 2013) effect size formula:

$$f^2 = [0.622 - 0.560] / [1 - 0.622] = 0.164.$$

Based on the results, the effect size f^2 of 0.164 indicates the medium effect size of this path model. Table 7 shows the bootstrapping results, where KMP*TL (t = 4.909) is significant. The interaction between KMP and TL shows a significant effect on the innovative performance strength. The moderating effect of KMP*TL on the relationship between KMP and innovative performance is further evaluated by using a two-way interactions plot, as shown in Figure 5. The results imply that the positive effect of KMP on innovative performance decreases when TL is high. As such, the positive effect of KMP on innovative performance increases when TL is low.

5. Conclusion

5.1 Discussion of findings

This study finds that KMI statistically and significantly affects firm innovative performance, implying that properly developing and using technologies has a positive effect on firm innovative performance. These results corroborate the findings of considerable relevant research. Cho (2011) shows that technological infrastructures allow the recording of information and knowledge in real-time, which enables new knowledge generation. These results also indicate that company culture allows the high innovative performance of service companies. These findings support those of Jurgen (2009) whereby well-established culture with awareness and commitment to knowledge sharing, learning and creating is a critical factor for innovation. A company's CI forms a core element that urges employees to acquire and create new ideas for the development of products and processes. In addition, these infrastructures help to enhance firm innovative performance through KM. This result is consistent with the findings of Jurgen (2009) that SIs (i.e. open team-based design) increase firm innovative performance by reducing innovation processing time to market.

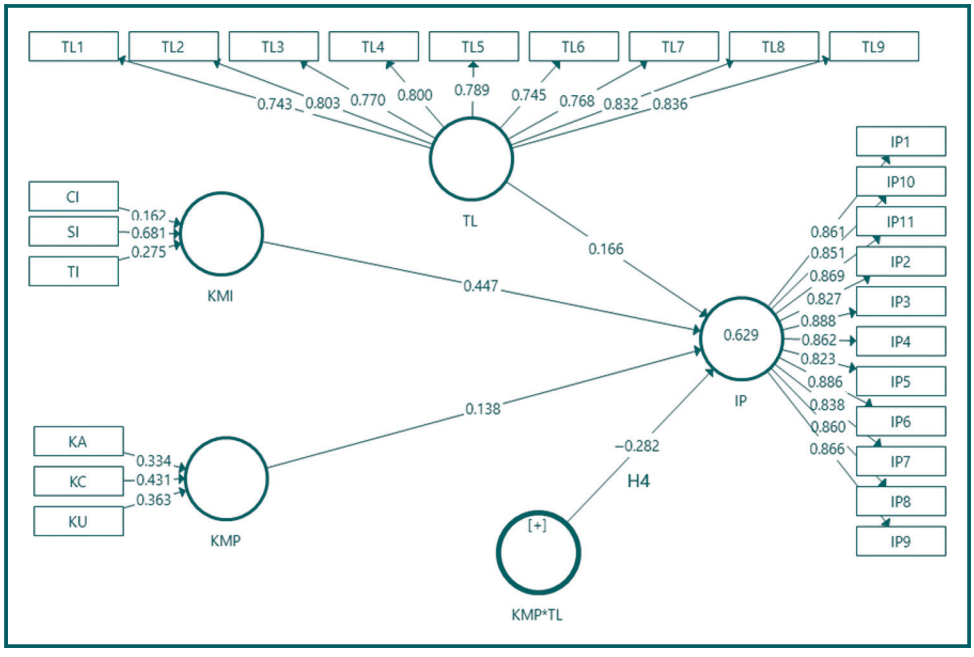
The present study also finds that KMP has a statistically significant and positive effect on firm innovative performance. In a service company that depends more on its processes, the acquiring, creating and applying of new knowledge becomes a vital source of competitive

Table 7 Moderating effects: Model 2 results

	Main effect model		*Interaction model*	
Path	*Path coefficient*	*p-value*	*Path coefficient*	*p-value*
KMI → innovative performance	0.427***	0.000	0.447***	0.000
KMP → innovative performance	0.285***	0.008	0.138	0.105
TL → innovative performance	0.109**	0.047	0.166***	0.007
KMP*TL → innovative performance			−0.282***	0.000
R^2	0.566		0.629	
R^2 adjusted	0.560		0.622	

Note: ** and *** denote statistical significance at the 0.05 and 0.01 levels (two-tailed), respectively

Figure 5 PLS-path interaction model with moderator KMP*TL



advantage (Abualoush *et al.*, 2018). These findings corroborate the idea of Valdez-Juárez *et al.* (2016), who suggest that the acquisition of external knowledge positively affects innovative performance. The results may be explained by the fact that acquisition of external knowledge (e.g. feedback from customers, stakeholders, partners) from the market through information and communication technologies allows for increasing customer satisfaction and enriching market information, thereby enhancing firm innovative performance. Moreover, KC enables companies to update their knowledge base and actively respond to environmental changes through interactions with and awareness of the business environment. Thus, new products and processes can be launched within a reduced time to market, which, in turn, improves firm innovative performance.

The results of this study further show that TL has a statistically significant and positive effect on firm innovative performance. This finding is consistent with that of Berraies and El Abidine (2019) that TL is positively related to innovative performance. Similarly, Donate and de Pablo (2015) stress that TL encourages the pursuit of innovative performance. That is, TL improves innovative performance by providing support, articulating a clear vision and mission, considering individual needs, building trust and developing capabilities. Leaders who apply individualised consideration make employees feel that their efforts are valued, which may motivate them to exert extra efforts and approach problems in new or improved ways. Furthermore, considering individual employees' individual needs may create a good interpersonal relationship between leaders and followers, which is essential to work success (Berraies and El Abidine, 2019).

This study also presents interesting findings on the moderating effect of TL on the association between KM and innovative performance. The results show that TL has a statistically significant and negative moderating effect on the relationship between KMI and firm innovative performance, implying that the positive effect of KMI on firm innovative performance decreases when TL is high. A plausible reason for the negative moderating effect may be due to Malaysian leaders are not interested in the management of knowledge resources for the long-term lasting improvement of firm innovative performance and they

only focus their resources on the everyday results (Valdez-Juárez *et al.*, 2016). Even though the average score of TL in this study shows 4.173, it may imply that transactional leadership is a more appropriate leadership style than the transformational one. The leaders may emphasise basic management processes such as organising, controlling and short-term planning for innovative performance improvement. This finding is in agreement with those of previous scholars (Gaviria-Marin *et al.*, 2019; Ode and Ayavoo, 2020). Although knowledge is a critical resource for firms, KMI appears to be not fully implemented in the context of developing countries, especially in Malaysian service companies.

Consistently, the result documents that TL significantly and negatively affects the relationship between KMP and firm innovative performance of public listed service companies in Malaysia. This has implied that the TL of the Malaysian public listed service companies are reducing the attention to KMP and are leaning mainly on short-term financial results (García-Teruel and Martínez-Solano, 2007; Valdez-Juárez *et al.*, 2016). Hence, transformational leaders who use enthusiasm and charisma to inspire their subordinates may not be workable to improve the KMI and firm innovative performance. The leaders may have to motivate and inspire the subordinates by giving more self-reward and maintain favourable relationship with the subordinates to promote KMP and innovative performance.

5.2 Implications

This study provides significant implications. This study adds to previous literature and presents several important theoretical contributions. A new integrated model is proposed with the main basis on leadership behaviour and resource-based theory and knowledge-based theory in the context of the listed service industry in Malaysia. The present study finds that TL has a significant and negative effect on the relationship between KMI and firm innovative performance and between KMP and firm innovative performance. The findings present important theoretical contributions by providing a new understanding of the moderating role of TL on the respective effects of KMI and KMP on firm innovative performance. The current study suggests new insights by identifying TL as a significant contributor to the relationship between KMI and firm innovative performance and the relationship between KMP and firm innovative performance, respectively.

This study makes practical implications. For the government, this study responds to the Malaysian government policy to achieve an advanced country status in high income. For policymakers, this study suggests the policymakers create policies to invest in service sectors by promoting more KM programmes. This would be able to build up long-term capability and capacity for the country's innovation, as well as economic growth. The Malaysian service industry displays a strategic role in improving the quality of life of society. The knowledge economy requires high innovation, especially in the service industry. The results of this study propose to the government set a guideline on the enforcement of using KMI and KMP, particularly for service companies. When service companies effectively implement KMI and KMP, it could enhance the efficiency, competitiveness, productivity and sustainability competitive advantages of the firms, thereby increasing the country'' growth rate in the knowledge economy age.

For the managers, this study serves as guidance to the top management on the importance of getting the team members who are innovative and create a culture where innovation will have thrived. Managers should implement effectively KMI to support KMP (including acquiring, creating and using) within their organisation so that they can enhance innovative performance in managerial, service and marketing. Besides, managers have to apply organisational policies such as an effective reward system for achieving improved or new product and process development and firm innovative performance. Through the effective reward system, managers can imbue employees with values by rewarding them for achieving expected firm innovative performance or exceeding the expectation.

Moreover, this study helps the Malaysian public listed service companies to be aware that TL style is the key for firm innovative performance improvement. However, TL has a statistically significant and negative moderating effect on the relationship between KMI and firm innovative performance, implying that the positive effect of KMI on firm innovative performance decreases when TL is high. A leader with its idealised influence, inspirational motivation, intellectual stimulation and personal attention may not be able to improve the relationship between KM and innovative performance. Leaders may promote compliance of his subordinate through contingent rewards to achieve targets and objectives set by the management.

5.3 Limitations and future research directions

This study is not without its limitations. Firstly, limitations in collecting perceptual data relate to three variables (i.e. dependent, independent and moderating variables) from the same source. In addition, the current research applies a survey instrument with self-reported data that may cause a common method variance. This issue commonly exists despite the theoretical support obtained from Harman's single factor scores and the directions of the relationships between variables. Future research can benefit from using objective measures of variables that are independently verified. Furthermore, this survey is carried out at the company level, including both company headquarters and branches. Future research can focus only on HQ companies and collect their perceptual or interview data.

Notes

1. https://mastic.mosti.gov.my/statistic
2. www.matrade.gov.my/en/malaysian-exporters/services-for-exporters/trade-market-information/trade-statistics
3. The associated items are TI, CI, SI, KA, KC and KU. Given that TI, CI and SI are used to determine KMI and KA, KC and KU are used to determine KMP.
4. The associate items are based on the 6 items from TI (TI1, TI2, TI3, TI4, TI5, TI6), 8 items from CI (CI1, CI2, CI3, CI4, CI5, CI6, CI7, CI8), 7 items from SI (SI1 SI2, SI3, SI4, SI5, SI6, SI7), 5 items from KA (KA1, KA2, KA3, KA4, KA5), 4 items from KC (KC1, KC2, KC3, KC4) and 6 items from KU (KU1, KU2, KU3, KU4, KU5, KU5, KU6).

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