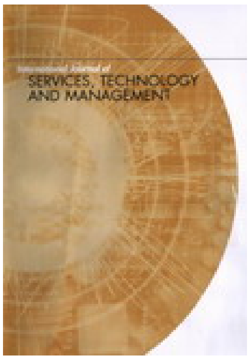


International Journal of Services Technology and Management

ISSN online: 1741-525X - ISSN print: 1460-6720
https://www.inderscience.com/ijstm

Capability development as a driver of organisational agility in the information technology sector: the mediating role of IT ambidexterity

Buspah Uierthiayagan, Haslinda Abdullah, Zeinab Zaremohzzabieh, Wan Munira Wan Jaafar, Aini Azeqa Ma'rof

DOI: 10.1504/IJSTM.2024.10069912

Article History:

Received:	28 July 2023
Last revised:	03 April 2024
Accepted:	16 May 2024
Published online:	28 March 2025

Capability development as a driver of organisational agility in the information technology sector: the mediating role of IT ambidexterity

Buspah Uierthiayagan

Faculty of Human Ecology,
Universiti Putra Malaysia,
Serdang, 43400, Selangor, Malaysia
Email: mohabat_reema@hotmail.com

Haslinda Abdullah*

Institute for Social Science Studies,
Universiti Putra Malaysia,
Serdang, 43400, Selangor, Malaysia
and
Faculty of Human Ecology,
Universiti Putra Malaysia,
Serdang, 43400, Selangor, Malaysia
Email: lynn@upm.edu.my
*Corresponding author

Zeinab Zaremohzzabieh

Institute for Social Science Studies,
Universiti Putra Malaysia,
Serdang, 43400, Selangor, Malaysia
and
Women and Family Studies Research Center,
University of Religions and Denominations,
Qom, 37185-178, Qom Province, Iran
Email: z_zienab@upm.edu.my

Wan Munira Wan Jaafar

Faculty of Human Ecology,
Universiti Putra Malaysia,
Serdang, 43400, Selangor, Malaysia
Email: wanmunira@upm.edu.my

Aini Azeqa Ma'rof

Faculty of Human Ecology,
Universiti Putra Malaysia,
Serdang, 43400, Selangor, Malaysia
and
Institute for Social Science Studies,
Universiti Putra Malaysia,
Serdang, 43400, Selangor, Malaysia
Email: azeqa@upm.edu.my

Abstract: This study investigates the associations between capabilities (X), IT ambidexterity (Y1), and organisational agility (Y2). The study specifically examines three key relationships: the direct associations between X and Y1, X and Y2, and the indirect link from X to Y2 through Y1. A comprehensive survey was conducted and carefully designed questionnaires were distributed to collect primary responses from 123 senior executives in Malaysia's IT companies. The collected data was rigorously analysed using SPSS and Smart PLS software. The findings offer valuable insights for business and IT executives, underscoring the importance of leveraging IT, innovation, and knowledge capabilities to enhance organisational agility. Furthermore, the data demonstrate how IT ambidexterity serves as a mediating factor in the relationship between innovation capability, knowledge capability, and organisational agility. These data hold substantial value as they can be replicated, reused and reanalysed for future research and analysis purposes.

Keywords: capability development; organisational agility; IT sector; IT ambidexterity.

Reference to this paper should be made as follows: Uierthiayagan, B., Abdullah, H., Zaremohzzabieh, Z., Jaafar, W.M.W. and Ma'rof, A.A. (2024) 'Capability development as a driver of organisational agility in the information technology sector: the mediating role of IT ambidexterity', *Int. J. Services Technology and Management*, Vol. 29, Nos. 2/3/4, pp.160–177.

Biographical notes: Buspah Uierthiayagan is a dedicated PhD student and currently studying at Universiti Putra Malaysia (UPM), Faculty of Human Ecology. With a passion for research and a keen interest in understanding human behaviour and interactions with the environment, she is committed to making meaningful contributions to the field of social psychology. With a background in environmental science and a strong foundation in research methodology, she is driven to explore new ideas and push the boundaries of knowledge in her field.

Haslinda Abdullah is currently serving as a Director at the Institute for Social Science Studies (IPSAS) UPM and a Professor of Applied Psychology at the Department of Social and Development Sciences, Faculty of Human Ecology, University Putra Malaysia (UPM). Her research focuses on primarily youth and development, particularly emphasizing youth well-being and mental health. She has conducted extensive research in this area, including collaboration with IYRES and UNISEF on the Malaysian Youth Index on Mental Health (2023).

Zeinab Zaremohzzabieh is a researcher in Youth Studies from Universiti Putra Malaysia (UPM), Malaysia. She is also working as remote Research Fellow at Women and Family Studies Research Center, University of Religions and

Denominations, Qom, Iran. Her main area of interest focuses on social sciences. Her area of expertise includes community development, youth, entrepreneurship, and meta-analysis.

Wan Munira Wan Jaafar is affiliated to Department of Social and Development Sciences, Universiti Putra Malaysia. She is currently providing services as Senior Lecturer. She has authored and co-authored multiple peer-reviewed scientific papers and presented works at many national and international conferences. Her contributions have acclaimed recognition from honourable subject experts around the world. She is actively associated with different societies and academies. Her academic career is decorated with several reputed awards and funding. Her research interests include sociology and ICT.

Aini Azeqa Ma'rof is a Lecturer at Institute for Social Science Studies (IPSAS), Universiti Putra Malaysia (UPM). She is also the Head of Laboratory of Youth and Community Well-being, IPSAS. Her research interests include mental health, intergroup relations, pro-social behaviour, social influence, and attitudes.

1 Introduction

The global landscape is currently undergoing significant changes, necessitating leaders to adopt a more resilient and agile approach to drive positive organisational performance (Shankar, 2020). The COVID-19 pandemic has profoundly impacted economies, particularly affecting vulnerable firms and sectors in developing countries such as Malaysia (Cheng, 2020; Jamil et al., 2022). This challenging environment poses specific hurdles for organisations, particularly those in the software and IT service industry (Shankar, 2020). In today's organisations, continuous change has become the norm, with the current volatile environment and global health crisis demanding a fresh policy approach (Dwivedi et al., 2020). However, researchers argue that existing schemes of organisational adaptation are inadequate when confronted with life-threatening events such as natural disasters, terrorist attacks, and pandemics (McDonald and Sinha, 2008). The ability to effectively respond to these changes is crucial for organisational success, making agility a necessity for survival rather than a choice.

The growing interest in organisational agility (OA) reflects the recognition that, to navigate the dynamic business landscape successfully, organisations must cultivate the ability to adapt continuously. In this context, the pivotal role of IT in sustaining agility has become increasingly evident. However, achieving agility through IT is a complex and lengthy process, necessitating the development of various IT-related capabilities. Recognised as a critical factor for modern firms to compete effectively, IT capability, defined as the capacity to manage IT resources, is essential for enhancing OA, as outlined by the resource-based view (RBV) established by Barney (1991), Wade and Hulland (2004) and Wernerfelt (1984).

While proponents of RBV argue for the positive impact of IT capability on OA, an alternative perspective posits that knowledge capability may also significantly contribute to agility. The knowledge-based view (KBV) contends that an organisation's ability to extract economic value from its knowledge assets is pivotal for agility (Côrte-Real et al., 2017). Facilitating effective communication internally and externally, knowledge capability enables the swift acquisition of relevant information and the sharing of specialised knowledge. The depth of an organisation's knowledge and associated processes enhances its adaptive capacity in the face of change.

Furthermore, it is argued that innovation capability plays a crucial role in allowing organisations to flexibly allocate resources and establish profitable activity systems (AlTaweel and Al-Hawary, 2021). This alternative perspective suggests that while superior IT capability has the potential to foster agility, this effect is further amplified when organisations possess a robust innovation capability (Ilmudeen, 2022). Previous studies have provided evidence that innovation capability empowers organisations to achieve agility (Gonçalves et al., 2022). Therefore, analysing organisational capabilities from the perspectives of IT capability, knowledge capability, and innovation capability is essential for a comprehensive understanding of their interplay in fostering OA.

Moreover, IT ambidexterity has emerged as a crucial ability that effectively enhances OA (Zhen et al., 2021). It is defined as an organisation's ability to concurrently engage in two activities: exploring new IT resources (IT exploration) and exploiting existing IT resources (IT exploitation). These two dimensions of IT, namely exploration and exploitation, possess the capacity to collaboratively enhance OA and secure enduring viability, thereby exerting a crucial influence on both present and prospects (Mithas and Rust, 2016). For example, Merrill Lynch successfully leveraged both IT exploration and exploitation to deliver cost-effective yet flexible IT services, exemplifying how it infused agility into its business processes (Mithas and Rust, 2016). Zhen et al. (2021) found that OA can benefit from IT exploration and exploitation indirectly, and organisational ambidexterity may act as a mediating factor in the link between dynamic capabilities and competitive advantage.

Numerous studies, including the work of Nafei (2016), have endeavoured to shed light on various factors impacting OA. However, a critical gap persists, marked by the absence of empirical evidence exploring the interconnections between IT capability, knowledge capability, innovation capability, and OA. To deepen our comprehension of these dynamics, further investigations are warranted. Specifically, there is a need for studies that discern the relative significance of IT capability, knowledge capability, and innovation capability in the context of enhancing OA. Remarkably, as of now, there exists no prior research that comprehensively examines all these factors within a unified conceptual framework, particularly within the unique landscape of the IT sector. Addressing this gap will contribute significantly to a more holistic understanding of the interrelationships crucial for advancing OA in IT environments. Furthermore, while the ambidextrous management of IT resources and practices is increasingly crucial for OA, the current body of literature has seldom examined IT ambidexterity as a significant driver of OA. Instead, previous studies have emphasised the importance of organisational approaches in both IT exploitation and exploration, but the indirect effect of IT exploitation and exploration on OA remains inconclusive. The two main objectives of the current research are:

1 to test pathways between ICT capabilities, innovation capability, knowledge capability, and OA

2 to explore the mediating role of IT ambidexterity (IT exploitation and exploration) on these relationships among senior executives in the Malaysian ICT sector.

2 Literature review

In this study, the RBV and RBV theories have been strategically employed to discern the factors associated with OA within the IT sector. The adoption of these theories is rooted in their proven effectiveness in comprehensively examining the strategic resources and capabilities of organisations. RBV, in particular, focuses on how the unique bundle of resources possessed by an organisation contributes to its competitive advantage. This lens is crucial in understanding how the interplay between IT capability, knowledge capability, and innovation capability influences OA within the complex landscape of the IT sector. On the other hand, RBV offers a theoretical foundation to evaluate the internal resources and capabilities that organisations leverage to attain and sustain a competitive edge. By integrating both RBV and RBV, this study aims to capture a nuanced understanding of the multifaceted dynamics shaping OA in the IT industry.

Furthermore, the research model, illustrated in Figure 1, is designed with OA as the central endogenous construct. Positioned as independent variables within this model are IT capability, knowledge capability, and innovation capability, each playing a distinctive role in contributing to OA. These components are chosen based on the premise that their integration and optimisation are pivotal for organisational success in the IT sector. Additionally, the mediator in this model is IT ambidexterity, encompassing both IT exploration and IT exploitation. The inclusion of IT ambidexterity underscores the importance of balancing exploratory and exploitative activities within the IT domain to foster agility. This model structure aligns with the chosen theoretical frameworks and aims to offer a comprehensive understanding of the intricate relationships between key variables, providing a robust foundation for analysis.

Importantly, the correlation between the RBV and RBV theories and the variables within the research framework requires explicit elucidation. Without this clarification, the connection between the chosen theories and the model may appear arbitrary. By delineating the specific functions of RBV and RBV regarding IT capability, knowledge capability, innovation capability, and IT ambidexterity, the study seeks to establish a coherent and logically grounded framework. This deliberate effort in articulating the rationale behind the incorporation of these theories and their alignment with the variables enhances the overall validity and relevance of the research, contributing to a more nuanced exploration of OA in the IT sector.

2.1 RBV and OA

OA refers to an organisation's capacity to rejuvenate itself, swiftly adjust, and thrive in a swiftly evolving, uncertain, and tumultuous environment (Attar and Abdul-Kareem, 2020). According to the RBV theory, dynamic capabilities and resources significantly impact the improvement of OA. RBV facilitates the examination of organisational capabilities, enabling the connection between outsourcing, OA, and, ultimately, competitive advantage. Applying RBV to analyse an organisation's capabilities relative to competitors and suppliers within an outsourcing framework is plausible. Resources and capabilities are deemed valuable when they enable an organisation to seize opportunities and mitigate threats effectively, addressing the key factors necessary for success in their business environment. Studies by Melián-Alzola et al. (2020) and Werder and Richter (2022) suggest an association between IT capabilities and OA, drawing from RBV theory. The utilisation of distinctive, scarce, and difficult-to-replicate technical and managerial IT skills can generate sustainable, viable benefits and assist the organisation in dealing with ambiguous market alterations.

In a recent study conducted by Cai et al. (2019) focusing on Chinese organisations, a strong IT capability among 194 senior executives was found to have a favourable impact on OA. Additionally, Melián-Alzola et al. (2020) demonstrated the effect of IT utilisation on OA within the hotel industry in the Canary Islands, aligning with RBV principles. Innovation capability is also highly esteemed as a valuable resource for firms, enabling the establishment and sustenance of competitive advantage while effectively executing overarching strategies. Soosay et al. (2008) argue that cultivating innovation capabilities requires firms to actively seek external resources and capabilities from suppliers and customers to generate exceptional value for end-users. Although several studies have examined the connection between innovation capabilities and business performance, more must be studied on how it relates to agility.

For example, a study by Kamali and Kamali (2012) focusing on Iranian insurance companies found a noteworthy association between OA and innovation. The study suggests that agility and innovation enhance organisations' capacity to implement effective changes. Based on these observations, the following hypotheses were framed to demonstrate the association between IT capability, innovation capability, and agility:

H1 IT capability has a positive association with OA.

H2 Innovation capability has a positive association with OA.

2.2 KBV and OA

Prior research conducted by Cooper et al. (2023) and Pereira and Bamel (2021) suggests that the KBV of the firm can be seen as an expansion of the RBV concept. The KBV perspective emphasises knowledge as the primary organisational resource. Although RBV recognises knowledge as a source of competitiveness, KBV researchers contend that RBV falls short in describing the precise knowledge needed by an organisation to successfully integrate, coordinate, and mobilise its resources and capabilities. It fails to differentiate between various knowledge-based capabilities (Kaplan et al., 2001; Theriou et al., 2009). To develop strategic assets that boost performance, proponents of the KBV advise businesses to concentrate on activities including knowledge generation, application, protection, and transfer (Khraishi et al., 2023).

Nonaka (1994) argues that the efficient utilisation of knowledge capability facilitates the transformation of implicit individual knowledge into explicit knowledge within organisations. In their empirical study, Mao et al. (2016) found a positive correlation between knowledge capability and OA. Similarly, Cai et al. (2013) conducted an independent study that demonstrated a positive association between knowledge capability and both operational adjustment and market capitalising agility. Given the limited empirical studies exploring the connection between knowledge capabilities and agility, this study aims to assess the following hypothesis:

H3 Knowledge capability has a positive association with OA.

2.3 IT ambidexterity

IT ambidexterity is considered a critical capability for organisations operating in unpredictable or turbulent environments as it enables them to effectively balance and engage in both exploitation and exploration activities simultaneously (Gregory et al., 2015). It is typically believed to be the capacity of an IT department to balance the pursuit of innovative IT resources and practices with maximising the usage of current IT resources and practices (Napier et al., 2011).

Lee et al. (2015) suggested that organisations need to engage in both IT exploration and exploitation to enhance their agility. IT exploration involves actively exploring IT technologies and applications to modify business processes and uncover new market prospects, while IT exploitation focuses on gathering IT-related data to facilitate coordination, integration of robust IT resources, and efficient decision-making within the organisation (Gregory et al., 2015; Lee et al., 2015). Organisations with a strong IT exploration capacity can identify and seize opportunities arising from advancements in IT technology, facilitate business innovation, and adjust plans and policies to meet evolving organisational needs (Ravichandran, 2018). On the other hand, effective IT exploitation enhances the integration between an organisation's IT infrastructure and its business processes, enabling prompt decision-making, information management, and responsiveness to market fluctuations (Gregory et al., 2015).

Previous studies have shown that IT ambidexterity plays a significant role in enhancing OA. For instance, research by Zhen et al. (2021) demonstrated that both IT exploration and exploitation positively influence OA. Through the simultaneous mediation of process-based and relational governance, as well as IT exploration and exploitation, top management support was proven to have a favourable impact on OA. Another study by Lee et al. (2015) provided empirical evidence supporting the indirect contribution of IT ambidexterity to OA, with operational ambidexterity mediating this relationship. Consequently, the authors formulated the following hypotheses (Figure 1):

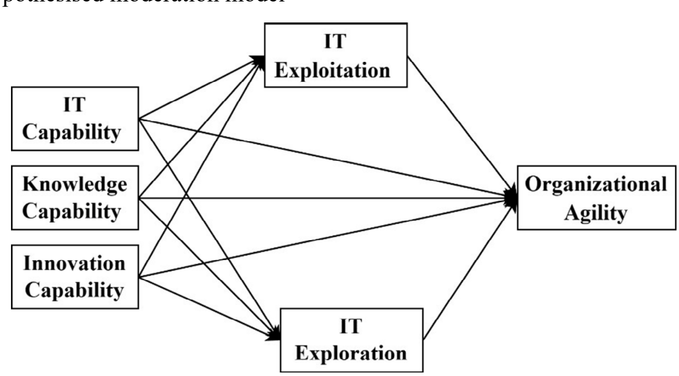
H4 IT exploration has a positive relationship with OA.

H5 IT exploitation has a positive association with OA.

H6 IT exploration mediates the relationship between the predictors and OA.

H7 IT exploitation mediates the relationship between the predictors and OA.

Figure 1 Hypothesised moderation model



3 Materials and methods

This research employed a quantitative approach for data collection and analysis, focusing on IT companies as the subjects of investigation within Selangor, Malaysia. The target population comprised all IT organisations in the specified region, and the sampling technique employed was stratified random sampling, ensuring representation from various strata within the IT sector. Survey participants were senior executives from IT companies with IT experience, including some with prior roles in managing information systems (IS) departments. Participants displayed varying levels of experience in their current organisations, ranging from 1 to 26 years, with an average of 5.27 years and a standard deviation of 3.83. Among the respondents, 58.2% were male, and 38.2% were female, highlighting the underrepresentation of females in the IT industry.

3.1 Sampling

The sampling process precisely selected 261 companies in Selangor, Malaysia, guided by a comprehensive rationale to ensure a robust and representative sample within the IT sector. Inclusion criteria considered company size, industry relevance, and geographical distribution. Larger firms were included to capture diversity in resources and capabilities, while industry relevance ensured the selected companies were integral to the IT landscape. Geographical distribution aimed at representing different pockets of the Selangor region. These criteria align closely with the research objectives, focusing on understanding the dynamics of OA within diverse IT companies. The study provides a detailed explanation of these criteria to enhance transparency and establish credibility in the sampling process.

3.2 Data collection procedure

For hypothesis testing, a survey instrument received approval from senior managers and was distributed among 261 identified participants using paper-based questionnaires. In March 2023, 123 fully completed questionnaires were received, resulting in a 47% response rate. The questionnaire's precision and relevance were enhanced by specifically designating the intended recipients as individuals holding the highest expertise and decision-making authority within the organisation's IT landscape, particularly the chief information officer (CIO) and IT manager. These key stakeholders, with comprehensive insights into technological infrastructure, strategic IT goals, and potential challenges, were strategically targeted. The survey, aimed at extracting nuanced perspectives and informed responses, significantly contributes to strategic decision-making processes, ensuring alignment with organisational objectives and addressing pertinent IT issues, thereby maximising the utility of the collected data.

3.3 Measures

The measurement of OA in this study utilised a scale developed by integrating six items from previous studies by Lu and Ramamurthy (2011), Ravichandran (2018) and Liang et al. (2017). The reliability coefficient of the OA scale was found to be 0.884, indicating its internal consistency. The average variance extracted (AVE) was calculated as 0.691, reflecting the amount of shared variance among the scale items. The construct reliability

(CR) was determined to be 0.917, demonstrating the reliability and robustness of the scale's measurements.

IT ambidexterity in this study consisted of two dimensions: IT exploration and exploitation. The assessment of these dimensions drew upon previous work by Nwankpa and Datta (2017) and Lee et al. (2003). Each dimension was assessed using four specific items. The reliability coefficient for IT exploitation was 0.881, with an AVE of 0.621 and a CR of 0.877. The IT exploration dimension exhibited a reliability coefficient of 0.897, an AVE of 0.675, and a CR of 0.892.

IT capability, as measured in this study, comprised three distinct dimensions: IT infrastructure capability, IT business spanning capability, and IT proactive stance. The measurement of IT capability was based on previous research by Weill et al. (2002) and Lu and Ramamurthy (2011). The scale consisted of 11 items to capture these dimensions. The reliability coefficient for IT capability was 0.917, with an AVE of 0.573 and a CR of 0.931.

Innovation capability, referring to the consistent conversion of ideas into novel processes and systems that contribute to organisational advancement, was assessed using a scale adapted from the work of Acosta-Prado et al. (2021). The scale included six items. The reliability coefficient for innovation capability was 0.907, the AVE was 0.684, and the CR was 0.928.

The measurement of knowledge capability drew upon previous studies by Gold et al. (2001), Pérez-López and Alegre (2012) and Zaim et al. (2007). The scale consisted of seven items to assess knowledge capability. The reliability coefficient for knowledge capability was 0.917, the AVE was 0.573, and the CR was 0.931. All questionnaires used a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree).

3.4 Content validity

Content validity for the six measures in this study was rigorously assessed through a two-phase approach incorporating both qualitative and quantitative methods. In the qualitative phase, an expert panel comprising four psychometric experts and six professionals evaluated the content validity. The assessment focused on aspects such as grammar, wording, item allocation, and scaling of the questionnaire. In the quantitative phase, two indicators, namely the content validity index (CVI) and the content validity ratio (CVR), were employed. The CVI gauged the relevance, simplicity, and clarity of each item using a Likert-type ordinal scale with responses ranging from 1 to 4. The CVI was calculated as the proportion of items receiving a rating of 3 or 4 from the experts. Additionally, the CVR assessed the essentiality of each item by having experts rate them as essential, useful but not essential, or not essential. This comprehensive content validity assessment ensures the robustness and appropriateness of the measurement instruments used in the study.

3.5 Data analysis

The initial analysis and treatment of missing data were conducted using the SPSS version 26. The missing data rate was below 2%, and the regression imputation method was employed to handle any missing values. To validate the model, a variance-based structural equation modelling (SEM) technique was utilised, specifically employing the partial least squares (PLS) approach outlined by Kock (2017). Smart-PLS software

(v. 3.3.3), which applies the partial least squares procedure, was used for the data analysis. The analysis included bootstrapping with 5000 subsamples, following the methodology described by Hair et al. (2020). The choice of PLS-SEM as the methodology for this study was based on its robustness in modelling and evaluating path models involving latent constructs. Additionally, PLS-SEM is suitable for addressing the limitation of a small sample size. Furthermore, this study primarily has an exploratory objective, aiming to uncover new insights rather than confirming existing theories (Hair et al., 2016). Evidence indicates that the authors adhered to the 'state-of-the-art' in PLS analysis and reporting, as supported by references to influential works in the field (Adler et al., 2023; Gentles et al., 2012).

4 Results

4.1 Preliminary analysis

The initial examination of the data revealed that the normality requirements were met, as indicated by the acceptable skewness and kurtosis values for all constructs. The bivariate correlations showed satisfactory levels of linearity, ranging from 0.553 to 0.693. The Box's M test provided strong evidence of homoscedasticity ($p < 0.001$), indicating consistent variances among the variables. Furthermore, the tolerance and variance inflation factor tests indicated no significant issues with multicollinearity among the variables.

To assess the measurement scales, we evaluated their internal consistency using Cronbach's α and CR. The CR values, all below 0.98, and the AVE values, all exceeding 0.50, as presented in Table 1, confirmed the reliability and convergent validity of the measurement items. These results indicate that each measurement item adequately represents its respective construct. Discriminant validity was assessed using the heterotrait-monotrait (HTMT) criterion, following the recommendation by Franke and Sarstedt (2019) of a threshold below 0.85. The results from Table 2 demonstrate clear differentiation among the study measures, affirming their discriminant validity.

4.2 Hypothesis testing

4.2.1 Path analysis

To assess effect sizes, we employed the coefficients of determination R^2 (explained variance), Stone-Geisser (Q^2) values, and f^2 (effect size) (Hair et al., 2017).

The findings indicate a good fit of the data to the model, as evidenced by the SRMR values being below 0.05 and the NFI values being above 0.88 (Henseler et al., 2016).

The coefficients of determination R^2, f^2, and Stone-Geisser (Q^2) values were used as indicators of effect sizes (Hair et al., 2017). With all SRMR values below 0.05 and NFI values over 0.88, the results demonstrate that the data fit the model well (Henseler et al., 2016). According to the results, knowledge capability, innovative capability, and IT capability were responsible for explaining 18% of IT exploration, 54% of IT exploitation, and 85% of OA, respectively. The results of the hypotheses indicate that H1 ($b = 0.382$, $p < 0.00$), H2 ($b = 0.183$, $p = 0.036$), H3 ($b = 0.427$, $p < 0.00$), H4 ($b = 0.345$, $p < 0.00$), and H5 ($b = 0.151$, $p < 0.00$) were supported, as presented in Table 5.

Table 1 Descriptive statistics

Construct	*M*	*SD*	*Convergent validity*			*Internal consistency*	*1*	*2*	*3*	*4*	*5*
			Loading	*AVE*	α	*CR*					
			> 0.70	*> 0.50*	*0.60*	*> 0.60*					
ITC	3.81	0.67	0.892	0.598	0.887	0.912	1				
ITEI	3.94	0.61	0.881	0.621	0.877	0.908	0.596**				
ITER	3.76	0.63	0.897	0.675	0.892	0.987	0.675**	0.553**			
ICT	3.73	0.66	0.92	0.573	0.917	0.931	0.567**	0.610**	0.633**	0.670**	
KC	3.75	0.67	0.912	0.684	0.907	0.928	0.693**	0.611**	0.685**	0.641**	
OA	3.68	0.63	0.905	0.691	0.884	0.917	0.633**	0.567**	0.592**	0.670**	0.657**

Notes: ITC: IT capability; KC: knowledge capability; ICT: innovation capability; ITER: IT exploration; ITEI: IT exploitation; OA: organisational agility. $^{**}p < 0.001$.

Table 2 Confidence intervals for HTMT criterion

Path	*Lower 2.5%*	*Upper 97.5%*	*Sig.*	*HTMT*
OA → ITC	0.745	0.869	0.000	0.809
OA → KC	0.767	0.888	0.000	0.835
OA → IC	0.695	0.842	0.000	0.768
OA → ITEI	0.458	0.657	0.000	0.561
OA → ITER	0.823	0.935	0.000	0.845

Notes: R^2 (OA) = 0.85; R^2 (ITER) = 0.543; R^2 (ITEI) = 0.181; ITC: IT capability; KC: knowledge capability; ICT: innovation capability; ITER: IT exploration; ITEI: IT exploitation; OA: organisational agility.

For the positive and statistically significant hypotheses, H1, $f^2 = 0.405$; H3, $f^2 = 0.105$; and H5, $f^2 = 0.112$. These results indicate that the variables have a moderate influence on R^2. Furthermore, a bootstrapping analysis was conducted (Hair et al., 2019). The results confirm the importance of the pathways for the five hypotheses (H1, H2, H3, H4, and H5). The analysis reveals that the t-statistics ranged from 2.107 to 7.119, and the p-values were lower than 0.005, signifying statistical significance. According to Table 3, the findings indicate a substantial predictive relevance of OA, as evidenced by a Q^2 value of 0.24.

Furthermore, the bootstrapping results illustrate the significance of the paths of the five abovementioned hypotheses, with the t-statistics being between 2.107 and 7.119 and the p-values < 0.005 (Hair et al., 2019). Q^2 was used to calculate the predictive relevance of OA. The results show that the value of Q^2 was 0.24, indicating a large predictive relevance of OA (Table 3).

Table 3 Parameter estimates for the path model predicting OA

Path	*VIF*	*t*	*β*	*Sig*	*F^2*	*Decision*
OA → ITC	1.90	7.119	0.382	0	0.405	H1: SU
OA → KC	1.92	2.107	0.183	0.036	0.034	H2: SU
OA → IC	2.233	4.933	0.427	0	0.105	H3: SU
OA → ITEI	1.357	4.783	0.345	0	0.073	H4: SU
OA → ITER	2.403	4.194	0.151	0	0.112	H5: SU

Notes: ITC = IT capability; KC = knowledge capability; ICT = innovation capability; ITER = IT exploration; ITEI = IT exploitation; OA = organisational agility; SU = supported.

4.2.2 Mediating path analysis

Following Baron and Kenny's (1986) recommendation, this study employed two mediating variables and assessed their effects. The research involved testing six hypotheses, namely, H5a, H5b, H5c, H6a, H6b, and H6c. The results of the hypotheses indicate that H5a ($b = 0.053$, $t = 2.782$, $p = 0.006$), H6a ($b = 0.135$, $t = 3.806$, $p < 0.03$), and H6c ($b = 0.161$, $t = 3.388$, $p < 0.01$) were supported. Conversely, Table 4 reveals that H5b, H5c, and H6b were not supported.

Table 4 The mediating effect of IT ambidexterity

Path	*t*	*β*	*Sig*	*Decision*
IC → ITEI → OA	2.782	0.053	0.006	H5a: SU
ITC → ITEI → OA	0.856	0.017	0.393	H5b: NS
KC → ITEI → OA	0.01	0.000	0.992	H5c: NS
IC → ITER → OA	3.806	0.135	0.000	H6a: SU
ITC → ITER → OA	0.367	0.015	0.714	H6b: NS
KC → ITER → OA	3.388	0.161	0.001	H6c: SU

Notes: ITC = IT capability; KC = knowledge capability; ICT = innovation capability; ITER = IT exploration; ITEI = IT exploitation; OA = organisational agility; SU = supported; NS = not supported.

5 Discussion

The primary aim of this research was to study the role of IT capability, innovation capability, and knowledge capability in predicting OA and to examine the mediating role of IT ambidexterity in a sample of senior IT executives. This study contributes to the existing literature in several significant ways. Firstly, it empirically validates the RBV and KBV theories by integrating IT capability, innovation capability, knowledge capability, and IT ambidexterity in the examination of OA. This highlights the importance of not only IT capability but also knowledge capability and innovation capability in influencing OA, building upon previous research by Ravichandran (2018) and Panda and Rath (2018).

Secondly, the study emphasises the critical role of IT ambidexterity in enhancing OA, thus expanding the scope of the RBV and KBV theories. By accentuating the significance of IT ambidexterity, the research underscores the capacity of organisations to adeptly balance both exploratory and exploitative IT activities, fostering agility. In doing so, it broadens the understanding of RBV, which traditionally focuses on static resource configurations, by incorporating the dynamic and adaptive nature of IT ambidexterity. Additionally, the study extends the KBV framework by recognising the role of knowledge in navigating the complexities of IT ambidexterity to enhance OA. This nuanced perspective contributes to a more comprehensive theoretical foundation, highlighting the interplay between IT ambidexterity and the RBV and KBV processes in shaping and sustaining OA.

Thirdly, it contributes to the limited literature on the influence of IT-related capabilities on OA by investigating the mediating roles of IT exploration and IT exploitation. Finally, the study presents a framework for understanding OA specifically tailored to senior IT executives in Malaysian IT companies. This is significant as previous studies have predominantly focused on Western cultures or developed countries, and the findings from the Malaysian sample provide valuable evidence of the cross-cultural comparability of the results.

The outcomes of this study support the hypotheses that individual, innovation, and technological capabilities are positively linked with OA (H1, H2, and H3 were accepted). Among these factors, innovative capability was found to be the most influential. These results align with previous studies by AlTaweel and Al-Hawary (2021), Cepeda and

Arias-Pérez (2019) and Panda and Rath (2018), highlighting the role of these capabilities in enhancing competitive advantage. The research findings illuminate the intricate RBV and KBV processes in nurturing OA. The emphasis is on harnessing IT, knowledge, and innovation capabilities to empower employees, fostering a heightened sense of control over their work environment. The RBV highlights the strategic importance of tangible and intangible resources, such as IT infrastructure and organisational knowledge, as drivers for agility. Simultaneously, the KBV accentuates the role of accumulated knowledge and learning processes in shaping OA. The integration of IT, knowledge, and innovation capabilities becomes pivotal in creating an environment where employees not only adapt swiftly to changes but also actively contribute to the organisation's agility by leveraging their empowered roles and understanding of the evolving landscape.

The research findings offer additional substantiation for the work conducted by Lee et al. (2015) and Zhen et al. (2021), providing further insights into the vital role of IT exploration and IT exploitation, regarded as dimensions of IT ambidexterity, in propelling OA. This underscores the paramount importance of adeptly managing IT resources and practices to fortify OA within organisations. By incorporating the ambidextrous concept into the investigation, the study establishes that IT ambidexterity, defined as the concurrent ability to explore and exploit IT resources and practices, stands as a pivotal factor in augmenting OA, with the acceptance of hypotheses H4 and H5. The findings also substantiate the mediating role of IT exploration in the intricate relationship between innovation capability, knowledge capability, and OA, with the acceptance of hypotheses H6a and H6c. Furthermore, the results highlight that OA is influenced by innovation capability through the nuanced mechanism of IT exploitation, supported by the acceptance of hypothesis H5a. These nuanced connections and validations underscore the multifaceted interplay between IT ambidexterity, innovation, knowledge, and OA.

These findings highlight the importance of cultivating a balanced set of capabilities in managing IT resources and practices, which should be a priority for modern organisations. The study emphasises that investing in IT exploitation and exploration is critical for contemporary companies. Senior executives need to recognise the significance of maintaining a suitable balance between IT exploration and exploitation to improve the effectiveness of innovation and knowledge capabilities. This, in turn, enables organisations to become more agile, particularly when navigating a rapidly changing business environment.

6 Conclusions

This study examines the influence of IT, innovation, and knowledge capabilities on the development of OA and the promotion of business performance within the IT sector. Additionally, the study investigates the role of IT ambidexterity as a significant factor influencing OA. Along with direct effects, the research suggests that IT ambidexterity serves as a mediating mechanism that explains how these capabilities contribute to OA in the IT sector. The results from the PLS-SEM analysis demonstrate the importance of organisational capabilities in fostering OA. Moreover, IT ambidexterity is identified as a key driver of OA and acts as a mediator in the relationship between innovation capability, knowledge capability, and agility. These findings indicate that organisations can leverage these capabilities to adapt to external changes and effectively navigate turbulent business environments, ultimately leading to improved agility. The findings of this study contribute to the existing knowledge on OA and the role of IT mechanisms, offering practical guidance for firms aiming to enhance their agility through IT-related activities.

7 Limitation and future direction

There are some limitations to consider in this work. Firstly, the cross-sectional nature of the research is a significant constraint, highlighting the need for future prospective studies utilising longitudinal methods. Secondly, the data may be culturally biased as it is derived from a limited sample of IT companies in Malaysia. Conducting comparative studies across different countries would be beneficial for future research. Finally, because capability development and agility are long-term processes, it is critical to recognise that this study is based on a cross-sectional survey approach, which may not reflect the full dynamics of these processes. Therefore, future studies could explore these relationships over a longer timeframe to gain a more comprehensive understanding.

References

Acosta-Prado, J.C., Severiche, A.K.R. and Tafur-Mendoza, A.A. (2021) 'Conditions of knowledge management, innovation capability and firm performance in Colombian NTBFs: a measurement scale', *VINE Journal of Information and Knowledge Management Systems*, Vol. 51, No. 2, pp.218–235.

Adler, S.J., Sharma, P.N. and Radomir, L. (2023) 'Toward open science in PLS-SEM: assessing the state of the art and future perspectives', *Journal of Business Research*, Vol. 169, p.114291.

AlTaweel, I.R. and Al-Hawary, S.I. (2021) 'The mediating role of innovation capability on the relationship between strategic agility and organizational performance', *Sustainability*, Vol. 13, No. 14, p.7564.

Attar, M. and Abdul-Kareem, A. (2020) 'The role of agile leadership in organisational agility', in Akkaya, B. (Ed.): *Agile Business Leadership Methods for Industry 4.0*, pp.171–191, Emerald Publishing Limited, Bingley, https://doi.org/10.1108/978-1-80043-380-920201011.

Barney, J.B. (1991) ''Firm resources and sustained competitive advantage', *Journal of Management*, Vol. 17, No. 1, pp.99–120.

Baron, R.M. and Kenny, D.A. (1986) 'The moderator-mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations', *Journal of Personality and Social Psychology*, Vol. 51, No. 6, pp.1173–1182.

Cai, Z., Huang, Q., Liu, H., Davison, R.M. and Liang, L. (2013) 'Developing organizational agility through it capability and km capability: the moderating effects of organizational climate', in *PACIS 2013 Proceedings*.

Cai, Z., Liu, H., Huang, Q. and Liang, L. (2019) 'Developing organizational agility in product innovation: the roles of IT capability, KM capability, and innovative climate', *R&D Management*, Vol. 49, No. 4, pp.421–438.

Cepeda, J. and Arias-Pérez, J. (2019) 'Information technology capabilities and organizational agility: the mediating effects of open innovation capabilities', *Multinational Business Review*, Vol. 27, No. 2, pp.198–216.

Cheng, C. (2020) *COVID-19 in Malaysia: Economic Impacts & Fiscal Responses* Institute of Strategic and International Studies, Kuala Lumpur, Malaysia [online] https://www.isis.org.my/wp-content/uploads/2020/03/COVID19-article- Calvin6.pdf (accessed 20 December 2023).

Cooper, C., Pereira, V., Vrontis, D. and Liu, Y. (2023) 'Extending the resource and knowledge based view: insights from new contexts of analysis', *Journal of Business Research*, Vol. 156, p.113523.

Côrte-Real, N., Oliveira, T. and Ruivo, P. (2017) 'Assessing business value of big data analytics in European firms', *Journal of Business Research*, Vol. 70, pp.379–390.

Dwivedi, Y.K., Hughes, D.L., Coombs, C., Constantiou, I., Duan, Y., Edwards, J.S., Gupta, B., Lal, B., Misra, S. and Prashant, P. (2020) 'Impact of COVID-19 pandemic on information management research and practice: transforming education, work and life', *International Journal of Information Management*, Vol. 55, p.102211.

Franke, G. and Sarstedt, M. (2019) 'Heuristics versus statistics in discriminant validity testing: a comparison of four procedures', *Internet Research*, Vol. 29, No. 3, pp.430–447.

Gentles, S.J., Härdle, W.K. and Mori, Y. (2012) *How Computational Statistics Became the Backbone of Modern Data Science*, Springer, Cham.

Gold, A.H., Malhotra, A. and Segars, A.H. (2001) 'Knowledge management: an organizational capabilities perspective', *Journal of Management Information Systems*, Vol. 18, No. 1, pp.185–214, https://doi.org/10.1080/07421222.2001.11045669.

Gonçalves, D., Bergquist, M., Alänge, S. and Bunk, R. (2022) 'How digital tools align with organizational agility and strengthen digital innovation in automotive startups', *Procedia Computer Science*, Vol. 196, pp.107–116.

Gregory, R.W., Keil, M., Muntermann, J. and Mähring, M. (2015) 'Paradoxes and the nature of ambidexterity in IT transformation programs', *Information Systems Research*, Vol. 26, No. 1, pp.57–80.

Hair Jr., J.F., Howard, M.C. and Nitzl, C. (2020) 'Assessing measurement model quality in PLS-SEM using confirmatory composite analysis', *Journal of Business Research*, Vol. 109, pp.101–110, https://doi.org/10.1016/j.jbusres.2019.11.069.

Hair Jr., J.F., Sarstedt, M., Matthews, L.M. and Ringle, C.M. (2016) 'Identifying and treating unobserved heterogeneity with FIMIX-PLS: part I – method', *European Business Review*, Vol. 28, No. 1, pp.63–76, https://doi.org/10.1108/EBR-09-2015-0094.

Hair, J.F., Hult, G.T.M., Ringle, C.M. and Sarstedt, M. (2017) *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*, 2nd ed., Sage, Singapore.

Hair, J.F., Sarstedt, M. and Ringle, C.M. (2019) 'Rethinking some of the rethinking of partial least squares', *European Journal of Marketing*, Vol. 53, No. 4, pp.566–584.

Henseler, J., Hubona, G. and Ray, P.A. (2016) 'Using PLS path modeling in new technology research: updated guidelines', *Industrial Management & Data Systems*, Vol. 116, No. 1, pp.2–20, https://doi.org/10.1108/IMDS-09-2015-0382.

Ilmudeen, A. (2022) 'Leveraging IT-enabled dynamic capabilities to shape business process agility and firm innovative capability: moderating role of turbulent environment', *Review of Managerial Science*, Vol. 16, No. 8, pp.2341–2379.

Jamil, A.H., Sanusi, Z.M., Yaacob, N.M., Isa, Y.M. and Tarjo, T. (2022) 'The Covid-19 impact on financial crime and regulatory compliance in Malaysia', *Journal of Financial Crime*, Vol. 29, No. 2, pp.491–505.

Kamali, A. and Kamali, S. (2012) 'Investigating relation between innovation and organizational agility (Iran & Parsian insurance companies)', in Kaplan, S., Schenkel, A., von Krogh, G. and Weber, C. (Eds.) (2001) 'Knowledge-based theories of the firm in strategic management: a review and extension', *International Journal of Project Management*, Vol. 25, No. 56, pp.143–158.

Kaplan, R. (2001) 'The nature of the view from home: psychological benefits', *Environment and Behavior*, Vol. 33, No. 4, pp.507–542, https://doi.org/10.1177/00139160121973115.

Khraishi, A., Paulraj, A., Huq, F. and Seepana, C. (2023) 'Knowledge management in offshoring innovation by SMEs: role of internal knowledge creation capability, absorptive capacity and formal knowledge- sharing routines', *Supply Chain Management: An International Journal*, Vol. 28, No. 2, pp.405–422.

Kock, N. (2017) 'Common method bias: a full collinearity assessment method for PLS-SEM', in Latan, H. and Noonan, R. (Eds.): *Partial Least Squares Path Modeling*, pp.245–257, Springer, Cham.

Lee, J., Lee, J. and Lee, H. (2003) 'Exploration and exploitation in the presence of network externalities', *Management Science*, Vol. 49, No. 4, pp.553–570, https://doi.org/10.1287/mnsc.49.4.553.14417.

Lee, O-K., Sambamurthy, V., Lim, K.H. and Wei, K.K. (2015) 'How does IT ambidexterity impact organizational agility?', *Information Systems Research*, Vol. 26, No. 2, pp.398–417.

Liang, H., Wang, N., Xue, Y. and Ge, S. (2017) 'Unraveling the alignment paradox: how does business – IT alignment shape organizational agility?', *Information Systems Research*, Vol. 28, No. 4, pp.863–879.

Lu, Y. and Ramamurthy, K. (2011) 'Understanding the link between information technology capability and organizational agility: an empirical examination', *MIS Quarterly*, Vol. 35, No. 4, pp.931–954.

Mao, H., Liu, S., Zhang, J. and Deng, Z. (2016) ''information technology resource, knowledge management capability, and competitive advantage: the moderating role of resource commitment', *International Journal of Information Management*, Vol. 36, No. 6, Part A, pp.1062–1074, https://doi.org/10.1016/j.ijinfomgt.2016.07.001.

McDonald, S.M. and Sinha, R. (2008) 'Information communication technology: reform of organisational crisis management during natural disasters', *International Journal of Management Practice*, Vol. 3, No. 2, pp.131–149.

Melián-Alzola, L., Fernández-Monroy, M. and Hidalgo-Peñate, M. (2020) 'Hotels in contexts of uncertainty: measuring organisational resilience', *Tourism Management Perspectives*, Vol. 36, p.100747.

Mithas, S. and Rust, R.T. (2016) 'How information technology strategy and investments influence firm performance', *MIS Quarterly*, Vol. 40, No. 1, pp.223–246.

Nafei, W.A. (2016) 'Organizational agility: the key to organizational success', *International Journal of Business and Management*, Vol. 11, No. 5, pp.296–309.

Napier, N.P., Mathiassen, L. and Robey, D. (2011) 'Building contextual ambidexterity in a software company to improve firm-level coordination', *European Journal of Information Systems*, Vol. 20, No. 6, pp.674–690.

Nonaka, I. (1994) 'A dynamic theory of organizational knowledge creation', *Organization Science*, Vol. 5, No. 1, pp.14–37.

Nwankpa, J.K. and Datta, P. (2017) 'Balancing exploration and exploitation of IT resources: the influence of digital business intensity on perceived organizational performance', *European Journal of Information Systems*, Vol. 26, No. 5, pp.469–488, https://doi.org/10.1057/s41303-017-0049-y.

Panda, S. and Rath, S.K. (2018) 'Strategic IT-business alignment and organizational agility: from a developing country perspective', *Journal of Asia Business Studies*, Vol. 12, No. 4, pp.422–440.

Pereira, V. and Bamel, U. (2021) 'Extending the resource and knowledge based view: a critical analysis into its theoretical evolution and future research directions', *Journal of Business Research*, Vol. 132, pp.557–570.

Pérez-López, S. and Alegre, J. (2012) 'Information technology competency, knowledge processes and firm performance', *Industrial Management & Data Systems*, Vol. 112, No. 4, pp.644–662.

Ravichandran, T. (2018) 'Exploring the relationships between IT competence, innovation capacity and organizational agility', *The Journal of Strategic Information Systems*, Vol. 27, No. 1, pp.22–42.

Shankar, K. (2020) 'The impact of COVID-19 on IT services industry-expected transformations', *British Journal of Management*, Vol. 31, No. 3, pp.450–452.

Soosay, C.A., Hyland, P.W. and Ferrer, M. (2008) 'Supply chain collaboration: capabilities for continuous innovation', *Supply Chain Management: An International Journal*, Vol. 13, No. 2, pp.160–169.

Theriou, N.G., Aggelidis, V. and Theriu, G.N. (2009) 'A theoretical framework contrasting the resources-based perspective and the knowledge-based view', *European Research Studies*.

Wade, M. and Hulland, J. (2004) 'The resource-based view and information systems research: review, extension, and suggestions for future research', *MIS Quarterly*, Vol. 28, No. 1, pp.107–142.

Weill, P., Subramani, M. and Broadbent, M. (2002) *IT Infrastructure for Strategic Agility*, p.329, Massachusetts Institute of Technology, Cambridge, MA.

Werder, K. and Richter, J. (2022) 'A meta-analysis on the effects of IT capability toward agility and performance: new directions for information systems research', *PLoS One*, Vol. 17, No. 10, p.e0268761.

Wernerfelt, B. (1984) 'A resource-based view of the firm', *Strategic Management Journal*, Vol. 5, No. 2, pp.171–180.

Zaim, H., Tatoglu, E. and Zaim, S. (2007) 'Performance of knowledge management practices: a causal analysis', *Journal of Knowledge Management*, Vol. 11, No. 6, pp.54–67, https://doi.org/10.1108/13673270710832163.

Zhen, J., Cao, C., Qiu, H. and Xie, Z. (2021) 'Impact of organizational inertia on organizational agility: the role of IT ambidexterity', *Information Technology and Management*, Vol. 22, No. 1, pp.53–65.