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Integrating business and market intelligence to expedite service responsiveness: evidence from Malaysia

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Abstract

In today's business world, Malaysian postal and courier companies are rapidly growing due to recent Covid-19 but they face various challenges due to intense competition in the use of high-tech e-services. The paper examines the role of business and market intelligence in expediting service innovation and responsiveness in Malaysia, which is considered the business hub of Asia. Primary survey data were collected from the 93 managerial staff of postal and courier companies in Malaysia. We employed PLS-SEM methodology to test the relationship between the selected variables of interest. The results indicate that market intelligence and business intelligence are the major contributors to service innovation and service responsiveness. Moreover, the role of knowledge management is crucial in better utilization of external and internal knowledge. Finally, this study provides practical guidelines to practitioners and policymakers of postal and courier companies to devise viable strategies for efficiently realizing service innovation and service responsiveness to the best satisfaction of the end customers.

Keywords Market intelligence · Business intelligence · Knowledge management · Service innovation · Service responsiveness · Postal and courier services

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1 Introduction

Recently, Al-Omoush et al. (2022) investigated the impact of intellectual capital related to e-services and supply chain management using a combined qualitative and quantitative approach. They observed that communication via e-plate and information technology is the future for courier deliveries. Others who have contributed to research in this area are Rahman et al. (2022), who argue that technological innovation is being used in the tourism industry while Izzah et al. (2021) examined these techniques in courier services and e-business. Ting et al. (2016) explored how e-services are being used in business marketing and improving e-quality of goods and services. The initial work on postal and courier services was done by Otsetova and Dudin (2018), who contended that postal and e-communication services play a central role in a nation's development because it creates a double impact in the shape of social and geo-political relationships, economic progress and public welfare. Alminnourliza (2016) and Pilinkienė et al. (2017) agree with the proposition that these services significantly contribute to gross domestic product (GDP). However, none of these studies addresses the case of Malaysia, which is Asian postal business hub. This paper attempts to fill this gap and identify the direction of change in postal services, logistical activities, and their critical segments.

Parcel and courier service companies have grown hugely in the last few years due to rapid increases in online shopping worldwide (Ministry of Science, Technology, and Innovation 2010). Malaysian parcel and courier companies were unable to compete with the multinational courier companies and their efficient services relative to other Westerner countries. This paper investigates the factors determining the failures of Malaysian courier services and why the sector is struggling due to innovative challenges and changes in technology knowledge as far as service management and realizing the expectations of consumers are concerned. Unlike Malaysia, courier service performance in European countries is appropriate and satisfying the requirements of clients (Ejdys and Gulc 2020). As an example, the courier services in Italy and other European countries have improved because public trust as risen in the services being done by this sector (Montwiłł et al. 2021 and German et al. 2022.

Historically, international courier companies and postal services began operating in Malaysia during the early 1970s. Various international companies such as DHL and OCS set up their Asian offices in Malaysia. In 1979, City-Link Express (M) Sdn. Bhd and Post Malaysia Berhad (PMB) was the first which started its operations and competing with DHL and OCS. This led to the steady growth of the postal and courier industry in Malaysia between 2001 and 2009. PMD, the major postal services provider in Malaysia was then growing at 5.2% per year, reaching an average annual growth of 10% (Alminnourliza 2016). Currently, these companies are facing various challenges due to competition. In response to the rise of the internet, these postal and courier companies now have to pay attention to electronic/digital developments for their survival (Wang et al. 2015). In this innovative and rapidly changing environment, their survival is not guaranteed. The price of postal and courier services is no longer the only element for satisfying customers (Aparecida Gouvêa et al. 2001). Customers require consistent high quality of service of which responsiveness is the major part (Meehan and Dawson 2002).

Service responsiveness is defined as the "capability of the service providers in being responsive to customers in terms of time, quality, and flexibility" (Razalli 2008). In the current global economic system, competition on service responsiveness enables companies to accomplish rapid responses, reduce costs, and improve their level of customization

(Zerenler 2007). Services has central importance among the businesses (Aljumah and Rehman 2022) therefore, service responsiveness requires market and business intelligence, which are based on external and internal knowledge, respectively. Incorporating external knowledge within the boundaries of the organization increases innovation (Hameed et al. 2018), which has significant ramifications for service innovation (Noordin et al. 2012). However, in this process knowledge management it is important to take advantage of external and internal knowledge (Chesbrough 2006). Organizations must have the best or most advanced knowledge management in order to achieve success (Anantatmula 2007). The model developed in this research is appropriate for courier businesses' practical requirements and the constructs used are based on what previous studies reported. However, this model can now be applied to courier services and so the novelty of this model is its direct link to the courier service business, which incorporates various dimensions.

It is noted that courier companies' management generally still work in the traditional way, and no research has been done to develop a new business competitive framework for modern circumstances. Previous research has explained service responsiveness from different perspectives, but not the role of market intelligence and service intelligence. Research on enrichment of the courier industry is necessary to improve employees' performance so that the business of couriering goods and services is sustainable. Similarly, knowledge management and service innovation in the research models developed in earlier studies were not discussed in terms of how they mediate the relationship with courier services. Therefore, the prime objective of this paper is to investigate the role of market intelligence and business intelligence to expedite service responsiveness with the following twin sub-objectives:

1. Examine the mediating role of knowledge management.
2. Examine the mediating role of service innovation.

This study contributes to the literature by exploring the role of market intelligence and business intelligence in service responsiveness. Moreover, it looks at the mediating role of service innovation and knowledge management. This paper contributes to the strategy for service innovation and service responsiveness that Malaysia's postal and courier services should employ. The rest of the paper is structured as follows. In the subsequent sections the hypotheses are developed followed by an explanation of the methodology. In Sect. 4 an analysis of results is described, followed in Sect. 5 by a discussion of the results. The final section contains some concluding remarks and recommendations for policymakers.

2 Literature review

2.1 Foundation theories

This section begins by exploring various theories to support psychological process of acceptance in technologies and the development of artificial intelligent (AI), Technology Acceptance Model (TAM), Technology organisation-environment (TOE) and the Theory of Action (ToA) which are instrumental models to be integrated in employing PLS-SEM methodology. A recent study by Na et al. (2022) and Al-Emran et al. (2023) outlines how TAM of AI based technologies are being used in mediating role of knowledge management and service innovation. They demonstrated that how firms are combining TAM, ToA,

TOE to achieve targets in knowledge management. Moreover Khan et al. 2023 proposed machine learning approach in measuring the corporate vulnerability in the US and China during COVID. Al-Emran et al. (2023) addresses the issue employing PLS-SEM and Fuzzy sets approaches using AI chatbots for knowledge sharing and knowledge management. Some of these approaches are summarised below which are related to our paper for the ready reference of the readers.

2.1.1 Technology acceptance model

Technology Acceptance Model and Theory of Action are instrumental models which have obtained the attention of information science community. The psychological process of acceptance is a foundation to adopt new technologies in the decision making for innovation, quality and efficiency of the product and service because the usage of technology excel the knowledge of employees. The technological acceptance model refers individuals' intent to accept only those interventions which are technology-based. Moreover, technology acceptance model describes the behavioural intention of users to adopt, use and obtain innovation (Dillon and Morris 1996; Keikhosrokiani et al. 2020). Therefore, the significance of business intelligence cannot be ignored in service industry's decision makers. Firms' own employees can necessarily initiate the usage of business intelligence for internal knowledge creation which will enhance the service innovation to get better service response. This research proposed its model on the foundation of Technology acceptance model by integrating mediating factors that imitate the usage of business intelligence approach to increase the internal knowledge as well its quality.

2.1.2 Unified technology acceptance and use theory (UTAUT)

UTAUT model is a valuable tool for practitioners and managers of the firms to evaluate the probable achievement of evolving technologies in assisting and implementing them in knowing the major determinants which drive their acceptance. UTAUT model concentrated on the aspects that have potential to use and adopt the IT by individuals in firm irrespective of larger and smaller firms in their knowledge creation from inside the organization or outside the organization (Dasgupta and Gupta 2019) as this research proposed the market intelligence a factor that influences the knowledge management, service innovation and service responsive. The market intelligence increases the external knowledge of employees which is only possible through the IT usage and acceptance as suggested in UTAUT model. UTAUT model was clearly emerged to make sure that the acceptance of technologies including market intelligence and business intelligence were the vastly assumed and implemented by researchers in modelling related to innovation and knowledge creation. In recent days the combinations of various technologies models are being used with AI to achieve the needed targets of quick deliveries like in postal services which we have elaborated in the rest of the paper with Malaysian context.

2.2 Hypotheses development and conceptual framework

According to Theoharakis and Hooley (2003), "service responsiveness refers to your business's ability to respond to service inquiries and fulfil them in a timely manner. This includes both the speed and safety it takes your agents to initiate the interaction as well as the time it takes for them to complete the customer's request." Meanwhile,

Hsieh et al. (2013) assert that "service innovation is to innovation taking place in the various contexts of services, including the introduction of new services or incremental improvements of existing services." McInerney (2002) contends that "knowledge management is the collection of methods relating to creating, sharing, using and managing the knowledge and information of an organization", while Lackman et al. (2000) posited that "market intelligence is gathering and analysing information relevant to a company's market—trends, competitor and customer monitoring." Jourdan et al. (2008) wrote that business intelligence constitutes the strategies and technologies employed by enterprises for the purposes of data analysis and managing business information.

Responsiveness is a characteristic that measures various outcomes of service based on how this is delivered to the customer. This term has been discussed in various service marketing areas. Responsiveness has become a vital element of performance in the business world (Hoyt et al. 2007; Liang et al. 2011). Service responsiveness can be defined as the degree to which a firm provides services, variety of services, and is ready to help customers on time (Razalli 2008). However, service responsiveness heavily depends on market intelligence and business intelligence. The former is based on knowledge and information gathered outside the boundaries of the firm and has an impact on innovation-related activities. External knowledge acquisition is heavily based on information from customers, creditors, suppliers, etc. According to Chesbrough (2004), Chesbrough (2006), and Enkel et al. (2009), external knowledge from suppliers, customers and business partners makes a major contribution to the innovation process of firms.

Business intelligence is based on the extent of internal knowledge and it is defined as the employees of an organization collaborating with each other in such a way to enhance the innovativeness of the company (Elche-Hotelano 2011). It is evident from the literature that any type of innovation can originate from a company's internal resources (Gebauer et al. 2008; Zainal Abidin et al. 2011). Both external and internal knowledge make a significant contribution to service responsiveness. External knowledge from customers and suppliers gives ideas to companies about how to deliver services in customized ways. Using external knowledge, employees generate new ideas that improve the circumstances of how internal knowledge is documented and applied which helps to develop what is known as a knowledge chain (Spinello 2000). This contributes to service responsiveness. Consequently, external, and internal knowledge acquisition wields a significant effect on service responsiveness.

According to Welsch et al. (2001), the external knowledge acquisition process and a firm's internal knowledge procurement procedures are positively connected to responsiveness. Responsiveness is one of the key elements of service quality (Bouranta et al. 2009) and it can be attained through better deployment of external and internal knowledge. Every employee of a company needs to respond internally as well as externally to fulfil what customers want and when (Stauss 1995). The study done by Salunke et al. (2019) demonstrated that market knowledge is helpful for devising and managing strategies that enable a company to retain market share in a competitive environment. In their research, Hameed et al. (2021) reported that service performance must be responsive to the requirements of customers when the appropriate facilities are available. Recently, Xie et al. (2021) reported those companies that are not working to get feedback from consumers, will be 'leapfrogged'. The research by YuSheng and Ibrahim (2019) concluded that the response of customers is simply a reflection of the need for a company's management to devise appropriate policies and procedures if it wants a consistent customer base and a good market reputation. The two hypotheses posited here are:

H1 There is a significant relationship between market intelligence and service responsiveness.

H2 There is a significant relationship between business intelligence and service responsiveness.

However, knowledge management is most important to get the maximum benefit from internal knowledge (business intelligence) and external knowledge (market intelligence). Innovation is based on both internal and external knowledge management (Chesbrough 2006; Ferraris et al. 2017). Innovation has vital importance in business activities (Azeem 2022). Improper utilization of external and internal knowledge leads to inferior ideas and service. Integration of both external and internal resources can generate valuable ideas to boost services. Market and business intelligence are both necessary for business management to develop effective strategies (Vakulenko et al. 2019). One study (Hameed et al. 2021) reported that businesses which are not viable betray a lack of sound management practices and information sharing. Research by Xie et al. (2021) recently asserted that the market value of a business is necessary if it is to survive, and for this reason market intelligence and related information is extremely relevant. This echoes the previous findings of YuSheng and Ibrahim (2019) who concluded that the business environment can be sustainable when the appropriate information about the market is managed accordingly.

For performance to improve, most business organizations not only depend on the fruitful division and allocation of various resources such as tangible assets, but also real knowledge management strategies (Lee and Sukoco 2007). Investment in knowledge management strategies has been documented as growing in importance (Mills and Smith 2011). In the current global economy, knowledge management is important for producing customized services through taking advantage of external and internal knowledge. Hence, from the above discussion, it is hypothesized that:

H3 There is a significant relationship between market intelligence and knowledge management.

H4 There is a significant relationship between business intelligence and knowledge management.

Business intelligence (internal knowledge) and market intelligence (external knowledge) are not only associated with knowledge management, but also have a noteworthy connection with service innovation. It is evident from Fig. 1 below, according to Soosay and Hyland (2004), that innovation derives from various generic factors. These include external factors such as knowledge from customers and suppliers, internal factor like the knowledge that exists inside an organization. Moreover, various push and pull factors are involved. The push factors initiate the various innovation activities, such as employee orientation as well as competition. The pull factors are based on the outputs that the firm wants to attain, for instance to be a leader in the industry or to achieve other financial goals (Alminnourliza 2016). Both these pull and push factors depend on the better utilization of external and internal knowledge.

When the management of any business has appropriate information, then it is possible to engage in innovation to compete with others and provide good services to consumers (Vakulenko et al. 2019). The role of consumer knowledge has become important

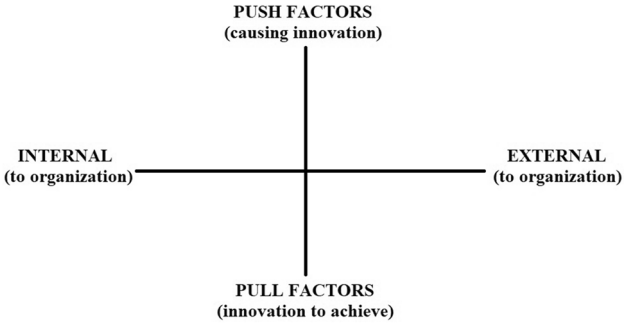

Fig. 1 Drivers of innovation. *Source* Soosay and Hyland (2004)

for businesses to innovate products and services so that they can compete in the market and retain customers (Aithal and Aithal 2019; Salunke et al. 2019). According to Chesbrough (2006) service innovation is mostly based on external and internal knowledge management. Thus, from the above discussion, the following hypotheses are proposed:

H5 There is a significant relationship between market intelligence and service innovation.

H6 There is a significant relationship between business intelligence and service innovation.

H7 There is a significant relationship between knowledge management and service innovation.

Service innovation has a very important relationship with service responsiveness. Service innovation leads to service responsiveness (Noordin et al. 2012). Service innovations bring new ideas which help to respond quickly to what customers need or want. Innovation is the creation of values as well as ideas that customers can use. It is in today's economy a driving force for big organizations worldwide. Even a small innovation in services would have consequences for an industry and how goods and services are delivered (Kandampully 2002).

Indeed, the study by Hameed et al. (2021) reported that the innovation of services is the key to improve the quality of what people receive and pay for. A service innovation is a way forward for a business to be sustainable and viable well into the future (Aithal and Aithal 2019). YuSheng and Ibrahim (2019) demonstrated that service performance is appropriate when there is keen interest shown by management to improve service quality. The information and feedback of consumers is necessary if the service innovation is relevant to the market and can be sustained. Recently, Xie et al. (2021) asserted that service performance is the key to business success, but innovation definitely improves the experiences of consumers. In a competitive environment, there is an extensive acknowledgement of the growing significance of service innovation (Oke 2007; Rowley et al. 2011). Service innovation is related to an organization's ability to deliver a creative space as well as certain resources to generate those ideas and implement service responsiveness. Moreover, Alminnourliza (2016) revealed that service innovation and postal courier service responsiveness are significantly and positively related to each other. Therefore, based on this argument it is hypothesized that:

H8 There is a relationship between service innovation and service responsiveness.

Additionally, from the above discussion, it is apparent that knowledge management and service innovation play a mediating role between market intelligence, business intelligence and service responsiveness. Thus, the following hypotheses are suggested here for testing:

H9 Knowledge management mediates the relationship between market intelligence and service innovation.

H10 Knowledge management mediates the relationship between business intelligence and service innovation.

H11 Service innovation mediates the relationship between market intelligence and service responsiveness.

H12 Service innovation mediates the relationship between business intelligence and service responsiveness.

H13 Knowledge management and service innovation collectively mediates the relationship between market intelligence and service responsiveness.

H14 Knowledge management and service innovation collectively mediates the relationship between business intelligence and service responsiveness.

Figure 2 below shows that how market intelligence and business intelligence affect service innovation and service responsiveness through the prism of knowledge management.

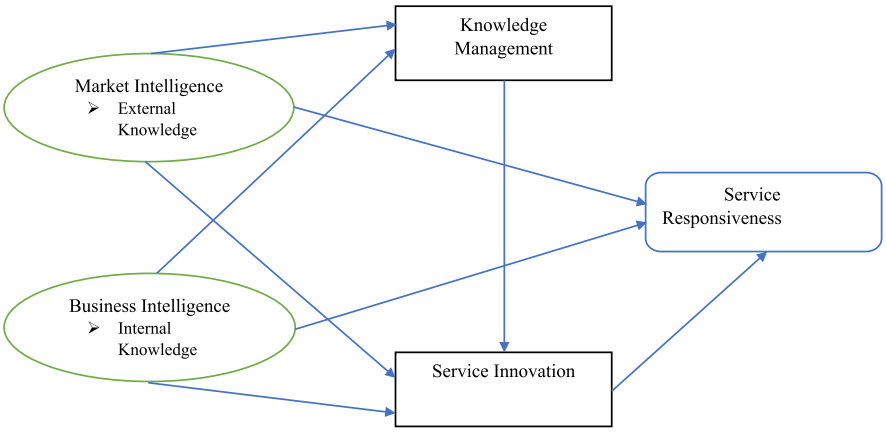

Fig. 2 Theoretical framework showing that how market intelligence and business intelligence affect service innovation and service responsiveness through knowledge management. *Source* Developed by the authors

3 Research methodology

3.1 Research design

The research design is based on the combination and cross-sectional of various management areas. It addresses the objective and the nature of the study related to 14 hypotheses detailed in previous section. The cross-sectional approach is consistent in understanding how market intelligence and business intelligence affect service innovation and service responsiveness through the prism of knowledge management and with the use of AI. For example, see recent work of Al-Emran et al. (2023) who combine various management tools using PLS-SEM methodology with Fuzzy sets (fsQCA) and AI in determining the AI-Based Chatbots for Knowledge Sharing. The current study examined the relationship between market intelligence, business intelligence, knowledge management, service innovation and service responsiveness. As this study is based on the questionnaire, therefore, cross-sectional research design is best suitable under these conditions with TAM, TOE, ToA and the use of PLS-SEM approach.

3.2 Population of the study

The current study looked at the service sectors of Malaysia due to its central location in ASEAN region. The target population sample consists of postal and courier companies that operate in the country. It was crucial to create a reliable sampling frame because none of the official directories documented postal and courier companies' data in running day-to-day postal and courier business. To this end, data were gathered from the managerial staff of these companies while other sources of information were also used to data collection. These sources were from Malaysian Communications and Multimedia Commission, Companies Commission of Malaysia (CCM), and Federation of Malaysia Freight Forwarder (FMFF) which helped to develop the sampling frame.

3.3 Data collection

Following the pilot study, a questionnaire was developed to collect the data from managerial staff of postal and courier companies. Due to the time and cost issues, all the data were collected through an email survey. Email IDs of managerial staff were collected from the headquarters of these companies and then respondents were selected randomly. Simple random sampling was used because it helps to generalize about a population. Furthermore, it is simple and lack of bias. Firstly, the questionnaire along with cover letter were emailed to the participants demonstrating the purpose and objectives. The respondents were all assured that their answers will be remain completely confidential. After two weeks, follow-up phone calls as well as emails were sent respondents to remind them to complete the survey questions. A sample size of 300 was preferred but only 93 respondents responded so the response rate was only 31%. According to Sekaran (2003), a 30% response rate is still enough for an email-based survey. Therefore, analysis was carried out by utilizing 93 responses.

3.4 Measures

In this study we based our work on the measures of existing studies and variables are chosen and adapted from prior studies. For example, the measures for market intelligence and business intelligence were based on the work by Alminnourliza (2016). Market and business intelligence are measured due to external knowledge and internal knowledge, respectively. Measures for knowledge management were adapted from Chuang (2004). These measures are based on knowledge culture of an organization's employees. Moreover, the measures for service innovation and service responsiveness were employed using the work from Den Hertog and Bilderbeek (1999) and Tiedemann et al. (2009), respectively. Service innovation is measured based on service technology innovation as well as service delivery system innovation. Service responsiveness is measured by how quickly the service company responds. Furthermore, a pilot study was conducted to ensure the instrument's validity and reliability, and both were achieved. Table 1 summarizes the operationalization of each construct.

3.5 Data analysis tool

Though using measures and selection of variables form the existing literature as listed in above table. These measures can be analysed by using Smart PLS 3 methodologies. In the literature the use of partial least squares is recommended if response rate is lower from selected respondents. This is documented in previous studies. For example Chin and Newsted (1999), Reinartz et al. (2009) are among others who recommended that PLS-SEM is the most suitable methodology while analysing data of a small sample size. We employed two-step process of PLS-SEM to analyse our data. The first step of PLS-SEM was based on measurement model assessment which was carried out to examine the reliability and validity. The second step was based on the structural model which was used to examine the relationship between variables (Albassami et al. 2019; Murad et al. 2022 and El-Emran 2023).

4 Analysis and results

The current study followed the recommendation of Henseler et al. (2009) to conduct all the steps of structural equation modelling (SEM). According to their recommendation, before hypothesis testing, assessment of the measurement model is required in terms of the internal and external consistencies. Internal consistency was achieved through factor loading. According to Hair et al. (2010), items having a factor loading between 0.4 and 0.5 should be deleted since all the factor loading should be higher than 0.5. All the factor loading outcomes are shown in Table 2 and Fig. 3. Two items have factor loadings below 0.5 but above 0.4 which is also acceptable because the value of composite reliability (CR) and average variance extracted (AVE) is higher than 0.7 and 0.5, respectively. There is consequently no need to delete these two items which previous studies also confirmed. In the current study one item was deleted from knowledge management, two from service responsiveness and two items from market intelligence.

External consistency was examined through AVE. Moreover, convergent validity was achieved by examining the AVE. According to Hair Jr and Lukas (2014), AVE and

Table 1 Operationalization

Construct	Sources	Items	Operationalization
Market intelligence	Alminnourliza (2016)	08	The degree to which companies focus on activities related to external knowledge acquisition from customers to fulfil their needs
Business intelligence	Alminnourliza (2016)	04	The degree to which companies focus on obtaining information inside the firm to expedite innovation
Knowledge management	Chuang (2004)	05	The degree to which how organizational culture motivates the employees to share knowledge
Service innovation	Den Hertog and Bilderbeek (1999)	03	The degree to which the company focuses on technological innovations and delivery of services
Service responsiveness	Tiedemann et al. (2009)	07	The degree to which the company responds to customers

Table 2 Factor loadings

	Service responsiveness	Market intelligence	Service innovation	Business intelligence	Knowledge management
SR1	0.922				
SR2	0.876				
SR3	0.400				
SR4	0.938				
SR5	0.911				
SR6	0.943				
MI1		0.959			
MI2		0.914			
MI3		0.918			
MI5		0.934			
MI5		0.890			
SI1			0.943		
SI2			0.419		
SI3			0.937		
BI1				0.940	
BI2				0.9919	
BI3				0.945	
BI4				0.929	
KM1					0.900
KM2					0.905
KM4					0.926
KM5					0.884

SR Service responsiveness, *MI* Market intelligence, *BI* Business intelligence, *KM* Knowledge management, *SI* Service Innovation

composite reliability should be equal to 0.5 and 0.7, respectively, or above to achieve a certain level of convergent validity. In the present study, all the constructs have AVE higher than 0.5. Table 3 shows the measurement model results of Cronbach's Alpha, CR and AVE.

After assessment of reliability and convergent validity, discriminant validity was examined by using the criterion of Heterotrait-Monotrait (HTMT). According to this criterion all the values should be less than 0.9. Table 4 shows that discriminant validity is evident.

After analysing the measurement model, the structural model was assessed through PLS bootstrapping. In this part of the analysis the relationship between variables was tested. In this study, 1.96 t-value was considered for either accepting or rejecting the hypotheses. Figure 4 shows the PLS bootstrapping in which the t-value means that all the direct hypotheses are supported since the t-value is more than 1.96. Moreover, Table 5 shows all the results with p-value and β-value. All the exogenous latent variables have a significant relationship with the endogenous latent variable. Subsequently, all the hypotheses are supported (H_1, H_2, H_3, H, H_4, H_5, H_6, H_7 and H_8).

Moreover, Table 6 shows the indirect effect results. In this part of the analysis, the moderating effect of knowledge management and services innovation was examined. Here the recommendations of Preacher and Hayes (2004, 2008) were followed. In line with the direct hypotheses, mediation was also examined through t-value. According to Table 5, it

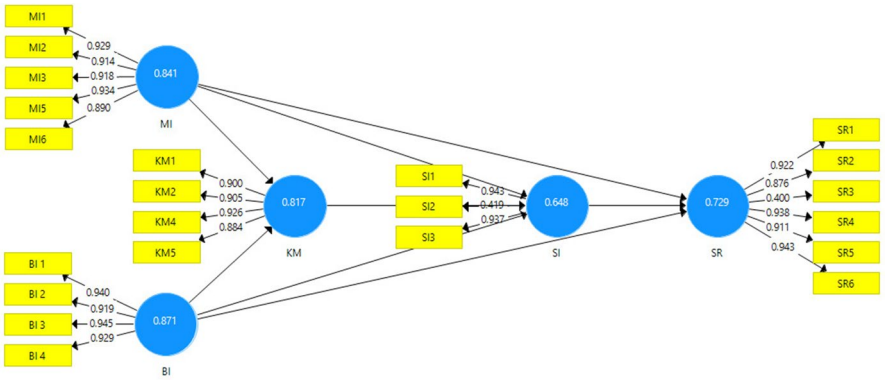

Fig. 3 Measurement model assessment showing the PLS algorithm. *Note* SR = Service Responsiveness; MI = Market Intelligence; BI = Business Intelligence; KM = Knowledge Management; SI = Service Innovation

is evident that all the mediation hypotheses (H_9, H_{10}, H_{11}, H_{12}, H_{13}, H_{14}) are supported and this means that knowledge management and services innovation play a mediating role between market intelligence, business intelligence and service responsiveness. Additionally, Table 7 shows that R-square (R^2) value is 0.599. According to Chin (1998), R-square (R^2) value above 0.33 and below 0.67 is deemed to be moderate. In the current study this value is 0.599 so R-square (R^2) has a moderate effect. It establishes that all the exogenous latent constructs can probably explain 59.9% variance in the endogenous latent variable.

Furthermore, Cohen (1988) demonstrates that 0.02 effect size (f^2) is small, 0.15 is moderate and 0.35 is strong. However, the results of the current study denote that market intelligence (MI), business intelligence (MI) and knowledge management (KM) have a small effect size (f^2) while service innovation (SI) has a moderate effect size (f^2). All the outcomes of effect size (f^2) are shown in Table 8. Finally, to examine the quality of the model,

Table 3 Outcomes of measurement model assessment (reliability and convergent validity)

Indicators	Alpha	CR	AVE
Market intelligence (MI)	0.953	0.964	0.841
Business intelligence (MI)	0.951	0.963	0.871
Knowledge management (KM)	0.925	0.947	0.817
Service innovation (SI)	0.705	0.833	0.648
Service responsiveness (SR)	0.915	0.939	0.729

Table 4 Discriminant Validity

	BI	KM	MI	SI	SR
BI					
KM	0.879				
MI	0.839	0.874			
SI	0.716	0.809	0.721		
SR	0.717	0.745	0.709	0.841	

SR Service responsiveness, *MI* Market intelligence, *BI* Business intelligence, *KM* Knowledge management, *SI* Service innovation

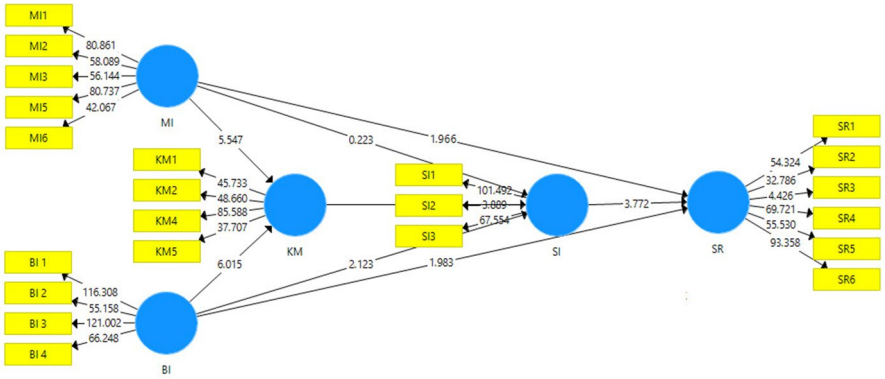

Fig. 4 Measurement model assessment showing the PLS bootstrapping. SR = Service Responsiveness; MI = Market Intelligence; BI = Business Intelligence; KM = Knowledge Management; SI = Service Innovation

Table 5 Direct effect results

	β	Mean	SD	T Statistics	*P* Values	Decision
BI→KM	0.496	0.501	0.082	6.015	0.000**	Supported
BI→SI	0.116	0.119	0.055	2.123	0.030*	Supported
BI→SR	0.286	0.305	0.144	1.983	0.048**	Supported
KM→SI	0.663	0.655	0.151	4.393	0.000**	Supported
MI→KM	0.472	0.468	0.085	5.547	0.000**	Supported
MI→SI	0.224	0.218	0.045	4.912	0.000**	Supported
MI→SR	0.165	0.154	0.084	1.966	0.049*	Supported
SI→SR	0.414	0.406	0.110	3.772	0.000**	Supported

SR Service responsiveness, *MI* Market intelligence, *BI* Business intelligence, *KM* Knowledge management, *SI* Service innovation

"**$P < 0.01$, *$P < 0.05$, ns = not significant ($P > .05$) (Two Tail)"

Table 6 Indirect effect results

	β	Mean	SD	T Statistics	*P* Values	Decision
BI→KM→SI	0.329	0.326	0.087	3.761	0.000**	Supported
MI→KM→SI	0.313	0.308	0.096	3.249	0.001**	Supported
BI→SI→SR	0.307	0.303	0.054	5.601	0.000**	Supported
BI→KM→SI→SR	0.136	0.135	0.059	2.322	0.021*	Supported
MI→KM→SI→SR	0.129	0.129	0.061	2.122	0.034*	Supported
MI→SI→SR	0.201	0.200	0.046	4.312	0.000**	Supported

SR Service responsiveness, *MI* Market intelligence, *BI* Business intelligence, *KM* Knowledge management, *SI* Service innovation

"**$P < 0.01$, *$P < 0.05$, ns = not significant ($P > .05$) (Two-Tailed)"

Table 7 R-Square (R^2) Value

Latent variable	Variance explained (R^2)
Service responsiveness (SR)	0.599

predictive relevance (Q^2) was performed. Predictive relevance (Q^2) is an alternative to goodness-of-fit. In this case, Q^2 value should be more than zero if a certain level of model quality is to be achieved (Henseler et al. 2009). This is documented in Table 9.

5 Results and discussions

Outcomes of the study revealed that market intelligence has a significant relationship with service responsiveness. The relationship between market intelligence and service responsiveness shows a t-value of 1.966 and β value of 0.165. Indicated here is a significant positive relationship with each other. Increases in market intelligence (external knowledge) will improve service responsiveness. In the same direction, it is found that business intelligence (internal knowledge) and service responsiveness have a significant positive relationship with each other with t-value of 1.983 and β value of 0.286. It demonstrates that both external knowledge and internal knowledge have the ability to enhance service responsiveness. Alminnourliza (2016) did research in Malaysia's postal and courier industry and found similar findings. Thus, the current study is consistent with Alminnourliza (2016). Furthermore, the research by Xie et al. (2021) highlighted that service responsiveness can be increased when management wants to get appropriate information for developing business plans and better processes. YuSheng and Ibrahim (2019) concluded that the management would be improved through understanding the external knowledge of the business environment as it can provide sustainable business performance and better services to clients.

Moreover, market intelligence and business intelligence have a significant positive relationship with knowledge management. According to the final outcomes of the study, the relationship between market intelligence and knowledge management had a significant t-value of 5.547 and β value of 0.472. Moreover, the relationship between business intelligence and knowledge management found a t-value of 6.015 and β value amounting to

Table 8 Effect size (f^2)

R-Squared	f-squared	Effect size (f^2)
Market intelligence (MI)	0.033	Small
Business intelligence (MI)	0.021	Small
Knowledge management (KM)	0.096	Small
Service INNOVATION (SI)	0.242	Moderate

Table 9 Construct cross-validated redundancy

Total	SSO	SSE	$Q^2 = (1\text{-SSE/SSO})$
Service Responsiveness (SR)	1194.000	708.195	0.407
Knowledge Management (KM)	796.000	257.906	0.676
Service Innovation (SI)	597.000	421.911	0.293

0.496. Consequently, the integration between external and internal knowledge management is most important (Díaz-Díaz and de Saá Pérez 2014). Hameed et al. (2021) reported that the knowledge management in any business will improve when the appropriate procedures are put in place, and it is constantly refined. In their work, YuSheng and Ibrahim (2019) reported that the sustainability of business knowledge management is possible with the internal information and external information practices are well synchronized. Xie et al. (2021) highlighted that the sustainability of business knowledge management is possible when the appropriate strategies are developed to combine them.

Outcomes of the study show that service innovation is based on external and internal knowledge acquisition. The relationship between external knowledge and services innovation found a t-value of 4.912 and β value of 0.224. Meanwhile, the relationship between internal knowledge and service innovation found a t-value of 2.123 and β value of 0.116. This indicates that both external and internal knowledge have a significant positive relationship with service innovation. According to Chesbrough (2006), external knowledge that is represented by customers, suppliers and external partners is essential to foster the internal capability to innovate services. Moreover, West and Gallagher (2006) discovered that internal and external knowledge are the key ingredients of the innovation process. Hence, the results of this study is similar to those of Chesbrough (2006) and West and Gallagher (2006).

Additionally, this study found that knowledge management is a mediating variable. Its mediation of external knowledge and service innovation was significant according to the t-value of 3.249. The mediation effect between internal knowledge and service innovation also proved to be significant with a t-value of 3.761 and a positive β value. So in this way, knowledge management increases service innovation when internal and external knowledge are managed effectively. Nevertheless, service innovation is a mediating variable between the relationship of external knowledge and internal knowledge with service responsiveness showing a t-value of 4.312 and 5.601, respectively. Although this relationship is newly developed in the literature, it is supported by what earlier studies reported. Xie et al. (2021) concluded that when the company's management has the relevant information about what knowledge is required, this information can be used in better ways for service innovation. Indeed, Hameed et al. (2021) reported that service innovation is possible when the management is genuinely keen on getting external knowledge for the organization's benefit, and utilize it so that service performance reflects what the market demands. Salunke et al. (2019) concluded that the reliability of service innovation and service responsiveness is based on a level of knowledge management that helps to develop a competitive advantage. Thus, consistent with knowledge management, services innovation increases the service responsiveness through effective external and internal knowledge acquisition.

6 Conclusion

The current study investigated the role of market intelligence and business intelligence on service responsiveness. Moreover, the mediating role of knowledge management and service innovation was examined. Data were collected from managerial staff of Malaysian postal and courier companies and surveys through a questionnaire. Results revealed that market intelligence and business intelligence are the major contributors to service responsiveness. Integrating external knowledge and internal knowledge enhances service innovation. External knowledge given by customers and suppliers has a key role to play in getting

the organization's internal knowledge to generate new ideas for service responsiveness in Malaysian postal and courier companies. Moreover, the role of knowledge management cannot be neglected. It is revealed that effective management of external as well as internal knowledge is the key to success in service innovation. Proper management of external and internal knowledge leads to better service responsiveness through innovation. By adopting the findings of this research, Malaysian courier companies can do more work on their systems of knowledge management by considering market intelligence and business intelligence, and in this way satisfy their customers. Scholars recommend extending this model of service responsiveness so that the moderating influence of consumer feedback can be tested between service innovation and service responsiveness. Finally, the moderating influence of advances in information technology should be tested for assessing the relationship between service innovation and service responsiveness.

6.1 Implications of the study

The current study has several theoretical as well as practical implications. Theoretically, the current study contributed significantly to the literature by examining the relationship between market intelligence, business intelligence, knowledge management, service innovation and service responsiveness. In rare cases any study formally documented this relationship in the postal and courier companies, particularly in Malaysia. Service responsiveness along with the service innovation is rarely discussed in the literature with reference to the postal and courier companies of Malaysia. This study proved that both market intelligence and business intelligence do make a key contribution to knowledge management, service innovation and service responsiveness which previous studies failed to identify. As well, this study examined the indirect effect of knowledge management and service innovation.

Along with the theoretical implications, the present study has practical implications for postal and courier companies. Its results are helpful for practitioners to promote services in postal and courier companies, which should promote market intelligence and business intelligence to promote their service responsiveness through knowledge management and service innovation. It is recommended that the postal and courier companies concentrate on external and internal knowledge acquisition through better knowledge management strategies. As this study proved the most crucial role of market intelligence in service responsiveness, therefore, postal courier companies should promote the use of market intelligence tools. Most importantly, to promote market intelligence, external knowledge should be focused by the management and indoor training session may be conducted to enhance the knowledge of the existing employees. Furthermore, business intelligence is another important element of service responsiveness. The management of these companies should enhance service responsiveness with the help of business intelligence using AI and machine learning approaches which can be promoted through internal knowledge and short-term courses. Some incentives may be given to employees who participate in these new training programmes for their future promotion and career development. In addition, the management should promote the extraction of valuable information to enhance knowledge management activities. Hence, this study has vital importance for the policy makers while making strategies to improve service responsiveness.

Appendix: Questionnaire of this research

Please circle your appropriate choice for variables, item code and their description from 1 to 5

1. Strongly disagree	2. Disagree	3. Neutral	4. Agree	5. Strongly Agree

Variables	Item Code	Description					
Service Responsiveness	SI1	The need of different customer groups drives new service development activities in our company	1	2	3	4	5
	SI2	When our customers are unhappy with the quality of products/services, we will take corrective actions immediately	1	2	3	4	5
	SI3	We use a formal program where we meet with our customers to determine their service needs regularly	1	2	3	4	5
	SI4	We make use of a formal program in which we ask customers for feedback on practices or policies regularly	1	2	3	4	5
	SI5	Our company involves in a formal internal process in which service and quality levels are examined regularly	1	2	3	4	5
	SI6	We deliver our services on time	1	2	3	4	5
Market Intelligence	MI1	Our company meets our customers regularly	1	2	3	4	5
	MI 2	Our company conducts related market research	1	2	3	4	5
	MI 3	Our company detects changes in consumers' preferences	1	2	3	4	5
	MI 4	Our company polls customers' opinion at least once a year	1	2	3	4	5
	MI 5	Our company detects fundamental shifts in industry	1	2	3	4	5
	MI6	Our company frequently reviews the effect of changes in business environment on customers	1	2	3	4	5
	MI7	Our customer feedbacks are taken into account for company's innovation plan	1	2	3	4	5
	MI8	Our suppliers have an influence in company's decision making	1	2	3	4	5
Business Intelligence	BI1	The employees are valuable to our company	1	2	3	4	5
	BI2	Our company has employees who are knowledgeable on organizations' operation	1	2	3	4	5
	BI3	Our company has a medium for employees to point out their opinion	1	2	3	4	5
	BI4	Managers outside the lower-level employee opinions for the benefit of our company	1	2	3	4	5
Knowledge Management	KM1	The Company can adapt quickly to the changing business environment and market changes	1	2	3	4	5
	KM2	The Company quickly understands and responds to customer demands both at present and future	1	2	3	4	5
	KM3	The departments, divisions and units of the company can collaborate well to achieve common goals	1	2	3	4	5

Variables	Item Code	Description	1	2	3	4	5
	KM4	The Company always has general rules on how to perform the work	1	2	3	4	5
	KM5	The Company appreciates its employees who have high sense of compliance with work regulations	1	2	3	4	5
Service Innovation	CP1	The postal/courier service requires the installation of new software to our company	1	2	3	4	5
	CP2	Our postal/courier service is supported by innovative technology	1	2	3	4	5
	CP3	The postal/courier service requires the installation of new hardware to our company	1	2	3	4	5

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