

The effects of retail channel integration through the use of information technologies on firm performance

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ABSTRACT

The ability of information technologies (ITs) to integrate activities and offerings across multiple channels offers a promising opportunity for retail firms to enhance their relationship with their customers and firm performance. Consumers value the flexibility to learn about the available offerings, complete their orders and obtain customer service across different channels in a convenient and integrated manner. Therefore, the retail industry has begun to use IT extensively to automate and integrate business processes across their traditional and online channels. This study examines the impacts of the use of IT by retail firms in integrating channel activities for selling to customers. Our research model argues that retail channel integration through IT should enhance the efficiency and innovation of a retail firm. In turn, these improvements should enhance their overall performance. We also propose that the environmental dynamism would moderate the effects of improvements in efficiency and innovation on firm performance. We draw upon recent theories in organizational resource integration and organizational learning to develop our research model and hypotheses. Based on survey data from 125 multichannel retailers in Singapore, we find that retail channel integration through the use of IT allows firms to not only be efficient in delivering the current offerings, but also be innovative in creating future offerings. Further, we find that environmental dynamism does positively moderate the effects of innovation ability on performance. Our results provide managerial insights for firms involved in digital integration not only in the retail sector but also in other service industries. These findings could also serve as a foundation for further research on service operations management for firms with both physical and online operations.

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1. Introduction

As a key industry in the service sector, retailers accounted for approximately 6.1% or \$884.9 billion of the U.S. GDP in 2010 (Bureau of Economic Analysis, 2011). Although the retail industry has traditionally been divided into store and non-store retailers, the “brick-and-click” business model is gaining prominence because the integration of retail processes across multiple channels allows retailers to benefit from the strengths of each channel and offer consumers multiple touch points and innovative services (Noble et al., 2009; Smith-Daniels, 2007; Wallace et al., 2004). Technology-savvy consumers now expect to receive pre-sales information, during-sales services, and after-sales support through a channel

customized to their convenience. Hence, multichannel retailers who can effectively manage their integrated service operations are deemed to be more capable of fulfilling the consumers' demands (Burke, 2002; Weinberg et al., 2007).

Retail firms such as Walmart, Macy's, Nordstrom, Best Buy, CompUSA, and Staples have exemplary multichannel retailing practices (Tedeschi, 2007a). However, a recent industry survey found that the majority of the current multichannel retailers have capabilities and systems that are siloed, which results in disjointed marketing and operations across retail channels (Cunnane, 2011). Multichannel retailing is challenging because it requires retailers to have functional integration across areas such as marketing, inventory, order fulfillment, and product returns so that the operations and logistical efforts are streamlined with the front-end marketing activities (Mollenkopf et al., 2007). It involves the extensive use of information technologies (ITs) to digitize and integrate resources and operations from physical and online retail channels.

Although recent supply chain research has examined internal integration, supplier integration, and customer integration of

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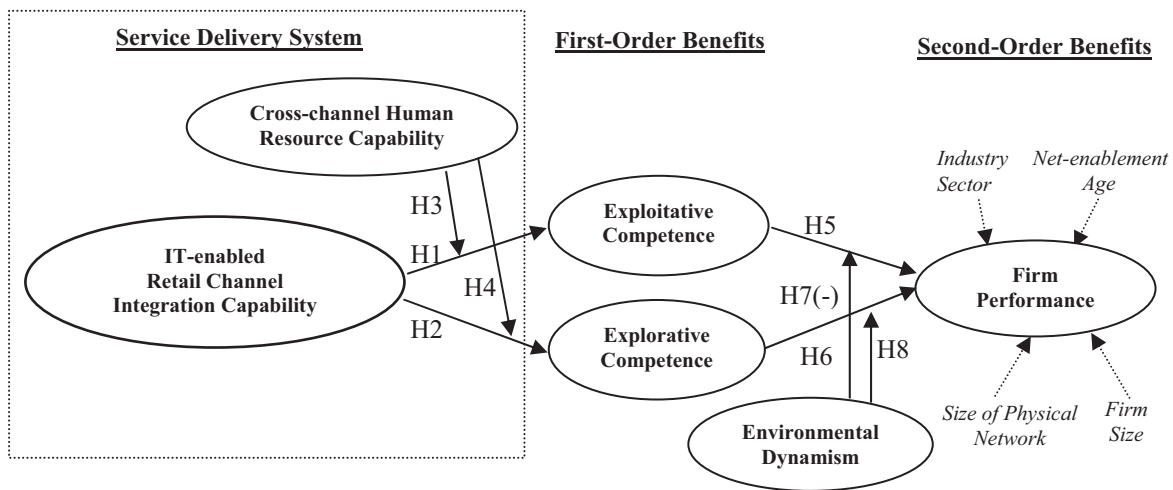


Fig. 1. Research model.

manufacturing firms (e.g., Koufteros et al., 2005; Swink et al., 2007), similar studies of services firms are lacking. Research on the impact of IT in operations management has also been primarily concentrated in manufacturing supply chain integration (e.g., Devaraj et al., 2007; Swink and Nair, 2007). Despite the increasing use of IT in service operations, research about its role has received limited attention in the service operations management literature (Machuca et al., 2007; Menor et al., 2002; Roth and Menor, 2003). Although some recent research has studied the impacts of IT on new product development (NPD) in manufacturing firms (e.g., Banker et al., 2006; Pavlou and El Sawy, 2006), the enabling role of IT in services industries is still relatively unexplored. Therefore, there have been growing calls to understand the connections between information systems (IS) and the design of service delivery systems in information-intensive service domains (Froehle and Roth, 2007; Spohrer et al., 2007).

We utilize theories related to the resource-based view of the firm and organizational learning to propose and empirically test hypotheses about the relationships between IT-enabled retail channel integration and firm performance. Prior research has proposed that when IT and business resources are deployed in a complementary manner, performance gains are likely (Barua et al., 2004; Melville et al., 2004; Ray et al., 2005; Tanriverdi, 2006; Wade and Hulland, 2004). Therefore, we study the complementary effects between the use of IT resources and human resources in retail channel integration. The next section describes the theoretical underpinnings of our research, the research model, and the hypotheses. Next, we describe the data-gathering procedure and operationalization of the constructs in the study. Subsequently, we describe the analysis and present our results. Finally, we discuss the future implications of our research.

2. Theoretical model and research hypotheses

2.1. Resource integration in service delivery systems

The resource-based view (RBV) of the firm has been widely used in service operations management research (e.g., Froehle and Roth, 2007; Menor and Roth, 2008; Roth and Jackson, 1995). It is especially appropriate for understanding the effects of firms' ability to integrate resources in delivering services and engaging in innovation activities (Goldstein et al., 2002; Sirmon et al., 2007). This theory is suitable for examining the effects of people, technology, and information resources across service delivery systems (Roth and Menor, 2003; Spohrer et al., 2007).

Although the RBV emphasizes the possession of rare, valuable, and inimitable resources as drivers of competitive advantage (Barney, 1991), recent theorizing argues that capability-building processes are more significant than resource-picking processes (Makadok, 2001). In competitive environments, the ability to integrate resources into bundles of competences is especially important (Eisenhardt and Martin, 2000; Sanchez, 2004; Sirmon et al., 2007; Teece et al., 1997; Teece, 2007) because they are difficult to imitate and confer firms with superior performance (Coates and McDermott, 2002). By integrating their operations across channels, retail firms can increase the difficulty of imitation because of the interconnectedness of integrated resources. Consequently, competitors would find it more difficult to isolate and identify the factors of success (King, 2007; Lavie, 2006; Pil and Cohen, 2006).

We use the RBV as the underlying conceptual foundation to propose a model that links resources, capabilities, higher-order competences, and firm performance in a service delivery system. Fig. 1 shows the research model. In this model, we examine the effects of two distinct capabilities within the service delivery system of retail firms: the IT-enabled retail channel integration capability and the cross-channel human resource capability. Further, drawing upon organizational learning theories, we propose that these capabilities influence firm competence in exploitation and exploration. These competences are viewed as impacting firm performance. Finally, we propose that environmental dynamism moderates the effects of these higher-order competences on firm performance. In the following sections, we describe the specific aspects of our model and the associated hypotheses.

2.2. IT-enabled retail channel integration capability

IT is becoming one of the most critical resources in service firms (Froehle et al., 2000; Sheehan, 2006); IT can be used to improve operational as well as strategic coordination (Sanders, 2008). IT is especially important for multichannel service operations management because the shareability and reusability of information are necessary for business process integration (Basu and Blanning, 2003). Therefore, it is crucial for multichannel retailers to use IT effectively in integrating their activities across the functional areas so that the consistency and flow of information regarding customers, orders, and inventory can be ensured (Cappiello et al., 2003; Markus, 2000; Vickery et al., 2003).

Consistent with Peng et al.'s conceptualization of operations capability (2008), we define *IT-enabled retail channel integration*

capability as a firm's ability to use IT in integrating their cross-functional channel resources and operations in their service delivery system. Our theorizing also parallels Rosenzweig et al.'s (2003) idea of supply chain integration intensity, which measures the linkages among the various supply chain elements.

The literature on traditional retailing and services marketing serves as the starting point for us to identify the dimensions of IT-enabled retail channel integration capability. For example, Mason and Mayer (1993), Samli (1989), and Zeithaml et al. (2009) identify product (breadth, depth), people (customer service, information, and employees), promotion (advertising, publicity), presentation (atmosphere), place (location, hours), process (customer involvement), and price as important activities for all retailing service firms. The literature in electronic commerce (Keeney, 1999) and multichannel retailing (Bendoly et al., 2005; Berman and Thelen, 2004; Mohammed et al., 2002; Steinfield et al., 2002) provides additional relevant insights about the key activities that might underlie resource integration in retail firms.

To further ensure that these dimensions have comprehensively covered the entire domain of cross-channel shopping important in the provision of multichannel retail services, we conducted interviews with consumers and focus group discussions with retailing practitioners. Next, we mapped the activities to the three common stages of the shopping process: pre-purchase, purchase, and post-purchase. Table 1 shows the results of our conceptual validation. These steps provided assurance of content validity for the six retail channel integration routines identified:

1. *Integrated promotion*: the advertising and publicity of one channel through another channel, to encourage customers of one channel to use the others, and increase awareness of the different channels (Bahn and Fischer, 2003). For example, the physical store can be used as an advertising medium for the Website through brochures, receipts, carrying bags, and posters (Berman and Thelen, 2004). Likewise, the Website can provide contact information about the physical stores and announce in-store promotions (Otto and Chung, 2000).
2. *Integrated transaction information management*: collecting customers' online and offline transaction information, managing this integrated information, and making it available across multiple channels (Kalakota and Robinson, 2004). Integrated transaction information increases the richness of the information available and the quality of services that can be provided (Payne and Frow, 2004). It allows the retailer to provide many value-added services such as personalized Web pages. It also enables customers to review their previous purchases and provides them with suggestions that can reduce the effort of future purchases (Straub and Watson, 2001).
3. *Integrated product and pricing information management*: ensuring the consistency of product and pricing information across different retail channels. This can be achieved by integrating product catalogs and ensuring that product descriptions, product categories, prices, and discounts are consistent in the various channels (Daniel and Wilson, 2003). It ensures the transparent flow of information between processes and reduces confusion arising from information inconsistencies (Rangaswamy and Van Bruggen, 2005).
4. *Integrated information access*: providing customers with access to information available in one channel from another channel. For example, the Website can allow customers to search for products available in the physical store through an integrated database (Bendoly et al., 2005). Likewise, information kiosks at the physical store can help customers search for product information, availability, and the store location of products from the Website (Gulati and Garino, 2000). Information on real-time inventory can be made available online so that customers will

not make wasted trips to the store when the product is not in stock (Prasarnphanich and Gillenson, 2003).

5. *Integrated order fulfillment*: offering support for customers to choose their preferred channel and complete their purchases. It includes allowing customers to use the online channel to order products and then pick them up at nearest physical stores and providing for gift coupons to be redeemed either online or offline (Wallace et al., 2004). Consumers can also choose to pay for their online purchases at the retailer's physical stores. An integrated product cataloging system can allow customers to place online orders quickly based on catalog numbers (Saeed et al., 2003). Customers can also place orders for out-of-stock items using self-serve Internet kiosks.
6. *Integrated customer service*: providing services for customers to access service support in the channel of their choice. Support can be offered at physical stores for problems related to online purchases, such as allowing customers to return goods ordered online at a physical store (Bendoly et al., 2005). It also involves having an integrated communication channel in which the Website provides after-sales services such as support for products bought in physical stores as well as real-time live chat that gives online customers access to customer service assistants (Amit and Zott, 2001; Jana, 2007).

Collectively, these six dimensions form the IT-enabled retail channel integration capability. Higher levels of retail channel integration occur when a retail firm can implement more of the above routines. Our research model proposes that the degree of channel integration will impact the development of competences in retail firms.

2.3. Antecedents of firm competences

Service firms can develop competences either by making process changes to their service delivery system or by adding a new service to their current mix (Menor and Roth, 2007). They seek to attain exploitative and explorative competences. *Exploitative competence* refers to the ability to maintain efficiency and make improvements to current operations, whereas *explorative competence* refers to the ability to offer presently unavailable services through new ways of combining existing resources to offer presently unavailable services (Jansen et al., 2006; Levinthal, 2005).

Resource integration enables firms to develop exploitative competence by using tangible resources to deepen relationships with existing customers (Hoque et al., 2006). Synergies from channel integration can reduce e-fulfillment costs through the sharing of infrastructure and resources. For example, inventories can be shared to reap pooling benefits, and the integration of information and order fulfillment processes allow customers to engage in self-service such as "online order/in-store pickup." These reduce the distribution and customer service costs (Chatterjee, 2010; Wind and Mahajan, 2002). As a result of channel integration, firms can provide more personalized information and differentiated services as well as a greater range of products (Agatz et al., 2008; Barnes et al., 2004).

Hypothesis 1. A higher level of integration across multiple retail channels with the use of IT will increase the ability of retail firms to improve the efficiency of their current operations (exploitative competence).

Channel integration also allows firms to bundle resources to enhance their explorative competence. The availability of a broad set of cross-channel resources provides firms with the flexibility to quickly reallocate resources and design innovative services to attract new customers, or to configure new channels for service delivery and handling of product returns (Benner and Tushman,

Table 1
Conceptual mapping of multichannel retail routines.

Multichannel retail routine	Stage of purchase		
	Pre-purchase	Purchase	Post-purchase
Integrated promotion	•		
Integrated transaction information management		•	•
Integrated product and pricing information management	•	•	
Integrated information access	•		
Integrated order fulfillment		•	
Integrated customer service	•	•	•

2003). The integration of knowledge about customers' needs, preferences, and buying behaviors across retail channels can result in numerous cross-channel synergies (Tanriverdi and Venkatraman, 2005). For example, the integration of offline and online transaction information would provide firms with "360-degree customer views" and thus would open up many opportunities to introduce new services (Kalakota and Robinson, 2004).

Hypothesis 2. A higher level of integration across multiple retail channels with the use of IT will enhance the ability of retail firms to offer new services (explorative competence).

Although channel integration capability can directly impact a retail firm's competences, the presence of a compatible human resource capability is likely to accentuate this effect. We define *cross-channel human resource (HR) capability* as a firm's ability to build talented staff that can operate effectively in supporting channel integration activities. Human resource capability has been found to be complementary to IT assets (Aral and Weill, 2007) and can have synergistic outcomes, including increased efficiency and enablement of new processes (Nevo and Wade, 2010). IT investments without the ability to use IT effectively do not enhance performance (Pavlou and El Sawy, 2006).

Innovations in services require the combination of both "hard" technologies, such as equipment and software, and "soft" aspects, such as human skills (Bettencourt and Gwinner, 1996; Froehle and Roth, 2007; Tether, 2005; Van der Aa and Elfring, 2002). In retailing, frontline service employees, who are responsible for sales and service delivery, play an important role (De Jong and Vermeulen, 2003). Hence, it is important to integrate frontline service employees with other resources such as IT in service design (Georgantzias and Madu, 1994). The level of service quality provided by the frontline service employees, in terms of understanding customers' needs and providing service competently, has been found to be positively correlated with favorable customer behavioral intentions (Boyer and Hult, 2006).

The cross-channel HR capability describes frontline employee's awareness, business skills, and technical knowledge about the entire set of service offerings across all of the channels (Payne and Frow, 2004). For example, customer service personnel in the physical store should be knowledgeable about the firm's cross-channel options, such as "ship-to-store," "online gift card redemption," "in-store payment for online orders," and "in-store returns of online orders." In addition, when consumers communicate through electronic means from the store's Website, they would expect the online customer service assistant to handle enquires related to the physical stores (Burke, 2002). Because retail channel integration involves functional interdependencies, the presence of complementary resources that can facilitate integration will strengthen the outcomes resulting from the use of technologies (Swink and Nair, 2007).

Hypothesis 3. The effects of IT-enabled retail channel integration on efficiency (exploitative competence) will be enhanced by a higher level of cross-channel human resource capability.

Hypothesis 4. The effects of IT-enabled retail channel integration on the ability to provide new services (explorative competence) will be enhanced by a higher level of cross-channel human resource capability.

2.4. Competences and firm performance

The integration of organizational resources can simultaneously improve both efficiency and flexibility, i.e., the organization's exploitative and explorative competences (Barki and Pinsonneault, 2005). Firms enjoy superior performance when they are able to satisfy the needs of current customers and attract new customers (Connor, 2007; Winterscheid, 1994). Positive performance implications arising from exploitative and explorative competences have been attested to in empirical studies, such as He and Wong (2004), Jansen et al. (2006), and Kyriakopoulos and Moorman (2004).

Exploitative competence allows firms to improve existing services and increase the efficiency of existing distribution channels (Abernathy and Clark, 1985). By drawing upon their exploitative competence, firms can meet current business demands through more efficient operations (O'Reilly and Tushman, 2004). It allows firms to reduce operating costs substantially (Barnes et al., 2004) and utilize their physical and informational assets effectively to increase the differentiation of their services (Straub and Watson, 2001). Retailers that employ strategies to reduce costs or improve delivery in terms of order accuracy or customer service have been found to achieve more superior firm performance (Boyer and Olson, 2002). By tapping resources across multiple channels to provide flexible options throughout the purchase process, firms can involve customers in co-creating personalized value, thereby increasing the level of customer loyalty (Prahalad and Ramaswamy, 2004).

Hypothesis 5. Higher levels of efficiency in operations (exploitative competence) will enhance the performance of retail firms.

Explorative competence gives firms the capacity to attract new customers (Benner and Tushman, 2003). Firms with higher levels of explorative competence can quickly reallocate resources based on changing market conditions. They can implement strategies to offer customers new distribution channels and new ways of performing transactions (Abernathy and Clark, 1985). By having multichannel IT systems and cross-channel service employees, a firm can both ensure that customers remain in its retail channels throughout the search and purchase phases and increase the opportunities for cross-selling (Verhoef et al., 2007). Consequently, firms can penetrate untapped market opportunities, garner new market share, and grow revenue (Storey and Easingwood, 1999).

Hypothesis 6. Higher levels of ability to provide new services (explorative competence) will enhance the performance of retail firms.

Environmental dynamism may affect the extent to which exploitative and explorative competences contribute to a firm's performance. In a dynamic environment, market shifts due to changes in consumer preferences, competitors' marketing

practices, and volatilities in the industry are swift (Boyd et al., 1993). Such an environment requires firms to be agile in reallocating their resources and proactive in their innovation activities to pursue emerging market opportunities (Covin and Covin, 1990). Firms that can capitalize on changing market conditions by creating new products and services to meet the needs of new markets would be able to enjoy superior performance (Zahra, 1996). Hence, when firms are operating in a dynamic environment, we expect that the positive relationship between explorative competence and firm performance will be strengthened. Conversely, in environments with high dynamism, competences focused on cost efficiencies and incrementally differentiated innovations are less valuable. Because exploitative competences are oriented toward the needs of current customers, they would have a negative effect on firm performance because dynamic environments are characterized by changing customer preferences and market demands.

Hypothesis 7. In a dynamic environment, the influence of exploitative competence on firm performance will be weakened.

Hypothesis 8. In a dynamic environment, the influence of explorative competence on firm performance will be strengthened.

2.5. Control variables

Consistent with prior research on the business value of IT and firm performance, we expect firm performance to be influenced by firm size and net-enablement age (i.e., number of years since the firm established its Website). Next, the extent to which a firm achieves superior performance through implementing various multichannel strategies is likely to be affected by the size of the physical store network because a large chain store can have more resources available for its online activities. Furthermore, integration of certain activities might differ across various retail industry sectors due to the products' physical properties (Steinfield et al., 2005), and this might influence firm performance. Therefore, we used these four factors as control variables for firm performance.

3. Research methods

3.1. Data collection

The unit of our analysis is a retail firm with both physical store(s) and a Website. Our sampling frame was drawn from *Dun and Bradstreet* directories and included retail trade companies in Singapore with Standard Industrial Classification (SIC) codes ranging from 5211 to 5999. The final sampling frame comprised 562 retail firms. We chose to use a survey approach instead of a field study based on interviews because much exploratory research has already been performed using a qualitative approach (e.g., Bahn and Fischer, 2003; Steinfield et al., 2002). Besides, existing research on multichannel retailing has focused mainly on conceptual frameworks (e.g., Neslin et al., 2006; Steinfield, 2002), consumer survey (e.g., Konus et al., 2008), Website content analysis (e.g., Muller-Lankenau et al., 2006), and analytical modeling (e.g., Venkatesan et al., 2007). Because empirical studies using surveys are scarce, we seek to enhance the generalizability of the evidence by conducting a large-scale survey.

We conducted the survey over three months using a three-wave mailing procedure (Dillman, 1999). A survey package with a postage-paid return envelope was mailed to the CEO (or equivalent senior executive) of each multichannel retailer. One week after the initial mailing, a reminder postcard was sent to each firm. After approximately one more week, a complete survey package was again mailed to all firms, excluding those that had already responded. After accounting for 20 undelivered packages and discarding eight incomplete responses, we obtained a final usable

sample of 125. The response rate of 24.5% is considered reasonable because the survey was unsolicited and involved the participation of senior management.

We motivated the respondents to provide valid data by offering a summary of the results and an invitation to a workshop on the findings. These helped ensure their professional interest in and commitment to providing accurate data. We assessed non-response bias by verifying that early and late respondents did not significantly differ in demographic characteristics and responses to principal constructs (Armstrong and Overton, 1977). A chi-squared analysis of the respondents' industry distribution also indicated no significant differences from the population industry distribution. Table 2 shows the characteristics of our sample.

3.2. Measurement of constructs

3.2.1. Integration capabilities

IT-enabled retail channel integration capability was conceptualized as a second-order formative construct manifested in the six integrated retail routines as first-order constructs. The extent of integration of each retail routine was measured with items as formative indicators (see Table A1 in Appendix A). The scale for measuring *cross-channel HR capability* was adapted from Byrd and Turner (2000) and Tippins and Sohi (2003). HR capability was assessed in terms of the service employees' knowledge and skills to exploit the IT infrastructure and their understanding of the firms' activities across multiple channels.

3.2.2. Firm competences

The scales used to measure exploitative and explorative competences were based on the work of Benner and Tushman (2003) and Mizik and Jacobson (2003) and the measurement scales developed by He and Wong (2004) and Jansen et al. (2006). These were contextualized to the domain of multichannel retailing. *Exploitative competence* measured the extent to which a firm is able to exploit cross-channel infrastructure synergies and customer information to reduce costs, to differentiate products/services, and co-opt customers in personalizing their shopping experiences. *Explorative competence* assessed the ability to launch new marketing strategies, to offer new ways of performing transactions and customer service support, and to quickly reallocate resources in response to market changes. Our measurement items for exploitative and explorative competences have some similarities with the assessment of operational and strategic benefits by Subramani (2004) and Sanders (2008). These authors measured operational benefits as cost efficiencies from higher sales volumes, improvements to current processes or creation of new processes, and increased profitability. Strategic benefits were assessed as learning about customers and markets for new products, creation of new products, product enhancements, and development of new business opportunities. The measurement approach we have used was also in line with Peng et al.'s (2008) assessment of improvement capability and innovation capability.

3.2.3. Environmental dynamism and firm performance

The scale to measure *environmental dynamism* was adapted from Paswan et al. (1998). Because not all of the firms in our sample are publicly listed companies, objective firm performance measures were not available for many of them. Furthermore, some responses were not identifiable because we provided the option to respond to the questionnaire anonymously. Tallon and Kraemer (2007) suggested that executives' perceptions of firm performance can be an accurate proxy measure in the absence of objective data on IT payoffs. Management assessments are generally consistent with secondary published performance data external to the firm. In the context of assessing organizational integration,

Table 2
Sample characteristics.

	Category	Number	%
Respondent position	CEO, CFO, CIO, Managing Director	80	64.0
	Sales and Marketing Directors/Managers	29	23.2
	Executives	10	8.0
	Others	6	4.8
Retail industry sector	Apparels, Accessories and Jewelry	23	18.4
	Cars and Automotive Products	9	7.2
	Book and Stationery Stores	5	4.0
	Furniture, Home Furnishings and Building Hardware	13	10.4
	Eating and Drinking Places	12	9.6
	Florists and Gifts Shop	15	12.0
	Grocery Stores and Health Products	13	10.4
	Home Appliances, Computers and Electronics	25	20.0
	Departmental Stores and Other Merchandise	10	8.0
No. of employees	<50	77	61.6
	50–100	19	15.2
	101–200	14	11.2
	>201	15	12.0
No. of physical retail stores	<5	84	67.2
	5–10	16	12.8
	11–20	15	12.0
	>20	10	8.0

Barki and Pinsonneault (2005) advocated that obtaining measures from knowledgeable individuals is a feasible approach. Following Wade and Hulland's (2004) recommendation, we measured *firm performance* using five indicators, which were measured relative to major competitors: market share gains, net profits, revenue growth, return on investments, and return on assets.

As a form of rigor test, we obtained the actual revenue figures for 39 firms (31.2% of sample) for which the respondents had attached their business cards to the returned questionnaires. Because we asked the respondents to assess their performance relative to their major competitors, we divided the dataset into different retail industry sectors and performed within-group correlation tests between the revenue per employee figure and the perceived aggregated firm performance measure. We obtained significant correlations ($p < 0.05$) ranging from 0.28 to 0.45 for different sectors with an overall average correlation of 0.39, indicating that our perceptual measures of performance are sufficiently correlated with objective measures.

3.2.4. Control variables

Firm size was coded as the *log* of the number of employees, and net-enablement age was represented as the *log* of the number of years of Website establishment. Physical network size was coded as the *log* of the number of physical retail store(s) in Singapore, and industry sector was coded as dummy variables for different retail industries.

4. Data analyses and results

4.1. Descriptive statistics of retail channel integration routines

Table 3 shows the descriptive statistics of the six first-order integrated retail routines forming the second-order IT-enabled retail channel integration capability construct.

Our results lend support to the common belief that the current level of retail channel integration is indeed rather low. On a scale of 0–9, the average channel integration capability value that we obtained for our sample population from Singapore was only 3.116. Firms scored high on the aspects of integrating promotion ($M = 5.378$) and product and pricing information ($M = 5.286$), but were weak in the deployment of IT to facilitate cross-channel order fulfillment ($M = 1.617$) and information access ($M = 1.512$).

Although “online order/in-store pickup” is fast becoming a common offering by many large multichannel retailers, it is a shipping option that requires the tight integration of the ordering and inventory systems. This can be challenging for retailers with fewer resources. Furthermore, most retailers in our sample did not allow in-store payment for online orders.

The low score on integrated information access was mainly due to the low adoption of in-store Internet-ready kiosks. Increasingly, many leading multichannel retailers such as J.C. Penney have been using in-store kiosks with great success. Given the ability of kiosk technology to reduce costs, increase orders for out-of-stock items, and promote cross-selling, the technology can be a key differentiator for building cross-channel capabilities (Demery, 2006). Retailers can offer wide-ranging technology-facilitated customer contacts to enhance service experience when kiosks are used by both customers and service personnel (Froehle, 2006). Although in-store kiosks installed by the retailers offer access to convenient integrated information, the advent of new mobile technologies has provided numerous other access options. For example, many retailers now provide service personnel with mobile handheld devices. In addition, many consumers are now accessing retailers' online channels from their mobile devices such as cell phones and tablet PCs. Many retailers are also developing iPhone and Android applications that provide consumers with highly mobile integrated information access. However, such mobile devices are limited in their screen size and ease of use, so it is likely that the user-friendly and customizable interface of kiosks will continue to play an important role in providing integrated information access despite the ubiquitous use of mobile devices in stores.

Table 3
Descriptive statistics of six formative routines of retail channel integration capability.

First-order formative construct	Mean	S.D.
Integrated promotion	5.378	1.901
Integrated transaction information management	2.465	2.353
Integrated product and pricing information management	5.286	2.243
Integrated information access	1.512	1.699
Integrated order fulfillment	1.617	1.837
Integrated customer service	2.440	2.456
Retail channel integration capability	3.116	1.473

4.2. Data analysis approach

The partial least squares (PLS) modeling technique, as implemented in Smart-PLS version 2.0.M3 (Ringle et al., 2005), was used for the data analysis. It is an appropriate method for testing predictive research models (Joreskog and Wold, 1982) because it can assess the measurement model (relationships between items and constructs) within the context of the structural model (relationships among constructs). PLS maximizes the explanation of variance and prediction in the theoretical model and is especially suitable for research involving a relatively small sample size. Although a series of multiple regression analyses could be used to test the model, PLS is a better approach because it can simultaneously account for measurement errors for unobserved constructs and examine the significance of structural paths. Our dataset satisfied the criterion that the sample size should be at least 10 times the largest number of structural paths directed at any one construct (Chin et al., 2003).

4.3. Assessment of common method bias

Because each response came from a single key informant, common method bias could be present (Podsakoff et al., 2003). To address this bias procedurally, we allowed respondents to answer anonymously to reduce their evaluation apprehension and to minimize social desirability bias. Next, we conducted two tests to determine the extent of common method variance (CMV) in the dataset. First, we performed a Harman's single-factor test on the reflective construct variables. The results showed the presence of five factors, indicating that common method effects are not likely to contaminate the results obtained. Second, we followed the method developed specifically for PLS analysis by Liang et al. (2007). We included a common method factor in the PLS model whose indicators included all of the constructs' indicators. We then calculated each indicator's variances substantively explained by the principal construct and by the method factor. We found that the average variance explained (AVE) by the indicators is 0.751, whereas the average method-based variance is 0.007. None of the method factor loadings are significant. These tests suggested that CMV is unlikely to pose a serious threat to the validity of the results.

4.4. Measurement model evaluation

Because the formative construct of retail channel integration capability is a latent variable determined by its indicators, the breadth of the definition is very important. The failure to consider all facets of the construct could lead to exclusion of relevant indicators (Nunnally and Bernstein, 1994). Thus, we adhered strictly to the recommendations of Diamantopoulos and Winklhofer (2001) on index construction to ensure the validity of our measure. First, we assessed the item weights to provide an indication of whether the item is relevant in forming the construct. As shown in Table A1, all item weights are significant at the 0.10 level or better. Next, we checked for indicator collinearity to minimize difficulties in separating the distinct influence of the individual items. Multicollinearity among the indicators was far below the variance inflation factor (VIF) cutoff threshold of 10.

To examine the convergent and discriminant validity of the formative scales, we followed the methods used in Loch et al. (2003) by calculating weighted score for each item as well as a weighted composite score for each of the six formative constructs. The weighted score of each of the six first-order constructs (η_i) was calculated using the principal components factor analysis approach (Diamantopoulos and Winklhofer, 2001)

$$\eta_i = \gamma_{i1}x_{i1} + \gamma_{i2}x_{i2} + \dots + \gamma_{ij}x_{ij}$$

where, γ_{ij} is the weight reflecting the contribution of the latent variable i 's j th item x_{ij} , and i is between 1 and 6 inclusive.

This process produced six values (η_i) representing the weighted scores of the six retail channel integration routines, which were used as formative indicators in the structural modeling. Next, the weighted items ($\gamma_{ij}x_{ij}$) were correlated against the composite weighted score (η_i) for each construct i , representing a "loading," whereas the correlations with other constructs represent the "cross-loadings" (Patnayakuni et al., 2006). The results in Table 4 show that all measures of the same construct are significantly correlated at $p < 0.01$ and that each item's correlation with its own construct is higher than that with other constructs. These results provide evidence of convergent and discriminant validity (Loch et al., 2003).

Table A2 in Appendix A shows the measurement scales of the reflective constructs. We used three tests to determine the convergent validity and internal consistency of the five reflective constructs: item loading, composite reliability of construct, and the construct's AVE. Table 5 presents the psychometric properties and descriptive statistics. All item loadings between an indicator and its posited underlying construct factor were greater than 0.7. Composite reliability of constructs all exceeded Nunnally and Burstein's (1994) criterion of 0.7, while the AVE was above the recommended threshold of 0.5, adequately demonstrating convergent validity. Table 6 reports the test for discriminant validity of the reflective constructs. The diagonal elements are the AVE for each construct, which, for discriminant validity, should be greater than the off-diagonal elements of the square of inter-construct correlations. All constructs fulfilled the requirement for discriminant validity.

4.5. Structural model test results

After assuring the psychometric properties of the measurement model, the PLS structural model was next assessed to determine the significance of the hypothesized paths and its explanatory power based on the amount of variance accounted for by the endogenous constructs (Marcoulides and Saunders, 2006).

We first estimated a structural model of firm performance with only control variables (Model 1). Next, we followed the method proposed by Chin et al. (2003) to create interaction constructs of (Retail Channel Integration Capability \times Cross-channel HR Capability), (Exploitative Competence \times Environmental Dynamism), and (Explorative Competence \times Environmental Dynamism) by multiplying indicators of each construct. We mean-centered the scores of the indicators before creating the interaction terms to minimize multicollinearity, which might arise from high correlations between the interaction and the main effects terms. Finally, we added the theoretical variables of Retail Channel Integration Capability, Cross-channel HR Capability, Exploitative Competence, Explorative Competence, Environmental Dynamism, and the three interaction constructs (Model 2) to determine their additional effects on explaining the additional variance of performance.

Fig. 2 shows the PLS results of Model 2, including standardized path coefficients, significance based on two-tailed t -tests for our hypotheses, and the amount of variance explained (R^2). A bootstrapping resampling procedure was used to estimate the standard errors and determine the significance of the path coefficients. With the addition of theoretical variables (Model 2) to the control variables model (Model 1), 22.3% incremental variance in the performance was explained. Following this, we used a pseudo F -test to statistically assess the effects of adding theoretical variables to the change in the R^2 of performance. The effect size f^2 was calculated as $(R^2_{\text{revised-model}} - R^2_{\text{original-model}}) / (1 - R^2_{\text{revised-model}})$, and the pseudo F -statistic was computed with the multiplication of f^2 with $(n - k - 1)$, where n is the sample size and k the number

Table 4
Item-to-construct correlation versus correlations with other constructs.

Construct	Items	IP	IT	IPP	IIA	IOF	ICS
Integrated promotion (IP)	IP1	0.851	0.421	0.501	0.469	0.492	0.470
	IP2	0.792	0.487	0.581	0.482	0.536	0.451
	IP3	0.804	0.426	0.556	0.492	0.499	0.552
	IP4	0.785	0.372	0.513	0.394	0.427	0.409
	IP5	0.718	0.474	0.487	0.474	0.511	0.460
Integrated transaction information management (IT)	IT1	0.412	0.846	0.526	0.510	0.537	0.423
	IT2	0.425	0.742	0.480	0.532	0.483	0.398
	IT3	0.473	0.797	0.498	0.426	0.455	0.468
	IT4	0.447	0.811	0.501	0.428	0.449	0.470
Integrated product and pricing information management (IPP)	IPP1	0.506	0.423	0.906	0.376	0.400	0.403
	IPP2	0.525	0.426	0.873	0.389	0.418	0.409
	IPP3	0.485	0.462	0.788	0.364	0.517	0.398
	IPP4	0.529	0.397	0.826	0.381	0.461	0.367
	IPP5	0.539	0.403	0.829	0.379	0.448	0.356
Integrated information access (IIA)	IIA1	0.456	0.395	0.466	0.812	0.568	0.501
	IIA2	0.468	0.416	0.414	0.787	0.572	0.532
	IIA3	0.512	0.484	0.471	0.790	0.515	0.417
	IIA4	0.479	0.459	0.462	0.698	0.523	0.426
	IIA5	0.558	0.382	0.426	0.729	0.533	0.468
Integrated order fulfillment (IOF)	IOF1	0.617	0.585	0.502	0.476	0.886	0.356
	IOF2	0.601	0.591	0.511	0.465	0.820	0.369
	IOF3	0.444	0.455	0.423	0.384	0.853	0.392
	IOF4	0.409	0.413	0.432	0.371	0.839	0.398
	IOF5	0.391	0.432	0.413	0.368	0.814	0.421
	IOF6	0.562	0.385	0.389	0.529	0.781	0.336
Integrated customer service (ICS)	ICS1	0.436	0.489	0.369	0.371	0.419	0.866
	ICS2	0.515	0.463	0.385	0.391	0.423	0.839
	ICS3	0.513	0.427	0.336	0.350	0.409	0.818

Notes: All item-to-construct correlations are significant at the 0.01 level. Diagonal boldface numbers are the item-to-construct correlations while off-diagonal numbers are item-to-other-construct correlations.

Table 5
Psychometric properties and descriptive statistics of measurement model.

Construct	Item loading	Composite reliability (Cronbach's alpha)		AVE	Mean	S.D.
Cross-channel human resource capability		0.952	(0.928)	0.833	4.163	1.387
HRC1	0.807					
HRC2	0.937					
HRC3	0.964					
HRC4	0.935					
Exploitative competence		0.912	(0.872)	0.723	3.988	1.284
EXPLOIT1	0.871					
EXPLOIT2	0.866					
EXPLOIT3	0.793					
EXPLOIT4	0.867					
Explorative competence		0.911	(0.869)	0.719	4.215	1.273
EXPLORE1	0.857					
EXPLORE2	0.885					
EXPLORE3	0.905					
EXPLORE4	0.735					
Environmental dynamism		0.903	(0.868)	0.651	4.954	1.035
ENV1	0.755					
ENV2	0.806					
ENV3	0.853					
ENV4	0.849					
ENV5	0.842					
Firm performance		0.939	(0.918)	0.756	4.420	0.915
PERFORM1	0.804					
PERFORM2	0.868					
PERFORM3	0.894					
PERFORM4	0.879					
PERFORM5	0.898					

Table 6
Discriminant validity of reflective constructs.

Construct	HRC	EXPLOIT	EXPLORE	ENV	PERFORM
HRC	0.833				
EXPLOIT	0.115	0.723			
EXPLORE	0.199	0.445	0.719		
ENV	0.103	0.122	0.135	0.651	
PERFORM	0.256	0.182	0.160	0.114	0.756

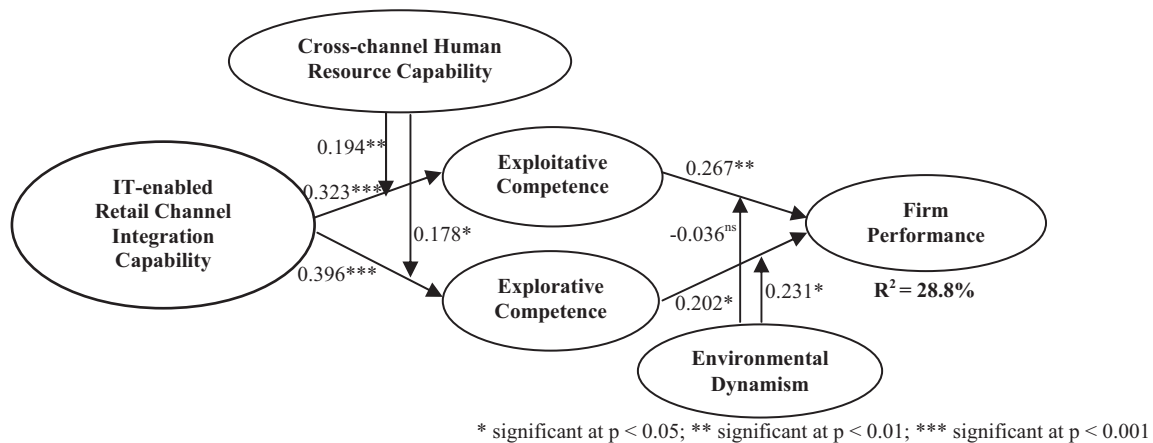


Fig. 2. Research model with PLS results.

Table 7
Variance explained by control and theoretical models.

Dependent variable	R^2 (Model 1)	R^2 (Model 2)	f^2 value	Pseudo F -statistic	Degrees of freedom
Firm performance	0.065	0.288	0.313	37.247**	(1,122)

** $p < 0.01$.

of independent constructs. Table 7 shows that adding theoretical variables to the control variable model significantly increased the variance explained for performance. The effect size f^2 of 0.313 of the full model is between a medium and large effect (Cohen, 1988). The variables in our research model could explain 28.8% of the variances in performance. All the control variables were insignificant at $p < 0.05$. Fig. 2 presents the results of the research model.

Hypotheses H1, H2, H3, and H4, which were related to the antecedents of firm competences, were supported. The IT-enabled retail channel integration capability had direct effects on exploitative competence ($b = 0.323$, $p < 0.001$) and explorative competence ($b = 0.396$, $p < 0.001$). Next, the presence of cross-channel HR capability positively moderated the relationship between channel integration capability and exploitative competence ($b = 0.194$, $p < 0.01$) as well as the relationship between channel integration capability and explorative competence ($b = 0.178$, $p < 0.05$).

Our findings are consistent with Sanders's (2008) study about the positive effects of IT use for exploitation and exploration in the computer industry. Although investing in IT to build retail channel integration capability can have a direct impact on firm competences, our results suggest that the presence of cross-channel human resources can be complementary. This is in line with the argument that the added value of IT assets can only be realized through their appropriate use with other complementary investments (Hoque et al., 2006). Our results converge with those of Powell and Dent-Micallef (1997) on the competitive advantage of IT and its complementary role with human, business, and technology resources. Similar to our results, they found that IT alone does not produce sustainable performance advantages in the retail industry, but that some firms gain advantages with IT to complement other business resources.

Hypotheses H5 and H6, related to the performance effects of firm competences, were supported. The levels of exploitative competence ($b = 0.267$, $p < 0.01$) and explorative competence ($b = 0.202$, $p < 0.05$) had direct influences on performance. These results suggest that both competences can lead to stronger performance for multichannel retail firms. Our findings support the view that firms devoting resources to meet the needs of current customers in existing markets at the expense of addressing emerging markets ran the risks of unsustainable performance (Christensen and Bower, 1996)

because firms that focus exclusively on serving existing customers may risk ignoring potential customers, thus resulting in missed market opportunities (Danneels, 2003). Hence, it is important to be able to meet current customer requirements and new customer demands (Berger and Bechwati, 2001; Blattberg and Deighton, 1996).

Exploitative competence can increase the efficiency of the customer-oriented processes. The increase in technology-mediated self-service options for customers can reduce the distribution and customer service costs (Mills and Morris, 1986). Furthermore, firms can increase overall customer value by allowing customers to co-create and personalize their shopping experience through flexible and convenient multichannel options. More firm-customer contact points in an integrated retail channel can improve multichannel service quality, thereby helping the firm retain its current market share (Palmer, 2006; Sousa and Voss, 2006).

At the same time, the integration of retail channel resources also builds up the firm's market-oriented explorative competence for delivering new services. Foremost, by pooling resources and customer knowledge, the integrated channels expand the possibilities for launching new marketing strategies and order fulfillment methods. For example, retailers can allow shoppers to use their cell phones and other mobile devices to search the store's inventory and prices while they are at the local mall (Tedeschi, 2007b). Such service innovation is only possible if the retailers have achieved a high level of integration in their inventory information across the retail channels. Because firms with well-integrated retail channels can expose customers to more products and services, it could translate into higher profits and customer growth as these multichannel customers allocate a higher share of their spending to the firm (Venkatesan et al., 2007).

These discussions highlight the importance of building firm competences to satisfy current customers' needs and address emerging customer markets. However, is the ambidexterity strategy of pursuing both forms of competences applicable to all firms in the dynamic retail industry? Analyses of the moderating effects suggest that Hypothesis H7 about the attenuating effects of environmental dynamism on the relationship between exploitative competence and performance were not significant. However, the positive effects of moderation of environmental dynamism

were significant in the case of explorative competences ($b = 0.231$, $p < 0.05$) (Hypothesis H8). This suggests that, in dynamic environments, the impact of exploitative competence on firm performance was not weakened, while the impact of explorative competence on firm performance was strengthened.

5. Discussion and implications

Overall, our findings provide substantial empirical support for the positive impacts of retail channel integration on firm competences and performance. The results highlight the importance of having a blend of “tech” and “touch” for multichannel retailers. The findings show that IT plays an important enabling role for multichannel retail firms to integrate their resources, and front-line service employees at both physical and online stores must be capable of spanning functional areas to serve cross-channel consumers. Firms can reap the benefits of multichannel retailing only by integrating employees with automated IT-enabled service interfaces into their service delivery systems (Rayport and Jaworski, 2005). The results also indicate that both exploitative and explorative competences have direct influences on firm performance. However, we found that in dynamic environments, the performance-enhancing effect of exploitative competence is not significantly weakened, while the relationship between explorative competence and performance is further strengthened. The fact that exploitative competence does not significantly decrease firm performance in dynamic environments is contrary to our hypothesis and prior research. Our interpretation of this result is that during the early stage of retail channel integration, exploitative competence would continue to have a positive effect on firm performance regardless of the level of environmental dynamism.

Collectively, the findings from this research offer some new insights into the complex challenges involved in multichannel retail service innovations (Neslin et al., 2006; Zhang et al., 2010) and make four significant theoretical contributions. First, this study constitutes one of the first attempts to comprehensively investigate the value of IT for service operations management in the context of multichannel e-commerce. We have developed a model that predicts and explains firm performance for multichannel retailers. The findings advance our knowledge about the role of IT in service innovation within the emerging field of service science (Chesbrough and Spohrer, 2006). Presently, the bulk of research in operations management related to organizational integration has examined supplier and customer integration along the supply chain. In this study, we focus on organizational integration in an intra-firm setting by considering the context of a retail firm that possesses a bundle of resources in multiple channels. In particular, we have examined the internal, operational aspects of the organizational integration framework proposed by Barki and Pinsonneault (2005) in the retail domain. By doing so, we provide a better understanding of resource integration for firms with both physical and online operations. Ample fruitful research can be pursued along the lines of our work to measure the organizational integration issues in other service industries with multichannel operations.

A second contribution of this study is the conceptualization of the retail channel integration capability as comprising six sets of integrated retail routines, thereby providing a rich platform for future research in integrated service operations management. Our findings provide some initial insights into the issues involved in cross-channel inventory management, fulfillment, and returns management. The present research has performed an aggregated analysis of the overall retail channel integration capability of a retailer. It is likely that each of the underlying retail routines has different performance implications and could be examined individually. In addition, it would be interesting to study how different

types of routines contribute to the improvement capability and innovation capability for retail firms, as Peng et al. (2008) has done for manufacturing plants. Furthermore, the question of how service operations should be managed internally and externally with business partners to maximize the value of a firm's resource portfolio could also be investigated (Santos and Eisenhardt, 2005).

The third significant contribution relates to the study of resource complementarities across channels that span multiple functional areas. Besides examining the role of IT resources in operations management as Sanders (2008) and Subramani (2004) have done, we went a step further to study the complementary role of human resources. The results we have obtained pertaining to the complementary effects of IT-enabled capability and HR capability highlight the importance of lower-order capabilities in nurturing higher-order firm competences. Our results contribute to the RBV literature by providing evidence on the relationships between interconnected resources, routines, capabilities, and competences. The findings regarding the reinforcing effects of HR capability upon IT capability underscore the complexity of integrating IT and human resources in service delivery systems. These findings can guide further work on boundary-spanning service employees in service organizations (Singh, 2000).

Lastly, through exploring the intermediate outcomes of the retail channel integration capability in terms of its competence-building ability, we have deepened our understanding of the integration-to-performance relationship. Our results suggest that multichannel retail firms can develop exploitative and explorative competences through the effective use of both IT-enabled capability and HR capability. This provides some evidence that multichannel e-commerce seems to be an effective approach for overcoming the resource allocation conundrum of operating to meet the needs of current customers while also developing the capacity to attract new customers. Our conceptualization and examination of exploitative and explorative competences in the multichannel retailing context has contributed substantial knowledge to the related stream of competence-based research that examines customer-oriented competence and marketing-oriented competence (e.g., Danneels, 2008; Slater and Narver, 1998). The study of ambidexterity has attracted the attention of many operations management researchers. For example, Kristal et al. (2010) recently investigated the performance implications of ambidextrous supply chain strategy on combinative competitive capabilities for manufacturing firms. Our results related to these two forms of competences in a retailing context should be relevant to understanding organizational ambidexterity in other types of service firms. The findings also shed some light for researchers in organization design. How should ambidextrous, information-intensive service organizations be designed and managed to enhance performance? More longitudinal studies are certainly needed to understand how firms search, adapt, and evolve from one strategy to another to increase their performance, especially under different external environmental conditions.

The study also provides several important practical implications. First, a major managerial contribution is the development of metrics to measure a retail firm's channel integration capability. Our set of 28 items grouped under six dimensions represents the most comprehensive measurement scale available to assess the maturity of multichannel retailing. Firms can use this as a diagnostic benchmark. Second, to successfully implement multichannel retailing, firms need to ensure that their information systems can provide seamless data and process integration (Bharadwaj et al., 2007). They must be certain that data are accurate, consistent, current, and complete across different channels, irrespective of the channel selected by customers to access services. In addition, service employees must understand the importance of the firm's cross-channel integration strategies and must be competent to

use IT to support multichannel customers. Therefore, firms should be mindful that while it is crucial for them to improve the quality of IT infrastructure, they also need to disseminate the firm's multichannel strategic vision and improve the IT competency level of their staff. Personnel in different channels and at different touch points along the various channels need to work together to ensure a seamless process flow between in-store operations and online operations (Tedeschi, 2007a). Third, although attaining cost efficiencies and making service improvements based on existing customers' needs are important to performance, firms should strive to strengthen their explorative competence in dynamic environments because the ability to reallocate resources and launch new services will be highly rewarding.

The findings of our study must be judged in the context of its limitations. First, even though we have performed statistical tests to address potential biases, the interpretation of our results must take into account that we collected data on each firm through a single informant. Second, the dataset comprising only Singapore retail firms that tend to be smaller in terms of the number of stores or the number of employees might limit the generalizability of our results. Integration issues might be different compared with retail stores in the United States or elsewhere that are larger and more geographically dispersed. Although our findings might provide fresh insights from an emerging Asian market, replication of the study in other countries is necessary for validation and extension of the findings. Third, even though the items used to measure the retail channel integration capability index have undergone rigorous validation, we do not claim to have fully captured the complete domain of the research phenomenon. Hence, it would be worthwhile to refine the measurement items because the technology and human factors involved in retail channel integration are always evolving. For example, the items used to assess integrated information access were constructed based heavily on kiosk technology. Future research should incorporate emerging mobile technologies that can enhance cross-channel information access. Fourth, the current study primarily examined the integration of two

retail channels: a physical store and Website. Further work can be performed to study how emerging technologies can be used to integrate the mobile channel into the service delivery system. Finally, it is possible that the performance impact of explorative competence could have been underestimated, and it might require a longitudinal study to uncover the dynamic balance between exploitation and exploration. Their effects under varying environmental conditions also require further study as the degree of retail channel integration matures.

6. Conclusion

This study attempts to examine the effects of retail channel integration through the use of IT on firm performance. Our results indicate that by integrating organizational resources, retail firms can attain better performance by developing exploitative and explorative competences and that in dynamic environments, the possession of explorative competence is particularly rewarding. We also found a significant complementary effect between IT-enabled capability and cross-channel human resource capability for multi-channel retail firms. Overall, this study has laid the foundation for further research to explore other multifaceted issues in addressing the challenges of deploying IT and complementary resources to manage service operations for sustainable organizational growth.

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Appendix A.

See Tables A1 and A2.

Table A1

Routines used to construct retail channel integration capability index (measured on a 10-point scale, 0: none to 9: to a large extent).

	Weight
Routine 1 – integrated promotion (IP)	
IP1: The firm's brand name, slogan and logo are consistent both online and offline	0.487**
IP2: The Website highlights in-store promotions that are taking place in the physical store	0.325*
IP3: The Website advertises the physical store by providing address and contact information of the physical store	0.354*
IP4: The physical store advertises the Website through pamphlets, receipts, and carrying bags	0.246*
IP5: The Website publishes advertisements appearing in newspapers or pamphlets	0.158*
Routine 2 – integrated transaction information management (IT)	
IT1: The firm keeps an integrated purchase history of customers' online and offline purchases	0.327*
IT2: The firm allows customers to access their prior integrated purchase history	0.149*
IT3: The firm makes future purchase recommendations to customers based on past consolidated online and offline purchases	0.216*
IT4: The Website customizes Web pages for customers based on past consolidated online and offline purchases	0.238*
Routine 3 – integrated product and pricing information management (IPP)	
IPP1: Product/service descriptions are consistent in both the physical store and Website	0.521**
IPP2: Product/service category classifications are consistent in both the physical store and Website	0.414*
IPP3: Information on stock availability is consistent in both the physical store and Website	0.184*
IPP4: Product/service prices are consistent in both the physical store and Website	0.302*
IPP5: Discounts are consistent in both the physical store and Website	0.287*
Routine 4 – integrated information access (IIA)	
IIA1: The Website allows customers to search for products available in the physical store	0.218*
IIA2: The firm allows checking of inventory status at the physical store through the Website	0.182*
IIA3: The physical store provides Internet kiosks for customers to access the information and functionalities available on the Website	0.169*
IIA4: The physical store provides Internet kiosks for customers to access store maps to quickly locate items in the store	0.135*
IIA5: The physical store provides Internet kiosks for customers to find answers to frequently asked questions without making enquiries from in-store customer service assistants	0.157*
Routine 5 – integrated order fulfillment (IOF)	
IOF1: The gift coupons or vouchers issued by the store can be redeemed either online or offline	0.455*
IOF2: The Website allows ordering by a catalog number	0.201*
IOF3: The physical store allows customers to self collect their online purchases	0.295*
IOF4: The firm allows customers to choose any physical store from which to pick up their online purchases	0.228*
IOF5: The firm allows customers to make payment in the physical store for their online purchases	0.199*
IOF6: The physical store provides Internet kiosks for customers to place orders for out-of-stock items	0.171*

Table A1 (Continued)

	Weight
Routine 6 – integrated customer service (ICS)	
ICS1: The in-store customer service center accepts return, repair or exchange of products purchased online	0.405*
ICS2: The Website provides post-purchase services such as support for the products purchased at physical stores	0.398*
ICS3: The Website provides interactive access to the customer service assistant through a real-time chat program	0.317*

^ Significant at 0.1.
 * Significant at 0.05.
 ** Significant at 0.01.

Table A2

Measurement scales for reflective constructs (measured on a 7-point Likert scale).

Cross-channel human resource capability (HRC):
HRC1: Our staff at the physical stores is knowledgeable about the products/services provided at the Website
HRC2: Our staff understands the firm's cross-channel integration strategies
HRC3: Our staff has the ability to implement the firm's cross-channel integration strategies
HRC4: Our staff is competent in the use of information technology to support the firm's cross-channel integration strategies
Exploitative competence (EXPLOIT):
EXPLOIT1: We have the ability to reduce distribution costs
EXPLOIT2: We have the ability to reduce customer service costs
EXPLOIT3: We have the ability to involve customers in personalizing their shopping experience
EXPLOIT4: We have the ability to differentiate our products/services from those of our competitors
Explorative competence (EXPLORE):
EXPLORE1: We have the ability to launch new marketing strategies
EXPLORE2: We have the ability to provide new ways of performing transactions
EXPLORE3: We have the ability to offer new ways of order fulfillment
EXPLORE4: We have the ability to reallocate resources quickly in response to changes in market conditions
Environmental dynamism (ENV):
ENV1: Environment changes in our industry are very difficult to forecast
ENV2: The business environment in which we operate is continuously changing
ENV3: In our kind of business, customers' product preferences change a lot over time
ENV4: Marketing practices in our product areas are constantly changing
ENV5: New product introductions are very frequent in this market
Firm performance (PERFORM):
Please evaluate your firm, relative to your major competitors, on the following performance measure: (1-much worse than the competition; 4-about the same; 7-much better than the competition)
PERFORM1: Market share gains
PERFORM2: Net profits
PERFORM3: Revenue growth
PERFORM4: Return on investment
PERFORM5: Return on assets

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