How does differentiated multichannel collaboration matter? The boom-bust effects on online–offline store images

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Abstract

Purpose – Drawing on open systems theory, this study aims to investigate the direct and moderating effects of information collaboration in the pre-sale stage, transaction management collaboration in the transaction stage and customer service collaboration in the post-sale stage on the linkages of the online–offline store image and the market performance of small sellers.

Design/methodology/approach – Data were collected from multiple sources, including self-reported and online objective data from 148 small restaurants that simultaneously sell online and offline, for validating the developed research model. Partial least squares-based structural equation modeling was used for data analysis.

Findings – This study illustrates the direct effects of an online store's image and online–offline collaborations on the market performance of small stores. This study further reveals the boom-bust moderating effects of different collaborations between online–offline images and market performance.

Practical implications – Small stores should be aware of the importance of information congruence and functional integration concerning online–offline collaboration. They should also recognize the paradoxical intervening effects of online–offline collaboration on different channels and arrange appropriate collaboration tactics.

Originality/value – This study presents a significant contribution to the open systems theory by revealing both constructive and destructive properties of the online–offline collaborative system with offline-to-online targeting. Vertically differentiated online–offline collaboration may strengthen one side of the store image but weaken the other side for promoting the market performance of small stores.

Keywords Online–offline collaboration, Store image, Multichannel commerce, Market performance

Paper type Research paper

1. Introduction

The online and offline business model is gaining prominence because integrated marketing and retailing processes across online and offline channels allow firms to benefit from the strengths of each channel. These processes also offer consumers convenience and innovative services (Emrich *et al.*, 2015; Oh *et al.*, 2012; Yang *et al.*, 2020). Internet-dependent consumers now expect to receive pre-sale information, during-sale services and after-sale support through a channel customized to their convenience. Hence, multichannel firms that can effectively manage their integrated service operations are deemed to be more capable of fulfilling consumers' demands (Oh *et al.*, 2012). However, many small and micro sellers, such

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as small restaurants, convenience stores and homestays, lack information-technology (IT) competency and have limited financial resources. They cannot or are unwilling to develop self-owned IT applications. Alternatively, they choose to join a third-party e-marketplace platform, such as Amazon, Airbnb, Taobao and Meituan, to present themselves on both online and offline channels simultaneously. However, they may also face a paradox, as online–offline collaboration may generate complementary effects (e.g. image reinforcement) and cannibalization effects (e.g. channel replacement) (Luo *et al.*, 2020).

To exploit the advantages of both channels, small stores should manage their online–offline store images effectively. The offline store image is the "personality" that the store presents to the public, and it affects consumers' shopping trips, shopping expenditure, store loyalty and purchase intentions (Babin and Attaway, 2000; Sirgy *et al.*, 2000). The offline store image is essentially the total impression of the functional factors (e.g. merchandise selection, price ranges, store layout, etc.) and the psychological factors (e.g. perceived behavior of the sales staff, reputation, etc.) (Verhagen and van Dolen, 2009). Also, online store image, which is shaped by merchandise, online layout and customers' online review information strongly impacts consumers' purchase intentions and the performance of online sellers (Duan *et al.*, 2008; Park *et al.*, 2007). When online–offline channels co-exist, online and offline images may play different roles for small stores (Wang and Goldfarb, 2017). However, it remains unclear how the online and offline store image help to improve the store's performance in the channel collaboration context.

Under the assumption of complementarity across online and offline channels, multichannel collaboration can bring positive outcomes to firms. Prior studies illustrate that online–offline collaboration positively impacts firm competencies, performance (Gu and Tayi, 2017; Oh *et al.*, 2012), sales growth (Cao and Li, 2015) and customer retention (Li *et al.*, 2018). Online–offline collaboration increases customers' search intention, purchase intention and willingness to pay via online channels and becomes a competitive advantage for the whole firm (Herhausen *et al.*, 2015). Although prior studies offer important insights on multichannel commerce, it is inadequate to illustrate only the direct impacts of the integral online–offline collaboration on firms. The assumed complementarity across channels may only reflect one side of a coin.

Online–offline collaboration may also intervene in the relationships between store images and the stores' market performance, as it can augment sellers' identity attractiveness (Li *et al.*, 2018). Trenz *et al.* (2020) further find that multichannel collaboration in the stages of transaction and post-transaction can exert different effects on consumers' channel choice. Therefore, it is crucial to investigate the moderating role of online–offline collaboration for improving small stores' market performance, decompose the online–offline collaboration into different stages and examine the nuanced effects hidden in these collaborative stages. Nevertheless, seamless online–offline collaboration occurs at the task level along a seller's complete marketing process, including the pre-, in- and post-sale stages.

Different online–offline channels can also be segmentation differentiated, resulting in an inherent competitive relationship between online and offline channels (Wang and Goldfarb, 2017). According to open systems theory (Katz and Kahn, 1978), online and offline channels coexisting in a system can have both constructive and destructive properties. Despite the constructive relationships and complementarities across online and offline channels, it is necessary to check whether any conflicts, even substitutions, will occur in the channel system. In multichannel commerce, both online and offline store images can influence consumers' purchase intentions (van der Heijden and Verhagen, 2004), repurchase intention (Chang and Tseng, 2013) and customer satisfaction (Chang and Tseng, 2013). Further, decent online–offline channel collaboration with mitigated differences in product assortments and price between channels can increase sellers' offline and online shopping utility (Melis *et al.*, 2015).

Hence, greater focus should be on the constructive and destructive effects of online–offline channels on small sellers' market performance. When a traditional seller's marketing channel expands from online to offline, the image of the physical store may have a billboard effect, which is beneficial for the online channel (Wang and Goldfarb, 2017). In contrast, the advantages of online channels may result in a dominance of online channels and thus might suppress the contribution of offline store image to the seller when it expands from offline to online (Ansari *et al.*, 2008; Ofek *et al.*, 2011). The destructive relationships across channels that were largely ignored in previous literature are increasingly drawing researchers' attention. Recently, Luo *et al.* (2020) identified both complementarity and cannibalization effects of offline-to-online targeting among different consumer segments. Therefore, the effects of both constructive and destructive relationships should be accounted for, when small stores adopt multichannel commerce (Trenz *et al.*, 2020).

Hence, this study aims to address the following research questions: How does online–offline store image affect the market performance of small sellers? How does online–offline collaboration at different stages directly and differentially affect the contribution of the online–offline image to the market performance of small sellers?

We develop a research model and hypotheses with the underpinning of open systems theory and the related literature on store image. We propose that small stores attract consumers through their "shop personality" via online and offline channels to improve market performance (Verhagen and van Dolen, 2009). We further propose that the different online–offline collaboration in the pre-, in- and post-sale stages will directly affect the market performance of small stores and differentially moderate the effects of the online and offline images regarding achieving market performance. Next, Section 2 elaborates on the theoretical foundation of our research and related literature. Then, Section 3 justifies the developed research model and hypotheses. Further, Sections 4 and 5 describe the data-gathering procedure operationalization of the constructs and the data analysis in this study. Finally, Section 6 discusses the findings and implications of this study, its limitations and avenues for future research.

2. Theoretical background and literature review

2.1 Open systems theory and multichannel commerce literature

An open system interacts with subsystems or agents in the form of material and information transfer. As an open system, multichannel commerce entails the two subsystems of online and offline channels, interacting with each other. As a meta-theory, open systems theory stresses that the relationship that exists in a system can have both destructive (e.g. conflict) and constructive (e.g. cooperation) properties (Katz and Kahn, 1978). Channel systems are considered dual systems that exhibit conflict and cooperation (Etgar, 1979). Conflicts between subsystems may occur when they differ in their quest for scarce resources. Alternatively, the collaboration between subsystems increases when they are interdependent for goal achievement (Katz and Kahn, 1978). Fürst *et al.* (2017) show that segment differentiation between multiple channels—each channel targets its particular segment of customers—would inhibit cooperation across channels, whereas task differentiation would promote channel relationships, cooperation and the consequent company sales success. Regarding small sellers with limited resources, it is important to uncover the constructive and destructive relationship across channels to help them manage online–offline channels for achieving the ultimate market success.

Research findings on multichannel and omnichannel commerce regarding the relationships between online and offline channels are inconsistent, especially when a traditional firm expands to online channels. Researchers acknowledge the complementarity and reinforcement across channels for promoting a seller's market performance (Bock *et al.*, 2012;

Wang and Goldfarb, 2017). Consumers who shop across channels tend to purchase more and have a higher lifetime value than any single-channel counterparts (Ansari *et al.*, 2008; Neslin and Shankar, 2009; Sebastian *et al.*, 2017). Online and offline channels can also reinforce each other due to the spillover effect resulting from the multiplicity and redundancy of the integrated channels (Chan and Pan, 2005). These constructive relationships are founded on the multichannel integration capability and quality in stores. Multichannel integration quality comprises information and process consistency, channel-service configurations, reciprocity and assurance (Hossain *et al.*, 2019, 2020; Sousa and Voss, 2006). Wu and Chang (2016) empirically validate that multichannel integration quality can enhance consumers' perception of online values and further increase their online purchase intention.

Moreover, Wang and Goldfarb (2017) consider the context of online-to-offline targeting and find that the presence of offline stores had a straightforward awareness-driven billboard effect and attracted new customers, resulting in the persistent increase of online sales. However, some studies also caution that managing online–offline channels is costly for small stores and may reduce their sales (Ansari *et al.*, 2008) and decrease their profits (Ofek *et al.*, 2011). In multichannel e-commerce, small stores with limited physical space and fulfillment capacity might discourage store patronage (Bell *et al.*, 2018).

To reconcile the debate on the relationships across channels, some scholars argued that the relationships across online–offline channels are substitutive or complementary depending on whether their conspicuous or experiential capabilities dominate the purchase process (Ansari *et al.*, 2008; Avery *et al.*, 2012; Chang *et al.*, 2018). Channel capabilities enable consumers to accomplish their shopping goals (Avery *et al.*, 2012). The conspicuous capabilities (e.g. immediate gratification, convenience) of one channel would lead to the substitution for its counterpart. The cannibalization effect may occur especially when the online channel exceeds the capabilities of the existing offline channel (Alba *et al.*, 1997). In contrast, the experiential capabilities (e.g. a pleasurable shopping experience, the ability to build a relationship) would lead to the complementarity between the online–offline channels, as the physical store serves as a living billboard and helps build customer relationships. Gu and Tayi (2017) argue for the spillover effect of consumer pseudo-showrooming behavior, which refers to "the consumer behavior of inspecting a product at a seller's physical store before buying a related but different product at the same seller's online store" (p. 584). Further, Luo *et al.* (2020) demonstrate that both complementarity and cannibalization effects across online and offline channels occur depending on the consumer segments based on their traveling distance. The offline-to-online targeting can have complementarity effects for consumers who live close to the offline store while having cannibalization effects for the distant consumers. Zhang *et al.* (2019) also distinguish the substitution effect from the complementarity of online and offline channels by investigating the fast-food restaurant chain that joined online-to-offline platforms. Their study demonstrated that the online channels complement the offline channels for the total sales and profits promotion long term. However, online channels on multiple platforms may increase competition and thus are not beneficial for those restaurants.

We regard online and offline channels as horizontally partitioned subsystems in a multichannel system. Such an open system can also be vertically differentiated along a purchase process in which the bricks-and-clicks sellers perform different tasks to interact with consumers in the pre-, in- and post-sale stages (Trenz *et al.*, 2020). Therefore, the sellers should stimulate persuasive and informative market communication between the stores and customers in the purchase process. Regarding persuasive market communication, building attractive store images via online and offline channels is a pivotal issue. Further, online–offline collaboration to reach a consensus in multiple aspects (e.g. information, products and services) is crucial to stimulate and maintain decent informative market communication between sellers and their consumers. According to open systems theory and

the contrasting findings in multichannel literature, the vertically partitioned online–offline collaborations may exert differential effects on the store images to exert their persuasive communications with consumers. The contributions of store images on a store's market performance may appear boom-bust depending on which channel can provide a conspicuous play in different stages of online–offline collaboration.

2.2 Offline–online store image

The store image affects consumers' shopping trips, shopping expenditure, store loyalty and purchase intentions (Babin and Attaway, 2000; Sirgy *et al.*, 2000). In a multichannel marketing system, the store image is presented in both online and offline approaches. However, online stores have distinct attributes different from those of physical stores (Katerattanakul and Siau, 2003; van der Heijden and Verhagen, 2004). Offline stores offer a physical and vivid shopping environment that help customers gain instant gratification when they have field visits, whereas online stores offer symbolic product presentations that help customers save their search costs (Huyghe *et al.*, 2017). Despite the distinct offline–online shopping environment, both approaches aim to improve the overall store image, and thus, they are constitutive to the brand equity of the store (Wang and Goldfarb, 2017).

2.2.1 Offline store image. The offline store image is defined as the "personality" that the store presents to the public, which contains a complex combination of meanings and relationships (Hirschman *et al.*, 1978). The offline store image can act as a living billboard to enhance the brand image (Bao *et al.*, 2011; Wang and Goldfarb, 2017). An offline store with a decent image can attract consumers. Consumers usually justify a physical store image based on several tangible, functional attributes. They may also justify a store's image based on their preferences. Hartman and Spiro (2005) and Lindqvist (1974) offer nine dimensions for evaluating a store's image—merchandise, service, clientele, physical facilities, comfort, promotion, a store's atmosphere, institutional and post-transaction satisfaction. Doyle and Fenwick (1974) identify five key attributes of the physical image of a store—product, price, assortment, styling and location.

Based on the existing literature on store image, we summarize the physical store image into five dimensions—merchandise, service, atmosphere, layout and convenience. First, the merchandise dimension refers to product quality, price and variety, which is a key factor that links consumers to retailers. Consumers' perceptions of product quality and price influence decisions regarding their store patronage (Darley and Lim, 1993). A variety of products helps retailers cater to consumers' heterogeneous tastes. Second, the quality of in-store service is related to the level of communication between stores and their consumers and directly affects consumers' purchase behavior and store evaluation (e.g. satisfaction) (Borucki and Burke, 1999). Third, a store's atmosphere provides a shopping environment that is carefully sculpted to induce consumers' purchasing behaviors and sound evaluations. Yoo *et al.* (1998) explain that the atmosphere in a store could affect consumers' thoughts and feelings. Fourth, the layout of a store helps customers orient themselves, find their way around, learn and understand signs, giving them a sense of personal control and mastery (Bitner, 1992). Signs and information labels are beneficial in improving the layout of a store. Finally, a consumers' perception of shopping convenience (e.g. opening hours, location and parking) positively impacts their satisfaction with the store's service (Berry *et al.*, 2002). Benedicktus *et al.* (2010) find that the presence of physical stores conveys trustworthiness to consumers.

2.2.2 Online store image. The online store image is essentially aimed at facilitating the information market communication between sellers and their customers (Wang and Goldfarb, 2017). Therefore, an online channel becomes increasingly important in helping sellers gain revenue. Sellers tend to develop their online store image to acquire new customers. Usually, an online store provides seller-created product information and

consumer-created feedback information. Therefore, an online store's image is viewed as a multifaceted concept (van der Heijden and Verhagen, 2004). The online store image is shaped by information from sellers and consumers; we decompose this image into three key components—merchandise, online layout, and customers' online review.

On online stores, small sellers can explicitly provide information about their products and prices, delivery service and provide a good shopping atmosphere and an attractive design layout (e.g. product presentation) (Chen and Teng, 2013; Verhagen and van Dolen, 2009). Consumers tend to evaluate small sellers from the quantity and quality of their available online products, which are determined by the product pictures, description texts and online reviews. Consumer-generated content, such as online reviews, stimulates word-of-mouth communication and exerts social influence on consumers' purchase behavior (Cheung *et al.*, 2008; Hu *et al.*, 2017; Park *et al.*, 2007). The number of online reviews shapes the popularity of a store and its products, which is often interpreted as a signal of quality by consumers (Duan *et al.*, 2008; Forman *et al.*, 2008). Such popularity of online stores strongly impacts consumers' purchase intentions (Zhang *et al.*, 2014) and the performance of online sellers (Duan *et al.*, 2008; Park *et al.*, 2007).

2.3 Online–offline collaboration

In multichannel e-commerce, some sellers tend to adopt online and offline channels but cultivate them as separate silos (Verhoef *et al.*, 2015), while others invest effort in enhancing complementarity and synergies across online and offline channels to broaden the range of service options beyond what is feasible via either channel (Trenz *et al.*, 2020; Verhoef *et al.*, 2015). According to open systems theory, the collaboration between subsystems or agents is essential in improving overall system performance. Following Schrage (1990), collaboration represents a process in which two or more agents work together with shared cognitions and resources to achieve common goals and visions. These agents cooperate in designing and implementing a better way to solve problems and deliver value to their customers. Online–offline collaboration requires agents to engage in and outside the store, such as a third-party online service platform. Effective collaboration requires sharing, communication and integration of information and resources in the whole system. Synergy derived from collaboration allows firms to achieve operational excellence (Flynn *et al.*, 2010; Zacharia *et al.*, 2011).

Collaboration has been extensively studied in supply chain management. For instance, extant studies demonstrate that collaboration and seamless convergence between firms along the supply chain can reduce a firms' inventory, shorten the order-to-delivery time and improve sales and customer service. Collaboration requires open information sharing and knowledge exchange, allowing firms to learn from each other, facilitating collaborative firms to understand and predict the business in-between, thus improving their performance (Zacharia *et al.*, 2011). Therefore, collaboration helps to reduce the terrible "bullwhip effect" caused by information asymmetry (Lee *et al.*, 1997) and accelerate the firms' response speed to the rapidly changing market and customer demands (Chen *et al.*, 2000). These positive findings provide insights to investigate the collaborations that occur across channels in a firm and between the firm and the joined online platforms.

Multichannel collaboration has drawn much attention (Cao and Li, 2015; Melis *et al.*, 2015; Oh *et al.*, 2012). Multichannel commerce emphasizes complementarity across channels to offer customers a better shopping experience. Brick-and-click stores that sell through their online and offline channels can leverage preexisting physical assets to bolster the appeal of online channels. Online transactions can be augmented by offering complementary services to facilitate transactional activities performed via offline channels (Trenz *et al.*, 2020).

Further, these stores intend to harness synergies across online and offline channels to broaden the service range and improve consumers' shopping experience (Luo *et al.*, 2016; Trenz *et al.*, 2020; Verhoef *et al.*, 2015). When online and offline channels are fully synchronized, sellers can optimize their collaboration across channels and provide consumers with a seamless shopping experience (Cao and Li, 2015). Therefore, the synergistic management of multiple channels and touchpoints concerning consumers—also called omnichannel management (Verhoef *et al.*, 2015)—is key in enhancing customer experience and maximizing the overall value of sellers.

Prior studies examined channel collaboration at an aggregate level but did not differentiate the types of multichannel collaborations nor deliberated on their feasibility at distinct phases of a transactional process (Verhoef *et al.*, 2015). Verhoef *et al.* (2007) argue for the stage–channel associations, as consumers may associate a certain stage (e.g. pre-sale, in-sale and post-sale) with a specific channel of their purchasing experience. Consumers may pursue different goals in different purchase stages (Gensler *et al.*, 2012). Consumers may strive to gather accurate and relevant information for making well-informed decisions in the pre-sale stage (Carlson *et al.*, 2008) and may be concerned about the trade-off of benefits and costs when they move into a transactional stage (Balasubramanian *et al.*, 2005; Hamilton and Chernev, 2010). They also tend to minimize effort in learning to use the products or services in the post-sale stage (Keeney, 1999). Accordingly, online–offline channel collaboration requires the integration of information distributed through various processes and components (Oh *et al.*, 2012; Rai *et al.*, 2006) and should cater to the requirements of consumers at different purchase stages. Therefore, we decompose online and offline collaboration into three stages—the pre-sale information collaboration, in-sale transaction management collaboration and post-sale customer service collaboration.

In the pre-sale stage, online–offline collaboration is reflected by the transparency and consistency of product price, assortment and promotion across channels. Similar product assortment and consistent product prices across channels are beneficial for stores (Zettelmeyer, 2000). This is because information congruence between physical and online stores influences customers' transference of attitudes and trust from the physical store to the online store and vice versa (Badrinarayanan *et al.*, 2012; Yang *et al.*, 2020). We regard the collaboration in the pre-sale stage as information collaboration.

During the in-sale stage, transaction management collaboration integrates customers' online and offline transaction information and makes it available across multiple channels (Oh *et al.*, 2012). Integrative transaction management helps stores to have an overall picture of their transactions and allows them to perform seamless collaboration between online–offline channels.

In the post-sale stage, customer service collaboration shall allow customers to access service support for the channels they may interchangeably use (Oh *et al.*, 2012). A physical store can offer support to help customers solve problems related to their online purchases (Bendoly *et al.*, 2005). Additionally, an online store can offer support (e.g. online real-time live chat) for after-sale services even though products were bought in physical stores (Amit and Zott, 2001). When firms do not differentiate between their customer segments across channels, the channels would have motives to collaborate at the task level (Wang and Goldfarb, 2017). The sales of one channel would encourage customers to interchangeably use multiple channels, therefore, improving customers' purchase experience (Bahn and Fischer, 2003).

3. Research model and hypotheses development

In this study, we draw on open systems theory to highlight the special role of online–offline collaboration on the market performance of small stores. According to the literature on the

store image, we initially propose the direct effects of a store's online and offline image on its market performance. Further, we propose the moderating roles of online–offline collaborations concerning pre-sale promotion and product information, in-sale transaction management and post-sale customer service on the direct linkages between the store images and the market performance of small stores. According to open systems theory, these effects can be complex in a boom-bust pattern. We develop the research model as shown in Figure 1.

3.1 The direct effects of offline–online store images on market performance

The store image is essentially the total impression of tangible or functional factors—merchandise selection, price ranges, store layout—and intangible or psychological factors, such as perceived behavior of the sales staff, service level and reputation (Verhagen and van Dolen, 2009). In the multichannel marketing era, the store image is exhibited online and offline. Some studies show that consumers may search online and then purchase offline (Bakos, 1997), while other studies illustrate that consumers may search for products in physical stores but then purchase online (Gu and Tayi, 2017; Mehra *et al.*, 2018). Researchers propose the potential interaction between online and offline store images, which influences consumers' purchase intentions (Verhagen and van Dolen, 2009). In summary, store images provide important momentum for consumers to select a shop. When consumers perceive that a store has a good image, they are more likely to patronize the shop. We argue for the direct effects of a store's online–offline images on its market performance.

A physical store image mainly consists of five dimensions—merchandise, service, atmosphere, layout and convenience. The presence of a physical store helps develop consumers' trustworthiness in the store and is beneficial to its market performance (Benedicktus *et al.*, 2010). According to the cue utilization theory, a physical store's image can signal product and service quality (Richardson *et al.*, 1994), influencing consumers' perceived risk of purchasing in the store and their further purchase intentions (Diallo, 2012). Despite product quality, the variety of product assortment helps consumers to develop trust in the store (Mitchell, 2001). A decent and convenient layout inside a physical store is beneficial in helping consumers to search for products, allowing consumers to enjoy the purchase environment. The in-purchase and post-purchase services offered by a physical store provide

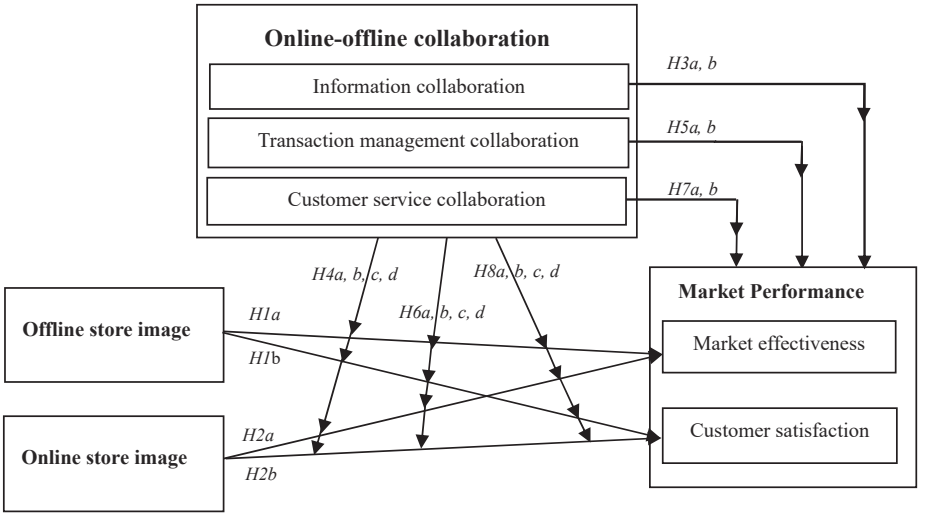


Figure 1.
Research model

an essential communication opportunity between the store and its customers. Thus, it has a direct impact on customers' patronage intentions and satisfaction. Furthermore, a convenient location of a physical store allows it to attract more customers and achieve a better market performance. Taken the above aspects together, a small store with a better overall offline image can attract more customers and obtain higher customer satisfaction. Thus, the following hypothesis has been proposed:

H1. The offline image of a small store has a positive effect on its market effectiveness (H1a) and customer satisfaction (H1b), respectively.

The online store image is reflected by its merchandise assortment, atmosphere (Verhagen and van Dolen, 2009) and online reviews (Cheung and Lee, 2012). This online image also has a strong influence on product sales and customer satisfaction. First, the online product assortment size is an important driver that helps consumers choose an online store channel (Melis *et al.*, 2015), as consumers find it easy to seek out satisfactory products at a relatively low cost of search and comparison (Betancourt and Gautschi, 1990). Brynjolfsson *et al.* (2003) find that greater product assortment variety would enhance consumers' welfare. Second, an online store's atmosphere helps in leveraging the store's market performance. This is because it can influence the surfers' emotions, thus influencing the amount of time and money spent in the store, their satisfaction with the store, their intention to return to the online store and their intentions to recommend it (Luo *et al.*, 2012). Third, online reviews from prior customers are important for product information (Luo *et al.*, 2012). New customers tend to rely on these reviews to infer product quality and make purchase decisions (Awad and Ragowsky, 2008; Cui *et al.*, 2012). Therefore, online reviews can also improve the market performance of small stores (Babić Rosario *et al.*, 2016). Thus, the following hypothesis has been proposed:

H2. The online image of a small store has a positive effect on its market effectiveness (H2a) and customer satisfaction (H2b), respectively.

3.2 The direct and moderating effects of online–offline collaboration

The online and offline collaboration aims to connect online and offline channels seamlessly along a consumer-centric purchase process, starting with an information search and ending with after-sale customer service. Studies show that online–offline collaboration positively impacts a store's market performance (Amit and Zott, 2001). Further, we argue for the moderating role of online–offline collaboration. According to open systems theory (Katz and Kahn, 1978), both constructive and destructive relationships across channels can co-exist in a complex system. Consumers can obtain cues from the online–offline store images to help in their purchasing decisions; however, these effects may be strengthened or weakened, depending on the channel that benefits most from the multichannel cue congruence and experiential fusion. Studies indicate that the relationship between online–offline channels is complementary or substitutive, depending on whether their conspicuous or experiential capabilities dominate the purchase process (Alba *et al.*, 1997; Ansari *et al.*, 2008; Avery *et al.*, 2012). Despite the benefits of online–offline collaboration for small stores, we further propose that online–offline collaborations at different stages will differentially moderate the direct effects of the online and offline images toward the market performance of small stores. The positiveness of online–offline collaboration is derived from the constructive and complementary relationship across channels, while the potential differential moderating effects shape the destructive and substitutive relationships across channels.

3.2.1 The role of information collaboration in the pre-sale stage. In the pre-sale stage, information collaboration is critical. Promotion and product information management are two major tasks of online–offline collaboration. First, promotion plays a vital role in attracting customers. The brochures, receipts, carrying bags and posters in a physical store

are the advertising medium for the online store. Likewise, contact information and promotional announcements provided online also serve as an advertising medium for its physical counterpart (Chandrasekaran *et al.*, 2018). Online advertising of the physical store, or the offline advertising of the online store, increases consumers' awareness of the store's platforms (Bahn and Fischer, 2003). When a physical store that has built its brand and image initiates an online journey, an online–offline promotion will largely reduce consumers' online search cost (Bock *et al.*, 2012). Collaborative promotions in the physical store help increase customers' awareness of and trust in its online store. In turn, advertising via the online channel is a cost-effective and fast way for small stores to build their reputation. The fast-increasing visit volume in an online channel serves as a good advertising platform for the offline channel (Kollmann and Hasel, 2008). Thus, collaborative online–offline promotion enhances image congruence, critical in attracting new customers and satisfying existing customers (Oh *et al.*, 2012).

Second, collaborative product information management in the pre-sale stage emphasizes the consistency of product assortment and price information across online and offline channels. It is critical to ensure information transparency and consistency in product catalogs, descriptions, prices (Wu *et al.*, 2019) and discounts across channels (Daniel and Wilson, 2003). Transparent and consistent information helps to reduce consumers' confusion (Rangaswamy and Van Bruggen, 2005). Such information congruence is essential in helping product-knowledgeable consumers make purchase decisions (Saghiri *et al.*, 2017). Consumers tend to rely on their existing knowledge about product assortment and price in the offline channel and then shop in the online channel and vice versa. Therefore, information transparency and consistency help consumers simplify their decision-making (Melis *et al.*, 2016) and increase the likelihood of consumers returning to shop on both channels (Lee and Hong, 2019).

Further, in the pre-sale stage, consumers' purchases are more information-driven than experience-driven. According to channel capability, consumers may find it easier and more convenient to search for product and promotion information via online stores than physical stores. Zhang *et al.* (2019) argue that online channels enabled by the online–offline service platform grant small stores access to and greater insights into customers, with lower advertising costs, thus exceeding the capabilities of traditional offline channels. When a brand's physical store is not nearby, consumers will search online rather than search offline channels far away, even if the online information was offered by the brand's competitors (Samuel *et al.*, 2020). Zhang *et al.*'s (2019) survey further shows that online channels attract more customers within a larger radius; therefore, customers living far away are more likely to adopt online channels while cannibalizing the physical store (Luo *et al.*, 2020). Thus, an online store has the conspicuous capability of presenting product information more distinctly than a physical store (Chiou *et al.*, 2017). According to the possible destructiveness in open systems, the obvious advantage of online stores in information management at the pre-sale stage is likely to make the functions of offline stores cannibalized. The dominance of online channels in information collaboration will positively affect an online store's image and on market performance while weakening the billboard effect on the presence of offline stores. Hence, the following hypotheses have been proposed:

H3. A small store's online–offline information collaboration positively affects its market effectiveness (H3a) and customer satisfaction (H3b), respectively.

H4. Online–offline information collaboration attenuates the positive impact of the small store's offline image on its market effectiveness (H4a) and customer satisfaction (H4b), respectively. However, it reinforces the positive impact of its online image on market effectiveness (H4c) and customer satisfaction (H4d), respectively.

3.2.2 The role of transaction management collaboration in the transaction stage. In the in-sale stage, collaborative transaction management aims to collect and integrate online and offline transaction information from both channels to make the information available across channels (Kalakota and Robinson, 2004). The integration of transaction information could increase information richness and completeness, leading to a higher level of a store's service quality (Payne and Frow, 2004). For instance, collaborative transaction management allows the seamless collaboration of an online ordering and offline delivery service, which offers customers excellent service experiences (Gu and Tayi, 2017; Zhang *et al.*, 2018). Such information integration also enables a store to provide value-added services, such as personalized recommendations (Zhang *et al.*, 2018). Furthermore, integrated transaction information allows customers to review their past purchases and consciously and unconsciously understand their purchase intentions with reduced cognitive effort (Shi *et al.*, 2020; Straub and Watson, 2001). In summary, collaborative transaction management enables stores to depict the targeted market better and understand their customers' requirements, preferences and behavior (Tanriverdi and Venkatraman, 2005), Thus, such collaboration at the task level helps to improve the market effectiveness of small stores.

However, different goals of channels may result in conflicts across channels, i.e. the destructive relationship in open systems. The online and offline store image may target different customer segments, making transaction management collaboration exert different moderating effects on the linkage between store image and market effectiveness. Similar to the pre-sale stage, online channels have more advantages than offline channels during the transaction. Online transactions can generate a larger volume of sales and more real-time and precise data for analytical purposes. Analytics can be very helpful in improving market effectiveness (e.g. cross-selling improvement via online recommendations) and customer experience (e.g. convenient transaction processes) (Wu and Chang, 2016). Thus, online–offline collaboration in the perspective of transaction management will strengthen the direct impact of a store's online image on market effectiveness, while it may weaken the impact of a store's offline image on market performance. Hence, the following hypotheses have been proposed:

H5. A small store's online–offline transaction management collaboration positively affects its market effectiveness (H5a) and customer satisfaction (H5b), respectively.

H6. Online–offline transaction management collaboration attenuates the positive impact of the small store's offline image on its market effectiveness (H6a) and customer satisfaction (H6b), respectively. However, it reinforces the positive impact of its online image on market effectiveness (H6c) and customer satisfaction (H6d), respectively.

3.2.3 The role of customer service collaboration in the post-sale stage. In the post-sale stage, customer service collaboration improves consumers' shopping experience by integrating customer communication and support information across online and offline channels. Collaborative customer service also resides in interchangeable communication across online and offline channels. Physical stores can provide customer support for online order fulfillment and problem-solving. For example, physical stores can deliver products that have been ordered online to customers due to position proximity. Physical stores can also receive returned products from customers (Bendoly *et al.*, 2005). Online stores can provide a communication channel for pre-purchase support (e.g. a real-time live chat) and after-sales service support for physical stores. The seamless collaborative service between online and offline channels is key in helping stores to deliver high-quality services.

It is noteworthy that physical stores can provide customers with instant feedback and a rich customer experience (Shi *et al.*, 2020). Such conspicuous capability of offline channels

makes online channels become less important in the customer service stage, resulting in the destructive relationships across channels in a collaborative system (Luo *et al.*, 2020). Although online stores also provide online customer service and communication tools (e.g. chatting robots, Q&A, online desk help and phone number), customers may not use those tools unless they cannot complete their purchases by themselves (Cambra-Fierro *et al.*, 2020). Self-management is common in online channels, reducing interaction between customers and stores, resulting in a less immersive online shopping experience. Unlike the pre-sale and in-sale stage, customers obtain more immediate gratifications from the physical stores in the post-sale stage. Therefore, online–offline customer service collaboration can enhance the positive effect of an offline store's image on market performance (Trenz and Veit, 2015). However, it may weaken the impact of an online store's image on market performance. Accordingly, the following hypotheses have been proposed:

H7. A small store's online–offline customer service collaboration positively affects its market effectiveness (H7a) and customer satisfaction (H7b), respectively.

H8. Online–offline customer service collaboration reinforces the positive impact of a small store's offline image on its market effectiveness (H8a) and customer satisfaction (H8b), respectively. However, it attenuates the positive impact of its online image on market effectiveness (H8c) and customer satisfaction (H8d), respectively.

4. Research method

In line with the spirit of multimethod research (Mingers, 1997), we adopted survey and field observation methods to collect quantitative data and verify our research model. Measures were adapted from validated research, and we collected data from small restaurants in a metropolis in China. Multiple data sources—self-reported data from small restaurants, expert evaluation on physical restaurants and online objective data—were collected. The partial least squares-based structural equation modeling (PLS-SEM) was used to test our hypotheses.

4.1 Measures

Following Moore and Benbasat (1991) and De Vaus (2002), we adopted the measures validated in prior research and modified them to fit this study's context. Since the survey was administered in China, we adopted Brislin's (1986) conventional back-translation method to translate the instruments originally published in English into Chinese. The instruments were translated back and forth between English and Chinese by two bilingual researchers, and this process was repeated until both versions converged. Thereafter, eight domain scholars and six e-commerce experts reviewed the measures to establish their face validity. Based on their feedback, minor revisions were performed to improve the content validity of the measurement. All measures are shown in Appendix 1.

Offline store image was treated as a formative construct. It is formed by five first-order reflective sub-constructs—merchandise, atmosphere, service, layout and convenience. The measures for these first-order constructs were adapted from studies by Verhagen and van Dolen (2009) and Jones *et al.* (2003) and were measured on a five-point Likert scale. Two experts used a field rating method. They used the walk-in method and provided their scores for each restaurant based on all the measurement criteria. *Online store image* was treated as a formative construct that is constituted of 3X2 indicators, including online merchandise (assortment and quantity), online layout (picture quality and quantity) and online review (evaluation score and quantity). These indicators were objectively measured by using online available data (see Appendix 2).

Measures for *online–offline collaboration*—information collaboration, transaction management collaboration and customer service collaboration—were adapted mainly from the study by Oh *et al.* (2012). Each stage of collaboration was measured by multiple items on a seven-point Likert scale. *Market performance* is manifested by market effectiveness and customer satisfaction (Vorhies and Morgan, 2005). Market effectiveness refers to the extent to which a store has enhanced its sales, new consumer acquisition and market share (Vorhies and Morgan, 2005). Customer satisfaction refers to the extent to which a store has achieved its customer satisfaction and retention goals (Rust *et al.*, 2002). Four items used in measuring market effectiveness were adapted from studies by Vorhies and Morgan (2005), and three items for measuring customer satisfaction were adapted from studies by Rust *et al.* (2002). Both market effectiveness and customer satisfaction were treated as reflective and measured on a five-point Likert scale. The stores self-reported their online–offline collaboration and market performance.

Table 1 summarizes the components of constructs.

Furthermore, prior research indicates that the size of a store, its online operation experience (Cao and Li, 2015; Oh *et al.*, 2012; Tanriverdi and Venkatraman, 2005), and platform multihoming (Wan *et al.*, 2020) will influence its market performance. Therefore, we account for three control variables in our model. *Store size*, a dichotomous variable, was classified based on the criteria published by the National Bureau of Statistics in China (0: micro restaurant defined as having less than 10 employees, 1: small restaurant defined as having employees above 10 but less than 100) (National Bureau of Statistics, 2018). The *number of online platforms joined* was measured by the self-reported number of online platforms that a small store joined. *Internet experience* was measured by the longest period (in years) that a small store was part of an online platform.

4.2 Data collection

In this study, we targeted small restaurants operating in a metropolis in China. Due to the rapid development and penetration of Internet technologies in China, the restaurant sector has become a typical representative of this era and has widely adopted online–offline

Construct	Type	Number of items
Offline store image (OFI)	Reflective-formative second order	Formed by 5 dimensions and each dimension reflected by 2 items
Merchandise	Reflective	2
Atmosphere	Reflective	2
Service	Reflective	2
Layout	Reflective	2
Convenience	Reflective	2
Online store image (ONI)	Formative	6
Online and offline collaboration		
Information Collaboration (IC)	Formative	4
Transaction Management Collaboration (TMC)	Formative	3
Customer Service Collaboration (CSC)	Formative	3
Market Performance		
Market effectiveness	Reflective	4
Customer satisfaction	Reflective	3

Table 1. Components of constructs

channels. Many small restaurants have joined and operated on the famous online platforms in China (e.g. eleme.com, meituan.com, dianping.com). The revenue of the restaurant industry accounted for 16.5% of China's O2O market in 2018 and has been growing rapidly (www.100ec.cn).

We collected data from multiple sources, including surveys, experts' scoring and online field data. To reduce the salient effect of restaurant location on its market performance, we selected several restaurant clusters in a metropolis city in China. Using the Baidu map, we identified four salient clusters in the city that entailed 650 small restaurants. We had three research groups, each assigned with different responsibilities. The first group was responsible for distributing paper-and-pencil-based questionnaires to small restaurants. Three well-trained research assistants independently conducted door-to-door visits in the identified restaurants. In each visit, the research assistant asked the owner or general manager of the restaurant a filtering question; that is, whether the restaurant joined any of the aforementioned three largest online platforms in China. If the answer was yes and the owner or manager agreed to participate in the survey, then the research assistants invited them to complete the structured questionnaire by themselves. The questionnaire included items of online–offline collaborations and the market performance of the restaurants.

The second research group was responsible for evaluating the physical store's image of participating restaurants. To ensure the offline store image evaluation was timely and reliable, two experts (including one author) had an on-site visit and performed field observations on each restaurant immediately after the first research group collected the self-reported data. The evaluation criteria were based on the developed measures for the physical store image. All scores related to the physical restaurants' images were given based on the agreement of two experts; discussions immediately solved any disagreement regarding the rating during on-site visits.

The survey via field visits lasted one month, and 186 restaurants that carried out online and offline collaboration participated. After removing the questionnaires with incomplete data, we obtained 148 valid samples. Exquisite gifts (roses) were given to all participating restaurants after the field visits. Table 2 shows the demographic information of the respondents from small restaurants.

Table 2.
Sample characteristics

Characteristics	Category	Frequency	%
Respondents' position	Store owners, General managers	55	37.2
	Department managers, group leaders	60	40.5
	Desk representatives	33	22.3
Respondents' gender	Male	68	45.9
	Female	80	54.1
Respondents' education degree	Junior high school degree	34	23
	High school or Technical school degree	74	50
	College/University degree	40	27
Number of employees in the restaurants	≤9	60	40.5
	10–99	88	49.5
Revenues of the restaurants (million RMB)	<1	73	49.3
	1–10	60	40.6
	10–20	15	10.1
Online platforms the restaurants joined	http://v5.ele.me	109	73.6
	http://waimai.baidu.com	68	45.9
	http://waimai.meituan.com	66	44.6
	Others	43	29.1

Based on the restaurant list, the third research group was responsible for capturing online store image objective data from the platforms that the restaurants joined (i.e. eleme.com, meituan.com and dianping.com). The merchandise of an online restaurant was identified by its commodity type and quantity. The layout was determined by the number of pictures that the restaurant posted online and the quality of the pictures. The volume and valence of the online reviews of the online restaurant were also captured to reflect the online restaurant's image. Additionally, store images, regardless of online or offline, are like stores' personalities that will not change in a short period. Therefore, we treated these measures as cross-sectional instead of with time lag. We are aware that this might limit us from inferring the causality; however, we believe the stability of store images helps to mitigate our concern on the causality inference.

4.3 Assessment of the common method bias

We collected data from different sources to prevent common method bias across variables. Different participants assessed the predicting variables (offline store image and online store image) and the criterion variables (market effectiveness and customer satisfaction). Thus, the common method bias between predicting and criterion variables was prevented. A group of experts assessed the offline store image of participating restaurants. Additionally, the online store image was shaped by online objective data from the platforms, whereas the stores' market performance was mainly reported by the owners of the restaurants or general managers.

Meanwhile, we recognized that the potential common method bias could be present among the moderating variables, three collaborative factors and the two criterion variables because the responses of these variables were self-reported by a single key informant (Podsakoff *et al.*, 2003). To minimize the common method bias, we took several precautions based on Podsakoff *et al.*'s (2003) recommendations. First, we organized the questions by interspersing the items relating to collaboration factors and those relating to store performance, therefore, achieving a counterbalance of the priming effect derived from the sequential arrangement of the questions. Second, we used different scales to measure the moderating variables (seven-point Likert scale) and the criterion variables (five-point Likert scale) to reduce the potential presence of the common method bias. Third, although the restaurants were identifiable for academic research purposes, we kept the respondents anonymous and assured their confidentiality. Fourth, we conducted statistical tests to check the presence of the common method bias. We conducted Harman's one-factor test on the reflective constructs. The results showed that the variance did not merely stem from the first factor, but it stemmed evenly from seven factors. We also used the marker variable method to check the common method bias (Liang *et al.*, 2007). We included a common method factor in the partial least squares (PLS) model, which included all the indicators of the constructs. Then we calculated each indicator's variances that were substantively explained by the principal construct and by the method factor. We found that the average variance explained (AVE) by the indicators was 0.304, whereas the average method-based variance was 0.015. None of the method factor loadings were significant. The above tests suggested that the common method variance was unlikely to occur in our study.

5. Results and discussion

We used the PLS modeling technique, particularly SmartPLS (Ringle *et al.*, 2005), for data analysis. Following the recommended two-stage analytical procedure (Anderson and Gerbing, 1988), we tested the structural relationships after assessing the measurement model. The PLS model is appropriate for testing our research model for two reasons.

First, the PLS model allows for the simultaneous use of reflective and formative measurements and can model latent constructs under conditions of non-normality (Chin, 1998). Second, the PLS model is especially suitable for research involving a relatively small sample size.

5.1 Measurement model assessment

Five constructs, including online store image, offline store image and three aspects of online–offline collaborations, were treated as formative constructs. Formative constructs are latent variables determined by their indicators, and the breadth of measures should be ensured. The failure to include the comprehensive facets of the construct would lead to the exclusion of relevant indicators (Nunnally and Bernstein, 1994). Thus, we adhered to Diamantopoulos and Winklhofer's (2001) recommendation to construct an index to ensure the validity of our measures. First, we developed the measures for these formative constructs based on the existing literature and conducted a pretest among 16 experts to validate the content validity of the developed measures. Second, we checked the item weight to assess the relevance of each item in forming its corresponding construct. As shown in Table 3, the weights of most indicators toward their corresponding formative constructs were significant. Furthermore, for formative constructs, when an indicator's weight is insignificant but its factor loading is high (i.e. above 0.5), the indicator should be interpreted as important and would generally be retained (Hair *et al.*, 2017; Huang and Shiau, 2017). Accordingly, we retained all insignificant indicators of formative constructs for model testing. Third, we checked the collinearity among the indicators to minimize difficulties in separating the distinct influence of the individual items. Multicollinearity among the indicators ranged from 1.476 to 6.302, which was below the variance inflation factor (VIF) cutoff threshold of 10 (Hair *et al.*, 1998).

Online and offline store images were treated as formative constructs. Offline store image was measured by five distinct dimensions, and each dimension was reflected by two items. Ten reflective items were independently evaluated by two experts when they walked into those restaurants. Different ratings were resolved by discussions until the two experts' evaluations converged. We used the agreed score on each item and then calculated the mean values (Chen *et al.*, 2012) of each pair of indicators to measure each dimension of the offline store image. Online store image was measured by three dimensions, and each dimension included two distinct indicators (i.e. quantity and quality). To simplify the measurement structure for online store images, we treated online store images as a first-order formative construct formed by six distinct indicators.

For the reflective constructs of market effectiveness and customer satisfaction, we assessed their scale reliability, convergent validity and discriminant validity. As shown in Table 3, all item loadings of the constructs were above 0.7. The composite reliabilities of the constructs exceeded the cutoff of 0.7, and the AVE values were above the threshold of 0.5. According to the recommendations by Nunnally and Bernstein (1994), the results adequately demonstrated the scale reliability and convergent validity of these constructs. Further, we assessed the discriminant validity across the constructs, as Table 4 shows.

5.2 Structural model assessment

After ensuring the reliability and validity of the developed measurements, we tested the hypothesized model by conducting the three PLS modeling analyses in a hierarchical procedure. This testing procedure has also been adopted by Oh *et al.* (2012). Table 5 demonstrates the three model tests by using the PLS technique. The explanation power of Models 1–3 incrementally increased, validating the effects of the online–offline store image and the moderating effects of online–offline collaborations for promoting the market

Constructs	Dimensions/ Indicators	Means	S.D.	Loadings	Weights	*t*-values
Offline store image (OFI)	Merchandise	4.10	0.474	0.521	0.362	1.106
	Atmosphere	4.04	0.898	0.519	0.179	0.593
	Service	4.52	0.399	0.542	0.453	1.208
	Layout	4.18	0.445	0.844	0.955**	3.011
	Convenience	4.43	0.625	0.516	0.268	0.847
Online store image (ONI)	The number of online merchandise types	8.44	3.951	0.522	0.404†	1.855
	The number of online products	78.26	51.148	0.511	0.007	0.046
	The quantity of online merchandise pictures	29.25	35.901	0.513	0.768***	3.486
	The quality of online merchandise pictures	3.09	1.870	0.508	0.645**	2.883
	The rating of online reviews	4.46	0.450	0.605	0.591***	3.213
	The number of online reviews[a]	454.27	1176.040	0.536	0.256†	1.651
Information collaboration (IC)	IC1	5.79	1.467	0.814	0.578**	3.288
	IC2	5.34	1.798	0.513	0.197	1.446
	IC3	5.32	1.675	0.813	0.541**	3.248
	IC4	4.78	1.664	0.567	0.303**	2.589
Transaction management collaboration (TMC)	TMC1	3.80	2.268	0.516	0.124	0.372
	TMC2	3.65	2.160	0.668	1.286***	3.512
	TMC3	2.99	2.014	0.526	1.036**	2.602
Customer service collaboration (CSC)	CSC1	5.32	1.788	0.904	0.600***	3.272
	CSC2	5.53	1.464	0.869	0.506**	2.681
	CSC3	4.43	2.122	0.503	0.041	0.384
Market effectiveness (ME) (Composite Reliability = 0.912; Cronbach's Alpha 0.872; AVE = 0.726)	ME1	3.78	1.087	0.885	-	32.882
	ME2	3.96	1.075	0.900	-	51.536
	ME3	3.84	1.105	0.817	-	14.518
	ME4	3.84	0.974	0.791	-	20.916
Customer satisfaction (CS) (Composite Reliability = 0.961; Cronbach's Alpha = 0.918; AVE = 0.924)	CS1	3.91	1.036	0.959	-	112.249
	CS2	3.91	1.075	0.968	-	140.740
	CS3	3.93	1.053	0.928	-	63.938

Note(s): a. The logarithm of the number of online reviews was used for model testing. b. $^{\dagger}p < 0.1$; $^{*}p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$

Table 3. Descriptive statistics of formative and reflective constructs

performance of the restaurants. We further summarized the results in Figure 2 to illustrate the hypothesis testing.

In the baseline model (Model 1), the online–offline images explained 10.6% and 13% of the variances in market effectiveness and customer satisfaction, respectively. The online store image exerted significant effects on both market effectiveness ($\beta = 0.277$, $t = 4.142$) and customer satisfaction ($\beta = 0.334$, $t = 4.480$). Hence, H2a and H2b were supported. However, the offline store image only had a marginally significant impact on market effectiveness ($\beta = 0.114$, $t = 1.734$) and an insignificant effect on customer satisfaction ($\beta = 0.098$, $t = 1.369$); H1a was weakly supported, and H1b was not supported. Thus, the online store

Constructs	OFI	ONI	PC	TC	CSC	ME	CS
OFI	–	–	–	–	–	–	–
ONI	0.052	–	–	–	–	–	–
IC	0.084	0.064	–	–	–	–	–
TMC	−0.020	−0.010	0.292	–	–	–	–
CSC	0.151	0.147	0.509	0.112	–	–	–
ME	0.132	0.281	0.532	0.178	0.439	*0.849*	–
CS	0.111	0.340	0.523	0.140	0.487	0.755	*0.961*

Table 4. Correlation of constructs and AVE values

Note(s): a. OFI: offline store image, ONI: online store image, PC: pre-sale collaboration, IC: information collaboration, TMC: transaction management collaboration, CSC: customer service collaboration, ME: market effectiveness, CS: customer satisfaction, b. Italic numbers are square roots of average value extracted. OFI, ONI, PC, TC and CSC are formative constructs, thus the AVE is not applicable for them

image plays a salient role in promoting the market performance of restaurants in the offline-to-online business model. In this new context, consumers' purchase and consumption processes are more likely triggered via online channels, and restaurants are responsible for fulfilling the online orders by providing on-time delivery and post-purchase customer services. An online image shaped by online products, pictures and other customers' evaluations signals the quality of a small restaurant. It strongly affects consumers' cognition of the restaurants and their subsequent purchase decisions. This finding was consistent with Verhagen and van Dolen (2009), who state that the online store image is a positive determinant of consumers' online purchase intentions. In the offline-to-online target, especially in the sector of restaurants with take-out business, online store images play an important role in attracting consumers to place orders online (He *et al.*, 2016; Yang *et al.*, 2020), while offline store images may become a less effective channel for promoting a small store's market performance. These results shape the competition on resources and segments across channels (Fürst *et al.*, 2017). However, this should not discourage small stores from developing a good image for their offline counterpart. Nevertheless, the offline store image can affect consumers' trust in the store and their patronization (Gensler *et al.*, 2012).

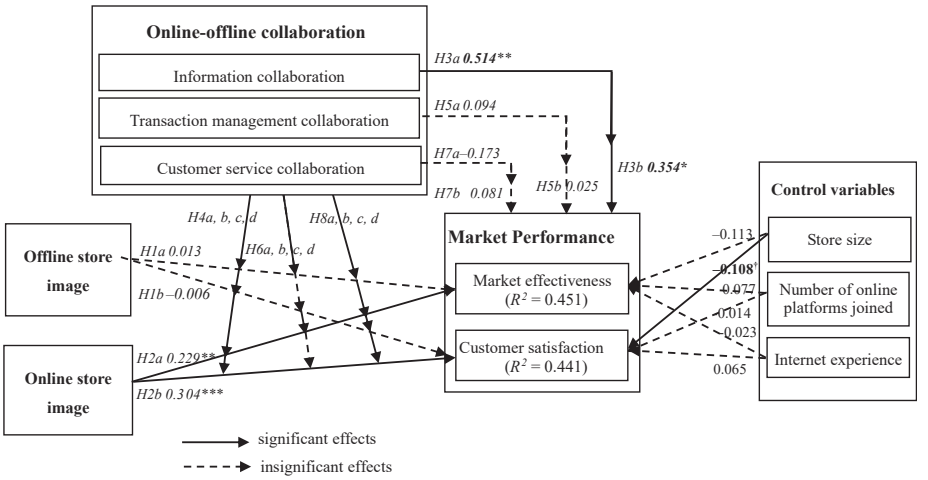
To clarify the impacts of the three types of collaboration on market performance, we first examined their direct effects on market effectiveness and customer satisfaction and then examined their moderating effects on the relationships between online–offline images and market performance. The results in Model 2 showed that information collaboration in the pre-sale stage ($\beta = 0.407, t = 4.542$; $\beta = 0.361, t = 4.567$) and customer service collaboration in the post-sale stage ($\beta = 0.191, t = 2.081$; $\beta = 0.261, t = 3.104$) had significant effects on market effectiveness and customer satisfaction, providing strong support for H3a, H3b, H7a and H7b. The result showed that transaction management collaboration could not directly promote the market performance of the restaurants. Thus, H5a and H5b were not supported. The main effect results implied that information and customer service collaborations in the pre- and post-sale stages were more straightforward than the transaction management collaboration in the in-sale stage to improve the sales of small restaurants and customer satisfaction. As consumers may have stronger and more stable individual preferences concerning food than other types of goods, the transaction management, such as recommendations based on customers' historical records, cannot directly stimulate consumers to purchase the food nor improve their satisfaction.

Next, we used the mean-centered method, similar to Oh *et al.* (2012), to create interactions assessing the hypothesized moderating effects of online–offline collaborations in Model 3. The mean-centered method can minimize the multicollinearity among the predicting variables (Aiken and West, 1991). The VIFs of these predicting variables were all less than 5,

Table 5.
Results of three PLS model tests

Paths	Model1 Market effectiveness β(se)	Model1 Customer satisfaction β(se)	Model2 Market effectiveness β(se)	Model2 Customer satisfaction β(se)	Model3 Market effectiveness β(se)	Model3 Customer satisfaction β(se)
Main effects						
OFI → MP	0.114† (0.070)	0.098(0.071)	0.053(0.064)	0.032(0.068)	0.013(0.060)	−0.006(0.071)
ONI → MP	0.277***(0.066)	0.334***(0.074)	0.225***(0.063)	0.276***(0.067)	0.229**(0.076)	0.304***(0.092)
IC → MP			0.407***(0.085)	0.361***(0.080)	0.514**(0.149)	0.354*(0.157)
TMC → MP			0.052(0.055)	0.018(0.044)	0.094(0.137)	0.025(0.120)
CSC → MP			0.191**(0.084)	0.261***(0.083)	−0.173(0.114)	0.081(0.158)
Interaction effects						
IC *OFI → MP					−0.689*(0.299)	−0.332† (0.197)
IC *ONI → MP					0.726*(0.204)	0.448†(0.247)
TMC *OFI → MP					−0.416*(0.210)	−0.100(0.140)
TMC *ONI → MP					0.406*(0.041)	0.084(0.125)
CSC *OFI → MP					1.306***(0.120)	0.708*(0.106)
CSC*ONI → MP					−0.998*(0.405)	−0.585*(0.297)
Control variables						
SZ → MP	−0.037(0.053)	−0.049(0.047)	−0.052(0.056)	−0.068(0.049)	−0.113(0.070)	−0.108†(0.065)
NP → MP	0.109(0.066)	−0.012(0.064)	0.132*(0.061)	0.016(0.038)	0.077(0.056)	−0.014(0.041)
IE → MP	−0.020(0.052)	0.063(0.064)	−0.046(0.043)	0.040(0.047)	−0.023(0.042)	0.065(0.051)
R^2	0.106	0.130	0.395	0.421	0.451	0.441
$\triangle R^2$			0.289	0.291	0.345	0.311
f^2			0.478	0.503	0.628	0.556
PFS			67.876	71.426	89.176	78.952

Note(s): a. MP: market performance, OFI: offline store image, ONI: online store image, IC: information collaboration, TMC: transaction management collaboration, CSC: customer service collaboration, SZ: store size, NP: number of online platforms joined, IE: Internet experience, PFS: Pseudo F-statistic, se: standard error, b. $f^2 = (R^2_{\text{full model}} - R^2_{\text{partial model}})/(1 - R^2_{\text{full model}})$, Model 1 as the partial model, Models 2 and 3 as full models, 0.02–0.15 small, 0.15–0.35 medium, >0.35 large, c. Pseudo $F = f^2_{(n\text{-}k\text{-}1)}$, where n is the sample size and k is the number of independent constructs, d. $^{\dagger}p < 0.1$; $^{*}p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$



H4a	Information collaboration(IC)*offline image(OFI)→market effectiveness	**–0.689 ***	**supported**
H4b	Information collaboration(IC)*offline image(OFI)→customer satisfaction	**–0.332†**	**marginally supported**
H4c	Information collaboration(IC)*online image(ONI)→market effectiveness	**0.726***	**supported**
H4d	Information collaboration(IC)*online image(ONI)→customer satisfaction	**0.448†**	**marginally supported**
H6a	Transaction management collaboration(TMC)*offline image(OFI)→market effectiveness	**–0.416***	**supported**
H6b	Transaction management collaboration(TMC)*offline image(OFI) →customer satisfaction	–0.100	not supported
H6c	Transaction management collaboration(TMC)*online image(ONI)→market effectiveness	**0.406***	**supported**
H6d	Transaction management collaboration(TMC)*online image(ONI) →customer satisfaction	0.084	not supported
H8a	Customer service collaboration(CSC)*offline image(OFI) →market effectiveness	**1.306*****	**supported**
H8b	Customer service collaboration(CSC)*offline image(OFI)→customer satisfaction	**0.708***	**supported**
H8c	Customer service collaboration(CSC)*online image(ONI)→market effectiveness	**–0.998***	**supported**
H8d	Customer service collaboration(CSC)*online image(ONI)→customer satisfaction	**-0.585***	**supported**

Note(s): †$p < 0.1$; *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$. Significant parameters are highlighted in bold

Figure 2.
Results of the holistic model testing

indicating a low level of multicollinearity. Compared with the baseline model (Model 1), the variances explained in Models 2 and 3 increased significantly. In particular, the holistic Model 3, which included all predicting variables and moderating effects, explained adequate variances of market effectiveness ($R^2 = 45.1\%$) and customer satisfaction ($R^2 = 44.1\%$). The explained variances increased by 34.5% and 31.1%, compared to the baseline. Further, we conducted the pseudo-F test to assess the effect size of adding variables to the change of R^2 for market performance. We calculated the effect size f^2 and the pseudo-F statistics. According to the rule of thumb (Cohen, 2013) and compared to the baseline model (Model 1), when the online–offline collaborations were accounted for, the effect sizes of Model 3 ($f^2 = 0.628$ and $f^2 = 0.556$, respectively) increased. These results indicate that online–offline collaboration can impact the market performance of stores.

Further, we checked the magnitudes of the moderating effects of the three types of collaboration in different stages. On the one hand, the information collaboration ($\beta = -0.689$, $t = 2.304$) and the transaction management collaboration ($\beta = -0.416$, $t = 1.979$) significantly attenuated the direct effects of offline store image on market effectiveness. In contrast, customer service collaboration ($\beta = 1.306$, $t = 3.316$) significantly strengthened the offline store image on market effectiveness, providing strong support for H4a, H6a and H8a. On the other hand, the information collaboration ($\beta = 0.726$, $t = 2.252$) and the transaction management collaboration ($\beta = 0.406$, $t = 1.995$) significantly strengthened the direct effects of the online store image and the market effectiveness. However, the customer service collaboration ($\beta = -0.998$, $t = 2.465$) significantly attenuated this direct effect, providing

strong support for H4c, H6c and H8c. These results illustrate the contrasting boom-bust effects of different types of collaborations on leveraging store images for the market effectiveness of small restaurants. When small restaurants expand from offline to online, online images of restaurants significantly promote their market effectiveness (e.g. sales). The online–offline information congruence regarding promotion and the seamless online–offline transaction management collaboration can further strengthen the positive effects from the online channels.

Meanwhile, the information collaboration interacted with the online store image ($\beta = 0.448$, $t = 1.816$) and the offline store image ($\beta = -0.332$, $t = 1.683$) to influence customer satisfaction in the small restaurants at a marginally significant level. The transaction management collaboration did not significantly interact with store images for improved customer satisfaction. There are several plausible reasons. First, information collaboration in the pre-sale aiming to provide consistent information across channels may extrude the necessity of cue utilization from store images. Second, the relatively lower mean values of transaction management collaboration indicate that the small restaurants may have had limited information management capacity to reasonably manage their transaction records and customer profiles for precise recommendations. However, the e-platforms could offer these functions. Therefore, they could not use collaborative transaction management to leverage their channels for gaining a higher level of customer satisfaction. Additionally, it is a limitation that customer satisfaction was reported by the restaurants.

As hypothesized, the results demonstrated that customer service collaboration in the post-sale stage exerted a different interacting pattern concerning store image than collaborations in the pre- and in-sale stages. Customer service collaboration had significant positive interactions with offline store image ($\beta = 1.306$, $t = 3.316$) for promoting market effectiveness of small restaurants, whereas it significantly weakened the effects of online store image ($\beta = -0.998$, $t = 2.465$) on market effectiveness. Regarding customer satisfaction, customer service collaboration significantly positively interacted with offline store image ($\beta = 0.708$, $t = 2.451$) and had a significant negative interaction with online store image ($\beta = -0.585$, $t = 1.971$). These results provide strong support for H8a–8d. For the catering sector, especially the take-out business, the physical store should accept the return or exchange of food purchased online. The offline channel should be able to provide consumers with interactive access to the customer service desktops.

Nevertheless, consumers may be more concerned with customer service than product and transaction information in the catering sector. The customer service collaboration could augment the presence of physical stores and make the billboard effect of offline channels play out as reported in previous research (Wang and Goldfarb, 2017). It is worth noting that such collaboration could attenuate the positive effect of online channels for promoting market performance. In any case, the above three stages of online–offline collaborations played distinct but competitive roles in moderating the effects of online–offline images on market performance.

Additionally, we found a marginally significant negative relationship between store size and customer satisfaction in Model 3, indicating that smaller stores are more likely to gain customer satisfaction. Although we controlled the store size of the sample, this result implies that it is easier for micro-stores to implement online–offline collaboration to create consistent experiences for customers than small stores.

6. Implications, limitations and conclusion

6.1 Theoretical implications

This study's first and essential contribution is associated with the impacts of online and offline collaboration for multichannel e-commerce. Prior research focused on overall

multichannel integration capability (Oh *et al.*, 2012) or on one integration (e.g. multichannel assortment integration) by Emrich *et al.* (2015) and verified the positive impact of the related integrative capability on the competence and performance of firms. Our study distinguishes the components of online–offline collaborations (i.e. information collaboration, transaction management collaboration and consumer service collaboration) along a vertical purchase process. Trenz *et al.* (2020) criticize the scarcity of multichannel research that addresses multiple phases of a transaction. Our study addressed this research gap; using multiple data sources, this study examined the nuanced effects generated by vertically differential collaborations. Further, our study showed the direct effects of online–offline collaborations on small stores' market performance. It revealed the contrasting moderating effects on the relationships between a store's online–offline images and its market performance. These findings enrich our understanding of how online–offline collaborations can influence small stores' market performance when expanding business from offline to online.

Next, our study enriched open systems theory by discovering the constructive and destructive relationships in multichannel research at a fine granularity. The paradigm of open systems has not been much exploited for collaborative relationships within organizations at a lower level of granularity, such as online–offline channels (Fürst *et al.*, 2017). Collaborations between online channels and offline channels constitute an open system, which has both constructive (e.g. cooperation) and destructive (e.g. conflict) properties (Katz and Kahn, 1978). Prior research emphasizes either the substitutive relationship between online stores and offline stores due to different shopping environments (Huyghe *et al.*, 2017) or their complementary relationship due to the billboard effect of physical stores (Avery *et al.*, 2012; Gallino and Moreno, 2014; Wang and Goldfarb, 2017). Our study demonstrated the co-existence of the contrasting properties in an online–offline collaboration system.

On the one hand, the online–offline collaboration at the task level enables cue congruence and functional integration, thus helping small stores to improve their market performance. The direct positive effects indicate the constructive property of online–offline collaboration. On the other hand, online–offline collaborations exert boom-bust moderating effects between a small store's online–offline images and its market performance. Online and offline channels may have differential segments. Luo *et al.* (2020) revealed complementarity and cannibalization effects in online and offline channels and argued that the contrasting effects appear in nearby versus distant customer segments. Our study teased out that vertically differentiated online–offline collaborations along a purchase process can also induce contrasting relationships in a multichannel system, further extending Luo *et al.*'s (2020) study, which used customer segments as a differentiator. While information and transaction management collaborations reinforce the impact of an online channel on market performance, they attenuate the contribution of the offline channel. In contrast, customer service collaboration can strengthen the offline channel image on market performance; however, it weakens the online store image. Boom-bust effects depend on the conspicuous capability of one of the two channels in different collaboration stages. These paradoxical effects imply the destructive property in the multichannel system. These findings confirm the open systems theory explaining the phenomenon in new contexts and add values to multichannel and omnichannel research streams.

Finally, our study enriched our understanding of how small stores' images affect their performance in a multichannel context. Although the presence of physical stores (e.g. Wang and Goldfarb, 2017) or virtual stores (e.g. Zhang *et al.*, 2019) is beneficial in terms of better market performance for small stores, their impact will be reinforced or attenuated along the three stages of online–offline collaboration. Our empirical results further illustrated that online and offline store images play distinct roles in promoting small stores' market performance, regarding their distinct interactions with the different stages of online–offline

collaborations. The online store image can deliver a dominant conspicuous capability to customers in information and transaction management collaborations, whereas the offline store image can dominate customer service collaboration. Also, small stores joining multiple platforms to set up virtual stores would increase their cost and management complexity and may not always bring positive values (Zhang *et al.*, 2019).

6.2 Managerial implications

The consequent implications for small stores' marketing practices are important. As multichannel and omnichannel commerce prevail, small stores are required to launch online channels on relevant platforms and build a favorable online image. The small sellers effectively using the online channel can find more consumers and attract them to place orders online at a lower cost (He *et al.*, 2016; Yang *et al.*, 2020), therefore, expanding their customer base and increasing total sales. For instance, small stores should provide various products, high-quality product pictures, consistent product information and favorable online reviews. The information representing the online store image help customers reduce risk and increase their trust in the pre- and in-sale stages. Simultaneously, offline stores should maintain favorable product and service quality, a variety of product assortment, a decent and convenient layout, dedicated in-store services and a convenient location, because offline store image has conspicuous capabilities in the post-sale customer service stage.

More importantly, the owners and managers of small stores should recognize the importance of information congruence and functional integration concerning online–offline collaboration. For example, the product specification, pricing, ordering and inventory information of an offline store should be consistent with and promptly shared with its online store. Such information congruence helps small stores build credible reputations and trusting relationships with consumers. Although small stores can expand the service radius by setting up online channels, the service area is usually limited to a 5-km radius (Zhang *et al.*, 2019). It is the functional integration in the online–offline collaboration that enables a smooth customer experience. The physical store should be capable of easily confirming online order details and swiftly authenticating the customer identity to improve customer satisfaction. Once an online order is generated, the physical store should respond to the orders promptly and fulfill them. These seamless collaborations at the task level enable synergy between online and offline channels, thus contributing to the market performance for small stores.

Furthermore, managers of small stores should recognize that the effects of collaboration are not universal for different channels; in contrast, it is most likely to result in the dominance of one channel with conspicuous capability in different stages of a purchase process. Therefore, managers should deploy differential marketing strategies to optimize the resource investment and maximize the channel utility in each stage. Small stores can invest more effort in online channels in pre-sale and in-sale collaborations (e.g. designing attractive online promotions, diversified online discount coupons and dynamic recommendations). Additionally, they can enhance the capability of offline channels by customer service collaboration (e.g. product take-away, exchange and returns).

6.3 Limitations and future work

We are aware of several limitations of this study. First, our samples were from small restaurants, although this section has been deeply penetrated by the new mode of online–offline marketing in China. Online and offline collaboration in the restaurant section may be different from the collaboration in the small-retailer section. For instance, compared to retailers, restaurants have a more salient effect on customers in delivering customer service in the offline channel. Therefore, an empirical study in small retailers (e.g. small clothing shops and convenience stores) can be done in the future. Furthermore, the sample size is small,

although it is acceptable for testing the models. If possible, more data from more business clusters and sectors should be collected to enlarge the sample size in future studies.

Second, the evolution of the online–offline market in China, particularly in the restaurant industry, requires serious consideration. Traditional small restaurants have an offline-to-online target, as they were constructed before opening online stores on platforms; therefore, their offline images might have been fixed in customers' minds. They can innovatively build online store images on the platforms to attract new customers. Traditional offline store images might not be as good as the image of the online counterpart. These are also plausible reasons for the discovered limited effect of offline channels on market performance. Luo *et al.* (2020) find evidence for both complementarity and cannibalization effects of online and offline channels depending on consumers' distance to the physical stores. Simultaneously, there is a new trend of multichannel marketing with online-to-offline targeting. For instance, Xiaomi established many physical shops to improve customer experience. Alibaba Group launched a new business (Hema fresh) with a unified online channel but plenty of physical stores widely distributed in many cities. In the context of online-to-offline targeting, offline store images can produce a billboard effect (Wang and Goldfarb, 2017). Therefore, we should account for both temporal and spatial factors to further examine the interplay between online and offline channels and how online–offline collaborations matter to different channels when stores are at different developmental stages. A thorough investigation in the future would help us establish a roadmap of online–offline business development and determine more contingencies for the effects derived from different channels.

6.4 Conclusion

This research enriches our understanding of the impacts of online–offline collaborations on the market performance of small stores. The basic assumption is that online and offline store images affect the market performance of small stores. We develop our research model on this premise and determine how vertically differentiated online–offline collaborations distinctly intervene in the effects of online image and offline image on the market performance of small stores. Our empirical results demonstrated that online–offline collaboration at the task level could help small stores improve their market performance (including market effectiveness and customer satisfaction). More importantly, these collaborations will reinforce the effect of online store image but weaken the effect of offline store image on market performance and vice versa. The boom-bust moderating effects lead us to re-think the complex open system and the multichannel service integration and innovation.

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Appendix 1
Measurements for market performance and store images (market effectiveness, customer satisfaction and offline store image measured in a five-point Likert scale)

Market performance (please evaluate the performance of your business relative to before participating in the platform)			
Market effectiveness		(1)	Market share growth relative to competitors
		(2)	Growth in sales revenue
		(3)	Acquiring new customers
		(4)	Increasing sales to existing customers
Customer satisfaction		(1)	Improved customer satisfaction
		(2)	Improved customer retention
		(3)	Enhanced quality of service
Store image related constructs			
Offline store image	Merchandise	(1)	The restaurant's merchandise or service is rich in size for consumers to choose from
		(2)	The quality of the restaurant's food is guaranteed
	Atmosphere	(1)	The atmosphere of the restaurant is very comfortable
		(2)	The restaurant is always kept clean and tidy
	Service	(1)	The restaurant's service staff can actively solve consumer problems
		(2)	The restaurant's service staff can provide food-related information to customers
	Layout	(1)	The restaurant's menu is well designed and convenient for customers' view
		(2)	The restaurant's foods have been displayed by pictures and models to facilitate customers to understand the information of foods
	Convenience	(1)	The location of the restaurant is very convenient
		(2)	Customers can easily find the restaurant
Online store image	Online product	(1)	The number of online merchandise types
		(2)	The number of online products
	Online layout	(1)	The quantity of online merchandise pictures
		(2)	The quality of online merchandise pictures
	Online review	(1)	The rating of online reviews
		(2)	The number of online reviews

Appendix 2
Measurements for collaboration-related constructs (in a seven-point Likert scale)

Constructs	Items
Information collaboration (IC)	(1) Food prices are consistent in both the physical restaurant and website
	(2) Discounts are consistent in both the physical store and website
	(3) The website highlights in-store promotions that are taking place in the physical restaurant
	(4) The website publishes advertisements appearing in newspapers or pamphlets
Transaction management collaboration (TMC)	(1) The restaurant allows customers to access their prior integrated purchase history
	(2) The restaurant makes future purchase recommendations to customers based on past consolidated online and offline purchases
	(3) The platform customizes web pages for customers based on their past comprehensive online and offline purchasing history
Customer service collaboration (CSC)	(1) The in-store customer service center accepts the return or exchange of foods purchased online
	(2) The website provides post-purchase services, such as support for the products purchased at physical stores
	(3) The website provides interactive access to the customer service assistant through a real-time chat program

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