Research Article

Platform-based customer agility: An integrated framework of information management structure, capability, and culture

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ARTICLE INFO

ABSTRACT

Platform-based customer agility is the ability to leverage the voice of the customer on a platform to achieve market intelligence and to explore competitive action opportunities. Prior studies have indicated the critical role of customer agility in enabling the survival and prosperity of contemporary organizations in a turbulent business environment, although how to develop this capability is not answered. The current research attempts to fill this theoretical gap. Drawing on the information management literature, we propose an integrative information management framework to investigate the process of developing customer agility. By conducting a case study of a leading e-commerce platform in China, we identify three types of platform-based customer agility (i.e. reactive customer agility, proactive customer agility, and coactive customer agility) in different phases of the growth of the platform. Furthermore, a process model is developed from the case study. It shows that platform-based customer agility is achieved by establishing information management structure, developing information management capability, and instilling information management culture. This study contributes to the knowledge on customer agility and information management. Detailed recommendations are also provided for potential practitioners.

1. Introduction

Electronic commerce (e-commerce) is a popular shopping and retail channel that is widely acknowledged. As a result, e-commerce websites have been appearing for the past decades, which has intensified competition in the industry (Granados, Gupta, & Kauffman, 2010). Given the abundance of online shopping information available, consumers are empowered to make better purchase decisions. Internet technologies allow consumers to compare offerings from different e-commerce websites at virtually no cost. Indeed, they can conveniently change websites due to very low switching costs (Campbell, Wells, & Valacich, 2013). On the other hand, e-commerce platforms experience increasing difficulty in maintaining a unique competitive advantage, as the functionalities of e-commerce websites are commodity-like, and different e-commerce platforms are providing homogenized products and services (Porter, 2001). Furthermore, competitors are better informed since they can readily access inexpensive intelligence based on the information available online (Granados et al., 2010). They can easily observe the competitive activities of the focal e-commerce platform by browsing through the website, which might put the platform at a

disadvantage. As a result, e-commerce platforms "must face the challenge of confronting this new open, dynamic, and information-rich business environment" (Granados et al., 2010, p.207).

Arguably, platform-based customer agility is the key to survival and prosperity for e-commerce platforms in a competitive and turbulent environment. Platform-based customer agility is the ability to leverage the voice of the customer on a platform to achieve market intelligence and to explore competitive action opportunities (adapt from Sambamurthy, Bharadwaj, & Grover, 2003). Customers are pivotal sources of knowledge that drive product and service innovation (Nambisan, 2002; Prahalad & Ramaswamy, 2000). Platform-based customer agility enables e-commerce platforms to translate customer needs into their products and services, which improves customer satisfaction and helps retain customers (Bendapudi & Leone, 2003). For example, Amazon. com collects and analyses all kinds of customer information to generate personalized recommendations and improve customers' shopping experience. Furthermore, platform-based customer agility allows e-commerce platforms to obtain innovative ideas from customers, which improves innovation speed and quality (Carbonell, Rodríguez-Escudero, & Pujari, 2009). As a result, the e-commerce platform with customer

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agility is more likely to lead the competition even when facing the pressure of competitors to imitate. For example, Ebay.com gains many innovative ideas from its customers by gathering and processing information in its virtual user community. Thus, platform-based customer agility is critical for e-commerce platforms to achieve a competitive advantage and improve their performance.

While platform-based customer agility is extremely important to e-commerce platforms, little is known about how to develop this critical capability. Existing research mainly centres on identifying and validating the antecedents and the performance impacts of customer agility (e.g., Goh, Pan, & Zuo, 2013; Roberts & Grover, 2012; Sambamurthy et al., 2003; Zhou et al., 2018), which fails to indicate the process through which customer agility is developed. It constitutes the major research gap that motivates this research. Drawing on information management research, we posit that the practices of an e-commerce platform to effectively manage and use information play a vital role in achieving platform-based customer agility. First, organizations with a better ability to offer key stakeholders' access to relevant information in a timely, accurate, and reliable manner are more effective in reacting to customer changing needs and improving customer relationships (Karimi, Somers, & Gupta, 2001). Second, by deriving insights from large volumes of customer data and uncovering patterns among seemingly unrelated pieces of customer information, decision makers of organizations are better informed with valuable market intelligence and can capture untapped opportunities (Ashrafi, Ravasan, Trkman, & Afshari, 2019; Saldanha, Mithas, & Krishnan, 2017). Finally, e-commerce platforms are increasingly applying broad social media and Web 2.0 tools to interact with their customers and build relationships (Busalim & Hussin, 2016; Meilatinova, 2021). Facilitating customer interactions, motivating customer sharing, and leveraging an enormous quantity of user-generated content are critical to improving the online shopping experience and discovering innovative ideas (Lin, Wang, & Hajli, 2019; Zhou et al., 2018). Therefore, this research intends to investigate the significant role of information management in enabling e-commerce platforms to achieve platform-based customer agility.

The research question in this study, then, is as follows: *how does information management enable e-commerce platforms to achieve platform-based customer agility?* We draw on the information management literature (e.g., Marchand, Kettinger, & Rollins, 2000; Mithas, Ramasubbu, & Sambamurthy, 2011) to propose an integrative information management framework composed of three interrelated components: information management structure, information management capability and information management culture. Based on the agility literature, agility is developed through the complementary intertwining of information technologies (IT) with organizational structures, skills and cultures (Sambamurthy et al., 2003). Consistently, we investigate the development of platform-based customer agility from the perspective of information management, which is the intertwining of IT with organizational structures, skills, and cultures. The information management framework provides an appropriate tool to investigate the development of platform-based customer agility. We adopt a case research method and choose a leading Chinese e-commerce platform as the case company. The selected company is a sizeable multi-sided platform (MSP) that is a commercial network of producers, suppliers, intermediaries, and customers and that creates value by facilitating transactions between these different entities (Cusumano & Gawer, 2002; Tan, Pan, Lu, & Huang, 2015). Since this study investigates the development of platform-based customer agility, we focus on the interactions between the e-commerce platforms and its online consumers. We observe three types of platform-based customer agility (i.e., reactive customer agility, proactive customer agility, and coactive customer agility) in different phases of the growth of the platform. Accordingly, information management practices vary across different types of platform-based customer agility. Furthermore, we develop a process model that demonstrates how information management enables the e-commerce platform to achieve the three types of platform-based customer agility.

This study addresses two gaps in the literature. First, despite the literature considering IT as a source of customer agility (e.g., Roberts & Grover, 2012; Sambamurthy et al., 2003; Zhou et al., 2018), the process by which customer agility is developed has not been previously studied. Current research develops a process model of developing customer agility to fill this theoretical gap. Furthermore, we propose the concept of platform-based customer agility and provide a typology of platform-based customer agility to enrich the scarce literature on customer agility. Second, we develop an integrative information management framework that synthesizes the findings of information management research. It responds to the research gap noted by Anand, Manz, & Glick (1998), namely, that researchers are not taking the lead in developing conceptual and theoretical models of information management that can provide management implications. This contribution is also valuable because information management has become increasingly crucial in this era of information explosion.

2. Literature review

2.1. Customer agility

Customer agility refers to "firms' ability to leverage the voice of the customer for gaining market intelligence and detecting competitive action opportunities" (Sambamurthy et al., 2003, p. 245). Except for customer agility, Sambamurthy et al. (2003) also proposed two other types of agility, which is operational agility that focuses on firms' business processes and partnering agility that focuses on partnerships with suppliers, distributors, producers, and logistics providers. Unlike the other two types of agility, customer agility focuses on firms' interactions with customers and highlights the pivotal role of customers in stimulating organizations' competitive actions in a turbulent environment (Roberts & Grover, 2012). The contemporary business environment is characterized by an increasing pace of globalization, changing customer demands, competitive rivalry, and rapid technological advancements, which make it difficult to achieve sustained competitive advantages (McAfee & Brynjolfsson, 2008). Instead, the ability to consistently launch and exploit competitive actions to develop a series of temporary advantages, called customer agility, becomes critical to survival and prosperity in the hypercompetitive environment (Roberts & Grover, 2012). Organizations that achieve customer agility are capable of making their products and services meet customer needs and improving customer satisfaction (Zhou et al., 2018). More importantly, customer agility enables organizations to absorb novel ideas of customer that drive product and service innovations, which creates more competitive action opportunities (Roberts & Grover, 2012). Thus, customer agility is of great significance to e-commerce platforms that face fierce competition and shifting customer needs.

Prior work on customer agility centres on examining the antecedents and the performance impacts of customer agility (e.g., Roberts & Grover, 2012; Sambamurthy et al., 2003; Zhou et al., 2018). In a conceptual study, Sambamurthy et al. (2003) discussed the role of IT as a digital options generator in enabling customer agility as well as the impact of customer agility on firms' competitive actions. Roberts and Grover (2012) divided customer agility into sensing and responding capabilities and investigated the impact of knowledge-based and process-based IT infrastructure on customer agility. Furthermore, this study indicated that the alignment between customer-sensing capability and customer-responding capability affect the efficacy of a firm's competitive actions. Zhou et al. (2018) investigated the impact of a specific IT application, online customer review, on customer agility and subsequently, the impact of customer agility on product performance in a product development context. Despite the literature considering IT as a source of customer agility (e.g., Sambamurthy et al., 2003), the process through which customer agility is developed has not been studied previously. This might be due to the implicit assumption of prior research that equates the implementation of IT with the achievement of customer

agility (e.g., Zhou et al., 2018). However, such an assumption might not be true since agility is developed through the complementary intertwining of IT with organizational structures, skills and cultures (Sambamurthy et al., 2003). As a result, there is a need to examine how to develop customer agility to fill the theoretical gap.

Based on Sambamurthy et al. (2003)'s definition of customer agility, we define platform-based customer agility as the ability to leverage the voice of the customer on a platform to achieve market intelligence and to explore competitive action opportunities. Our study specifies 'customer' as a group of users who shop on the e-commerce website. This scope of 'customer' is consistent with existing research on customer agility in the context of MSPs (e.g., Zhou et al., 2018). Platform-based customer agility highlights the application of various e-commerce technologies to capture and leverage customer information on an e-commerce platform. These technologies can be divided into three categories. First, interactive e-commerce technologies enable online interactions and communications between customers and an e-commerce platform to meet online shopping needs (e.g., Cenfetelli, Benbasat, & Al-Natour, 2008; Jiang & Benbasat, 2007; Piccoli, Brohman, Watson, & Parasuraman, 2004). Interactive e-commerce technologies allow customers to obtain relevant shopping information by actively controlling information to be displayed or communicating with customer representatives (Jiang, Chan, Tan, & Chua, 2010). For example, live chat tools allow customers to communicate with customer representatives in case of missing information about the products and services. Second, analytical e-commerce technologies are adopted to capture insights from large volumes of customer data and provide a personalized shopping experience (e.g., Ho, Bodoff, & Tam, 2011; Xiao & Benbasat, 2007; Zhang, Agarwal, Lucas, & Henry, 2011). For instance, an e-commerce platform can apply data mining and click-stream analysis to customize product recommendations at the individual level. Third, social e-commerce technologies, such as the broad social media and Web 2.0 tools, are increasingly adopted by e-commerce platforms to improve online shopping experiences and discover innovative ideas (e.g., Kumar, Salo, & Li, 2019; Zhou et al., 2018). Unlike interactive e-commerce technologies, social e-commerce technologies are mainly used to facilitate interactions and communications among customers (Meilatinova, 2021). Customers interact, and their interactions influence other customers by using social e-commerce technologies (Hajli, Lin, Featherman, & Wang, 2014). For example, an e-commerce platform can develop an online product community where customers can share their shopping experiences and discuss the products. These technologies bring about different ways to interact with customers, as well as different approaches to leverage the voice of the customer on a platform. As a result, platform-based customer agility might emerge in several different patterns. In this study, we attempt to examine the development of platform-based customer agility and the impact of different e-commerce technologies on it.

2.2. Information management literature

To study the development of platform-based customer agility, we draw on information management research to propose an integrative information management framework that is composed of three components: information management structure, information management capability, and information management culture. Information management structure refers to the IT-enabled coordination mechanism that facilitates information processing, communication, and knowledge sharing (adapted from Kwon, Oh, & Jeon, 2007). Information management capability is the ability of the organization to collect, analyse and disseminate information (Mithas et al., 2011). Information management culture refers to the shared patterns of values and behaviours that define the significance of information and affect how information is used by organizational members (Sundqvist & Svard, 2016). Based on the agility literature, agility is developed through the complementary intertwining of IT with organizational structures, skills and cultures (Sambamurthy

et al., 2003). Consistently, we investigate the development of platform-based customer agility from the perspective of information management, which is the intertwining of IT with organizational structures, skills, and cultures. The information management framework provides an appropriate tool for investigating the development of platform-based customer agility. Next, we introduce the three components in more detail.

2.2.1. Information management structure

Information management structure refers to the IT-enabled coordination mechanism that facilitates information processing, communication, and knowledge sharing (adapted from Kwon et al., 2007). It is also known as the information network or information processing network in some studies (e.g. Huang, Pan, & Ouyang, 2014; Pan, Pan, & Leidner, 2012). IT-enabled information management structure improves organizational information flows, which enhances the organizational efficiency in responding to customer needs (Karimi et al., 2001). At the same time, the structure generates many unprecedented ways of interacting with customers (e.g. the online user community), resulting in improved customer service (Nambisan, 2002; Zhou et al., 2018). Existing research on information management structure has identified several structure types in different research settings. Kwon et al. (2007) applied the concept of centralization and decentralization to analyse information management structure and identified four structure types, namely random, small world, Barabasi, and moderate scale free (MSF). They investigated the stability of each structure in the event of corporate restructuring (e.g., downsizing). Based on the analysis of information intensity, network density, direction of information flow, and role of central response organization in an information network, Pan et al. (2012) proposed four information network structures in response to crisis: information star, information pyramid, information forest, and information black-out. They further indicated the significant role of IT in enabling the information star that has the greatest reach and is capable of processing the largest amount of information among the four structures. Huang et al. (2014) identified information star, information mesh, and information tree as three types of information management structure by investigating the level of hierarchy and the degree of centralization in the structure. They posited that the interplay of information management structure and information management capability leads to the achievement of operational agility. Thus, the current study attempts to identify different types of information management structure that enable e-commerce platforms to develop platform-based customer agility.

2.2.2. Information management capability

Information management capability is defined as a firm's ability to manage information effectively over the life cycle of information use, which includes sensing, collecting, organizing, processing and disseminating information (Marchand et al., 2000). It indicates the extent to which the process of information management supports organizational work processes (Huang et al., 2014; Mithas et al., 2011) and is usually reflected in the prescribed organizational procedures and guides (Marchand et al., 2000). While IT offers e-commerce platforms the structure of information management, the ability to manage and exploit information to create information capabilities is of greater salience in capturing competitive action opportunities (Cotteleer & Bendoly, 2006; Huang et al., 2014; Mithas et al., 2011). Karimi et al. (2001) found that the ability to configure firms' IT resources and offer key stakeholders timely, accurate and reliable information helps improve customer service and customer relationships. Nambisan (2002) indicated that better information management capabilities enable firms to collect information about customers through virtual communities, capture customer knowledge and facilitate the development of new products that meet customer needs. Mithas et al. (2011) reported that information management capability is crucial for building other firm capabilities for customer management, process management and performance

management. They further demonstrated the significance of information management capability in improving a firm's performance. Saldanha et al. (2017) theorized relational information processing capability and analytical information processing capability as two significant capabilities in customer management practices. They further showed that the two types of information processing capability complement product-focused customer involvement and information-intensive customer involvement practices, to enhance the amount of firm innovation. Cao, Duan, and Cadden (2019) indicated that information processing capability enhances a firm's decision-making effectiveness, leading to better understanding of customers and increased customer loyalty. Thus, existing research shows the significant role of information management capability in improving customer management.

2.2.3. Information management culture

Information management culture, or information culture, is defined as the shared patterns of values and behaviours that define the significance of information and affect how information is used by organizational members (Choo, 2013; Marchand et al., 2000; Sundqvist & Svard, 2016). While information management capability is associated with formal procedures and guides that prescribe information management process (Marchand et al., 2000), information management culture is often reflected in informal norms that influence information management behaviours (Oliver, 2008). To achieve effective information management, IT has to be complemented with a good information management culture (Curry & Moore, 2003; Oliver, 2008). Information management culture influences how organizational members sense and respond to customer feedback and how large volumes of customer data are utilized (Choo, 2013), which further impact the activities of customer management. For example, organizational members might intentionally pass on inaccurate customer information if information management culture does not encourage information integrity behaviours (Marchand et al., 2000), which could lead to customer service failures. Existing studies on information management culture focus on identifying different types of information management culture (e.g. Choo, 2013; Choo, Bergeron, Detlor, & Heaton, 2008; Marchand et al., 2000; Vick, Nagano, & Popadiuk, 2015). Marchand et al. (2000) indicated information integrity, information formality, information control, information sharing, information transparency, and information proactiveness as six types of information behaviours and values that affect the effective use of information. Choo et al. (2008) empirically examined the six information behaviours and values identified by Marchand et al. (2000) and concluded that the six information behaviours and values are able to systematically characterize each organization's information management culture. Based on aforementioned information behaviours and values, Choo (2013) classified information management culture into four categories: result-oriented culture, rule-following culture, relationship-based culture, and risk-taking culture. Each category is the combination of two types of information behaviours and values. Therefore, most research on the types of information management culture is rooted in Marchand et al. (2000)'s framework of information behaviours and values. This framework is used to guide the investigation of information management culture in the current study.

In summary, we propose that information management enables e-commerce platforms to achieve platform-based customer agility. The integrative information management framework indicates that the development of platform-based customer agility should consider the information management structure, information management capability, and information management culture. This conceptual model is applied to guide subsequent data collection and analysis.

3. Research method

Given limited evidence regarding how information management enables e-commerce platforms to achieve platform-based customer agility, we adopted a case research method to explore the research question (Eisenhardt, 1989). This method is appropriate in examining a "how" question (Walsham, 1995). Furthermore, both information management and customer agility are complex and multi-faceted phenomena that are embedded in an organizational context (Pentland, 1999), thereby investigating the phenomena through relevant stakeholders' interpretations is more suitable than applying a quantitative approach (Klein & Myers, 1999). The application of a case research method provides researchers with contextual richness (Davison & Martinsons, 2016) and allows us to gain a nuanced understanding of the phenomena.

We selected B.com (a pseudonym) as the case company for this inquiry. B.com is one of the largest Chinese e-commerce platforms, with over 300 million active users and approximately 67.2 billion U.S. dollars net income in 2018. This company is chosen for four reasons. First, the considerable customer base makes the interactions and communications between the platform and its customers very complicated, leading to a strong need to develop platform-based customer agility. Second, B.com is good at leveraging customer needs to improve existing services and develop new ones. For example, B.com developed the online order tracking tools based on customer feedback so that customers can trace their orders easily. Another example is to offer product recommendations based on customers' preferences, which enables customers to discover the products that meet their needs. The strong ability of B.com to sense and respond to customer needs makes it one of the most popular e-commerce websites in China. In 2009, B.com was awarded "Internet User's Favourite Online Shopping Site" by the Internet Society of China. In 2015, B.com ranked first in the "China e-Commerce Website Ranking" published by Kantar consulting company. Thus, we believe that B.com has achieved platform-based customer agility. Third, our observations of the company's website show that B.com offers an excellent online shopping experience by facilitating effective interactions and communications with customers, offering customers personalized information, and providing social media functions to enable information generation and sharing. It seems that platform-based customer agility is achieved through effective information management. Finally, B.com incorporates various e-commerce technologies, such as live chat, recommendation agents, and online product reviews. This creates the complexity of customer interactions and the different types of platform-based customer agility developed. Overall, B.com is particularly appropriate for this study.

3.1. Data collection

We followed the theory-building process as prescribed by Eisenhardt (1989) to design and conduct this study. Data collection started by investigating the website, searching for second-hand data, and filtering relevant theories. The researchers spent considerable time browsing through the website, studying its functions and terms, observing the content created by customers, and taking screenshots of the website as records. At the same time, we looked for "non-technical literature" such as books, magazines, biographies of the CEO and founder of B.com, newspapers, and electronic articles, which allowed us to become better acquainted with the company (Pan & Tan, 2011, p.166). We also collected some first-hand information from our local collaborator. The data gathered from these sources were further organized into formal slides and presented to experienced case study researchers. We attempted to discover the uniqueness of B.com through discussions. Furthermore, we scanned different theories from both IS and management literature. This led us to some pertinent theories or theoretical constructs (e.g., Chen, Pan, & Ouyang, 2014), such as customer agility and information management literature. Accordingly, an initial set of pertinent themes (e.g., information management structure, information management capability, and information management culture) was identified. The pertinent themes were adjusted several times once our data were updated, or new theoretical constructs were identified. This set of themes formed a "sensitizing device" (Klein & Myers, 1999) to
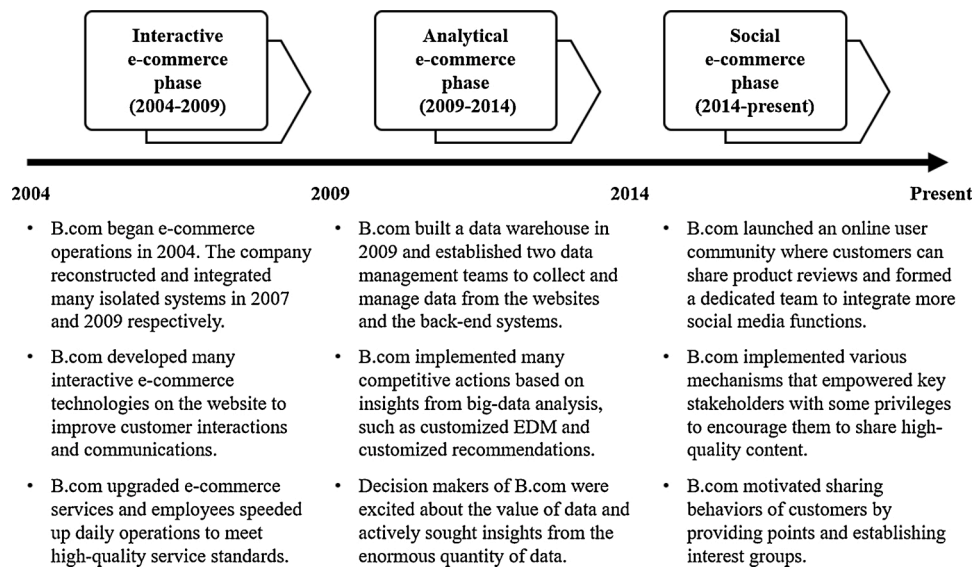
Fig. 1. The Development Timeline of B.com.

guide the following data collection and analysis.

Onsite data collection was guided by an interview protocol (see Appendix A). The protocol, including an introduction to the research objectives, a guideline of the interview, a set of interview questions, and resources needed, was compiled into a formal document and sent to B.com for their response. Access to the company was difficult to achieve since B.com was quite sensitive to any academic investigation. Our local collaborator managed to arrange the first visit to the company in November 2011 after signing a non-disclosure agreement that prevented the leaking of sensitive information. Fifteen informants were interviewed in the first visit, which was supplemented by a follow-up interview in November 2018 with 3 informants and provided validation of our research model and identified recent updates. Informants were anonymous based on the request from B.com. The information of all informants' positions and departments is shown in Appendix B. The arrangement for interviewing informants in different positions allowed us to access both daily operational information and high-level strategic plans of B.com. Interview questions were designed to be open-ended, covering history, best practices, and a typical workday routine (see Appendix A). The theoretical themes identified previously served an important role in ensuring that open-ended interviews continuously followed a general direction and a clear structure (Pan, Pan, Chen, & Hsieh, 2007). Each interview involved multiple investigators to enhance the creative potential of the study and confidence in the findings (Eisenhardt, 1989). Whereas the interviews formed the primary source of data, they were corroborated by onsite observations and secondary data such as internal publications, organizational documents, and field notes. Multiple data collection allows for triangulation, offering stronger substantiation of theoretical constructs and hypotheses (Eisenhardt, 1989).

3.2. Data analysis

We conducted preliminary data analysis at the same time as the onsite data collection to benefit from the flexibility offered by the case study method (Eisenhardt, 1989). A significant feature of the case study is that concepts can emerge from data rather than being restricted by a priori hypotheses (Strauss & Corbin, 1990). This required us to adjust our direction once a new concept arose. A short discussion between all the investigators was conducted following each interview to compare different interpretations. Furthermore, a follow-up discussion was conducted after all the interviews every day to analyse information gathered from interviews and adjust interview questions for the coming

interviews. The interviews were recorded and later transcribed and translated by research assistants for follow-up data analysis.

Three coding techniques (i.e., open coding, axial coding, and selective coding) were applied to analyse the data collected. First, we started using an open coding technique (Strauss & Corbin, 1990). Open coding was executed by placing conceptual labels on the data to uncover general recurrent themes that helped explain the phenomenon (e.g., Ravishankar & Pan, 2013). Some of the conceptual labels used in this research – such as motivating information sharing behaviour by monetary incentives and by interests (Hong, Pavlou, Shi, & Wang, 2017) – were suggested by the literature, while others – such as timeliness of information – were suggested by the data (Strauss & Corbin, 1990). Following this, we linked similar concepts from open coding into theoretical constructs through axial coding (Strauss & Corbin, 1990). Associations among concepts were made primarily according to the existing literature. In continuing with the previous example, motivating information sharing behaviour by monetary incentives and by interests were suggested by the literature as extrinsic and intrinsic motivations that facilitate information sharing behaviours. Thus, the common underlying theme of the two concepts is instilling information sharing value. Axial coding enabled us to generate a meaningful comprehension of the phenomenon of interest (Strauss & Corbin, 1990). Finally, the selective coding technique was used to integrate and refine concepts for a coherent picture of the phenomenon examined (Strauss & Corbin, 1990). We treated the process of managing information for customer agility as the core phenomenon of interest. A storyline was created to describe this process (see Fig. 1). Furthermore, we integrated and linked constructs identified from axial coding to the core phenomenon. This was accomplished by alternately examining the interview data, the relevant literature, and the emerging model. The emerging model was presented to a panel of academics and practitioners who were responsible for challenging the underlying logic and data accuracy. The analysis process continued until the model reached theoretical saturation, in which newly collected data began to be repeated (Eisenhardt, 1989).

4. Case description

4.1. Organizational background

Since the inception of B.com in 2004, the company has experienced a remarkably increasing rate of over 200 % for eight consecutive years. This record has hardly been seen in the entire Chinese e-commerce industry. In 2010, B.com had become one of the top-3 e-commerce

platforms in China with a 35.6 % market share. In 2016, B.com entered the list of Fortune's Global 500 for the first time and secured its position for four consecutive years. Currently, B.com has over 300 million active users annually, and more than 100,000 suppliers offer a comprehensive list of high-quality products.

The great success of B.com depends to a large extent on the excellent online shopping experiences provided by its e-commerce website. The website creates a favourable online shopping environment by enabling effective interactions and communications with customers, offering customers personalized products and services, and establishing a reliable online community for sharing and discussions, which rely largely on the effective management of information. Our interviews with B. com's top management and IT professionals show that the company has recognized the crucial role of information management in e-commerce success. This is reflected by one of the informants, "*as an e-commerce platform, the most valuable thing is information*". As B.com grew, it incorporated different e-commerce technologies on the website to attract and retain customers, which also created different patterns of information management. Based on the different types of technologies developed, we divided the development of B.com into three phases: interactive e-commerce phase (2004–2009), analytical e-commerce phase (2009–2014), and social e-commerce phase (2014-present) (see Fig. 1). Data collected are presented according to the sequence of three phases in the subsections that follow.

4.2. Interactive e-commerce phase (2004–2009)

B.com began e-commerce operations in 2004. From 2004–2009, when the Chinese e-commerce industry was in its infancy, B.com centred on enabling effective customer interactions and communications on the website to achieve a better understanding of customer online shopping needs and capture opportunities presented by customers. Thus, this phase is named the "interactive e-commerce phase".

As online shopping became more and more popular, B.com witnessed massive growth in online sales, while also more challenges to the existing systems. To ensure that the existing systems can meet new business needs, B.com reconstructed and integrated many isolated systems in 2007 and 2009 respectively. Many useful functions were developed based on the access to information available from integrated systems. More importantly, B.com integrated the ERP system with supply chain systems, logistics systems, and financial systems, which improved the information flows among departments, allowing internal users to access timely, accurate, and reliable information. For example, the integrated ERP system enabled customer service representatives to access various real-time information about customers, products, and orders during interacting with customers. System integration led to high flexibility in reacting to customer online shopping needs.

Improved information flows allowed B.com to implement various interactive mechanisms on the sales website for better customer interactions and communications. The CEO and founder highlighted the critical role of excellent user experiences in the success of the platform. He was in charge of the overall website design. A dedicated team was founded to research and implement interactive e-commerce technologies that improved user experience. Many interactive technical features were developed to meet customer information needs, such as a search engine, product navigation tools and online order tracking tools. B.com also developed useful communication tools (e.g., online Q&A and live chat) that allowed customers to consult customer representatives in case the technical features failed to meet their needs. As a result, the ability of B.com to respond to customer online shopping needs was significantly enhanced.

With the above improvements, B.com attempted to upgrade e-commerce services. B.com launched a customer service program called "Promise", which guaranteed customers that their ordered products would be delivered at the "promised" time. In order to fulfil the "Promise", customer representatives monitored the order status closely

Table 1
Exemplary Quotes and Codes Identified for "Interactive e-Commerce Phase".

Exemplary Quotes and Open Codes	Axial Codes
"We reconstructed the systems in 2009. I was the team leader. Before the reconstruction, many systems were isolated. We incorporated technologies from external partners. The reconstruction brought about integrated systems." —manager of logistics system development division (open code: integration of isolated systems) *"We have four types of systems. There are the front-end sales website, supply chain systems, logistic systems, and financial systems. Although they operate independently, the systems are integrated, and information is exchanged frequently."* —vice president of B.com, Internet article (open code: integration of isolated systems) *"We have an integrated ERP system in the back-end. Customer service representatives can access a lot of relevant information from the system, such as customer information, transaction details, and customer inquiries about the products."* —manager of software quality assurance division (open code: improved information flows due to integrated systems)	Establishing Integration Structure
"One of our team's priorities is user experience design. It includes Web page design, interaction design and user research. … user experience design is an important topic that requires the efforts of the whole company. Our boss is the top decision maker for user experience design. He will make the final decision for user experience design issues." —manager of website product division (open code: a dedicated team for interactive technologies design and development) *"Some of the customer inquiries are answered by customer service representatives. The integrated systems enable them to retrieve information needed. Some of the inquiries are answered by the system automatically. That is why we can reply to customer inquiries rapidly."* —manager of website data management division (open code: fast response to customer needs due to interactive technologies)	Developing Responsive Capability
"We receive all kinds of feedback every day. Normally I focus more on customer-related feedback rather than internal requests. This is basically the way that we handle feedback." —manager of website product development division responsible for transaction systems (open code: prioritizing customer needs) *"We guarantee our customers that the product will be delivered in the "promised" time. However, there are unexpected conditions sometimes. The operation department should provide the information of orders to customer representatives timely so that they can communicate with customers promptly. Timely communication is critical to the "Promise" program."* —manager of platform architecture division (open code: timeliness of information)	Instilling Information Rapidity

and communicated with customers promptly to manage customer expectations. The "Promise" program showed the significance of using information in a timely manner to handle customer inquiries. More importantly, all employees shared a common understanding that customer needs were transient and should be given higher priority compared to the internal needs of the company. Subsequently, the company became faster in dealing with customer needs.

In this phase, B.com discovered many innovative ideas through improved customer interactions and communications. For example, B. com did not provide online order tracking tools in the beginning. However, customer representatives reported that many customers made frequent inquiries about delivery status after they bought expensive products such as a laptop. Inspired by this information, B.com integrated the logistics systems and the sales website to develop useful online order tracking tools that met customer needs. By reacting to online shopping needs presented by customers, B.com developed the ability to leverage customer voice for competitive actions. The exemplary quotes and relevant codes identified under the 'interactive e-commerce phase' are summarized in Table 1.

Table 2
Exemplary Quotes and Codes Identified for "Analytical e-Commerce Phase".

Exemplary Quotes and Open Codes	Axial Codes
"If there is a need to collect data that are not recorded by the existing systems, we will modify the existing systems accordingly. Once the data needed are collected, we extract and clean the data. The data are stored in a data warehouse where it is classified by different themes, such as customer online behaviours, transactions, and products." —manager of back-end data management division (open code: storing data in a data centre)	Establishing Analytical Structure
"The data management team collects a large quantity of data from various systems, either from the back-end systems, or from the front-end website. Integrating data is a complicated and time-consuming task. All the data are stored in a data warehouse. There are many different types of valuable data. They organize the data based on the analytic models and generate reports based on business needs." —director of Chendu research institute (open code: collecting data from various systems)	
"The data collected includes the interactions between customers and the website, such as the click-stream data. It also includes transactional information, such as order details and relevant information. Furthermore, the interactions between customers and customer service representatives are also recorded and gathered." —manager of website data management division (open code: collecting data from various systems)	
"EDM is a good example of how we use data. We generated customer segmentation based on the analysis of customer behaviour data, transaction data and other information. EDM campaign provides different promotions to customers according to different customer segmentation." —manager of website data management division (open code: customized marketing campaign)	Developing Customizing Capability
"We offer customized recommendations to meet the preferences of individual customers. For example, a store might recommend beer when people buy diapers. Why? The buyers could be men. It is possible that they also want to buy beer. The data mining technology allows us to discover these kinds of correlations. We can leverage this knowledge to provide customized recommendations." —manager of website product development division responsible for recommendation systems (open code: customized recommendations)	
"If you would like to draw any conclusions, you should let the data speak. We used to make decisions based on our experience. However, now we rely on the results of data analysis to support our decision making." —manager of website data management division (open code: data-driven decision making)	Instilling Information Proactiveness
"Our data management teams should understand business needs. We invite people from other business units to share their daily operations. In addition, we encourage our data administrators to take the initiative to understand how other business units are using the data provided. This is the only way to create more value from data." —manager of back-end data management division (open code: data-driven business and technologies alignment)	

4.3. Analytical e-commerce phase (2009–2014)

Given the increasing volume of information accumulated by the website and systems, B.com was motivated to derive insightful knowledge from the wealth of information. Since 2009, B.com started to adopt analytical technologies, such as data mining and click-stream analysis, to discover customer hidden needs, offer personalized content, and capture unexpected competitive action opportunities. Therefore, we name this phase the "analytical e-commerce phase".

B.com built a data warehouse in 2009 to apply analytical technologies. Two data management teams were established to collect and manage data from the sales website and the back-end systems (e.g., ERP system, supply chain systems and logistics systems). Data collected included customer information, product information, order details,

transaction data and operational data, among others. The sales website and the existing systems were modified accordingly if the required data could not be collected at that time. As a result, large volumes of data were collected from all the organization systems into a central data warehouse. Data management teams applied sophisticated algorithms and analytical models to transform data into more meaningful pieces of information, such as detailed customer segmentation. This knowledge thus became the source of many innovative competitive actions.

The foremost application of the knowledge extracted from the data was to help B.com create customized offerings based on the discovered customer preferences. Accordingly, B.com implemented many competitive actions to leverage the knowledge. For instance, the company launched an e-mail direct marketing (EDM) campaign based on the identified customer segmentation. EDM was a marketing approach that used e-mail to disseminate marketing information to customers. B.com tailored marketing information according to identified customers' preferences, thus increasing the success rate of the marketing campaign. Another example was to offer customized recommendations for customers during the shopping process. The recommendation tools increased exposure to products that might meet customer needs and thereby encouraged impulsive purchases. As an improved understanding of customer preferences became available, B.com developed the ability to customize its offerings to meet hidden customer needs.

The applications of analytical technologies demonstrated the value of data, which motivated employees of B.com to actively discover more insights from the data. There was a popular saying in the company at that time, "*let the data speak*". Decision makers relied on the results of data analysis to make decisions. They were excited about the value of data, leading to the proposal of many novel competitive actions, especially many customized marketing campaigns. Data management teams took the initiative to understand business needs, seeking to identify the alignment of the business and the analytical technologies applied. They believed that the alignment of the business and the analytical technologies would create more untapped opportunities for B.com. The proactive actions enhanced their confidence in providing business solutions.

In this phase, B.com centred on capturing the business value of the data accumulated in the website and systems. The company applied analytical technologies to analyse customer behaviours and uncover the hidden needs of customers, enhancing the ability to leverage large amounts of customer data for competitive actions. Exemplary quotes and relevant codes identified under the 'analytical e-commerce phase' are summarized in Table 2.

4.4. Social e-commerce phase (2014 – present)

E-commerce websites added broad social media and Web 2.0 tools to provide a unique social shopping experience for customers. Since 2010, B.com has adopted social media functions on the website to enhance customer engagement. B.com became more active in integrating social media functions after the announcement of the strategic partnership with Tencent, the largest social media company in China, in 2014. Therefore, we call this phase the "social e-commerce phase".

In 2010, B.com launched an online user community where customers can share their shopping experiences, discuss products and services, and make product recommendations. B.com recruited IT experts who were experienced at developing social media functions and formed a dedicated team to ensure the development of the online community. The online community allowed users to post a question about a product before purchasing and invite other users who purchased the same product to answer the question. After purchase, users could post product reviews consisting of text comments, images, and videos to share their shopping experience with others. So, each product page became an information hub that accumulated a lot of information about the product and attracted many interested customers. The partnership with Tencent provided B.com the ability to share its product pages in Tencent's social media applications (such as WeChat and QQ), bringing more viewers

Table 3

Exemplary Quotes and Codes Identified for "Social e-Commerce Phase".

Exemplary Quotes and Open Codes	Axial Codes
"It is important to provide various social media functions in the online community, such as product review functions and product page sharing functions. Our boss emphasized the strategic value of a user community and encouraged adding more social media functions to the e-commerce website." —manager of website product development division responsible for transaction systems (open code: developing tools for information sharing) *"Each product page offers three aspects that we can interact with customers. Firstly, the purchase inquiry allows customers to interact with our customer representatives. Secondly, the product reviews enable potential customers to interact with those who have already purchased the products. Lastly, the product forum allows all users to interact and communicate with each other freely."* —CEO of B.com, Internet article (open code: product page as an information hub) *"The product reviews attract more viewings from customers, leading to more purchases. Customers are cautious when making purchase decisions. They are looking for more information to decide if the product fits their needs. They read many reviews before they make their decision. Therefore, the online product community creates great value to the company."* —director of Chendu research institute (open code: product page as an information hub)	Establishing Social Structure
"Applicants should post at least two high-quality product reviews monthly, and pass through the official examination to receive the title of 'Evaluator'. … high-quality product review: at least 100 words with images or videos and all the information is original, product-related, and positive." —criteria of "Evaluator" from the website (open code: empowering certified customers) *"We allow some third-party retailers to reply to customer inquiries. Third-party retailers are willing to answer customer questions since it can increase product sales. For these retailers, we offer them a privilege that allows them to receive customer inquiries and reply directly."* —manager of website product division (open code: empowering third-party retailers)	Developing Empowering Capability
"If you like this cell phone, you can share the product page with your friends. If your friends make a purchase from the link you shared, as a referrer, you will get some points. We offer points to motivate our customers to share the products." —manager of website product division (open code: motivating information sharing behaviour by monetary incentives) *"Some customers share product reviews in the online community. This attracts other customers with the same interests, leading to more purchases and more customers willing to share their shopping experiences."* —manager of website product development division responsible for recommendation systems (open code: motivating information sharing behaviour by interests)	Instilling Information Sharing

and purchases. As a result, the online user community became a cluster of information hubs and hosted considerable user-generated content, providing a source of valuable information for improvement and innovation.

B.com implemented various mechanisms that empowered key users with some privileges to encourage them to share high-quality content. First, customers who shared quality product reviews twice per month were given the official title of "Evaluator". This title was displayed with the product review to suggest that the product review is of good quality and trustworthy. Second, except for the ask and answer function mentioned previously, the website allowed third-party retailers to provide official answers to customer inquiries in the product consultation section. Third, the website integrated video technologies and allowed certified marketers or key opinion leaders (KOLs) to create live broadcasts for products. The audiences were able to interact with the marketers in real time. The above empowering mechanisms created

Table 4

A Typology of Platform-based Customer Agility.

Types of Customer Agility	Definition	Roles of the Customer
Reactive Customer Agility	It refers to the ability of an e-commerce platform to rapidly sense and respond to the online shopping needs presented by customers (e.g., Cenfetelli et al., 2008; Piccoli et al., 2004).	As a resource for supplying information
Proactive Customer Agility	It refers to the ability of an e-commerce platform to uncover the hidden needs of customers and customize products and services accordingly (e.g., Ho et al., 2011; Tam & Ho, 2005; Xiao & Benbasat, 2007).	As a user in visiting the website and making a purchase
Coactive Customer Agility	It refers to the ability of an e-commerce platform to enable and motivate customers to generate and share product and service knowledge to discover customer needs (e.g., Kumar et al., 2019; Porter & Donthu, 2008; Zhou et al., 2018).	As a co-creator in product and service knowledge generation and sharing

considerable high-quality content.

B.com recognized that it was critical to motivate sharing behaviours of customers to benefit from social media functions. In the beginning, the platform mainly relied on offering points to motivate customer sharing behaviours. For example, customers received points if they posted a product review, or they shared a product page to their social media accounts. Points could be used to discount the payment amount when they made a purchase. As user-generated content increased, B.com organized the content into different interest groups and allowed customers with similar interests to participate in the groups. Thus, the sharing behaviours were also driven by customer interests, except for points.

In this phase, B.com adopted broad social media and Web 2.0 tools to enhance customer engagement. Customers shared their online shopping experiences, which became a credible source of information for others. B.com discovered many new ideas from the interactions among community members. By enabling and motivating customers' participation in content generation and sharing, B.com developed the ability to leverage customers' involvement for competitive actions. Exemplary quotes and relevant codes identified under the 'social e-commerce phase' are summarized in Table 3.

5. Discussion

To understand how information management enables e-commerce platforms to achieve platform-based customer agility, we undertook an iterative process between relevant literature, qualitative data, and the emerging model. Subsequently, a typology of platform-based customer agility (see Table 4) was identified, and a process model (see Fig. 5) was inductively derived. We first introduce three types of platform-based customer agility and depict the role of customers in each type of platform-based customer agility. Then, we explain the process model in detail.

5.1. A typology of platform-based customer agility

Different e-commerce technologies bring about different patterns of leveraging customer-related information and thereby result in different types of platform-based customer agility. In the current study, we observed that as B.com grew with different e-commerce technologies incorporated in the three phases, the roles of customers changed accordingly, and three types of platform-based customer agility were
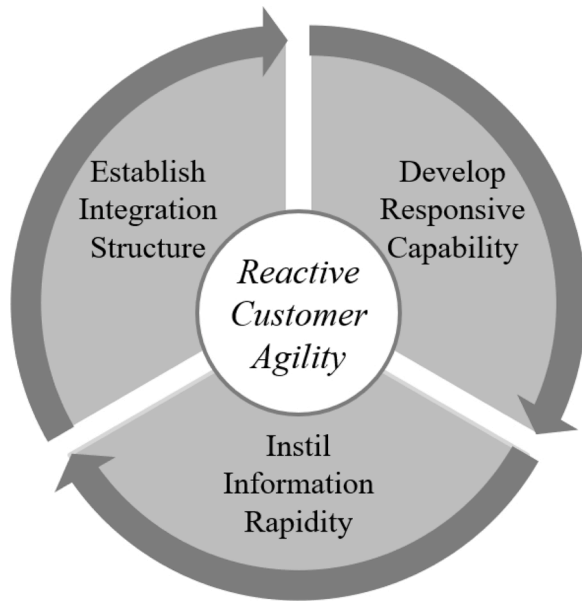
Fig. 2. The Development of Reactive Customer Agility.
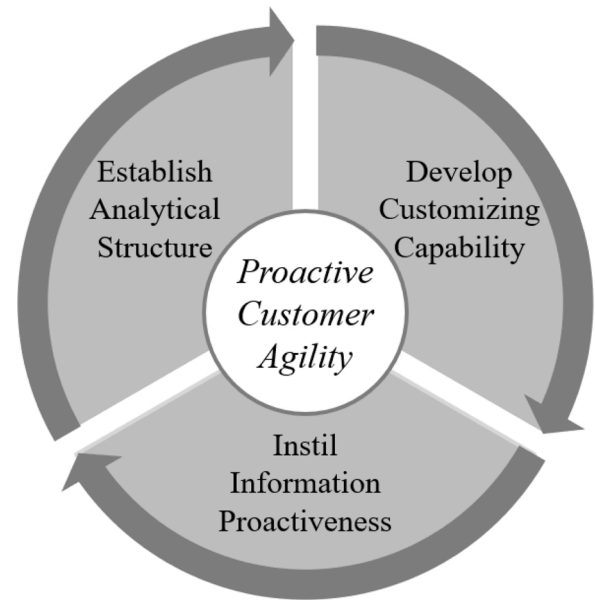

Fig. 3. The Development of Proactive Customer Agility.

developed (see Table 4).

We define reactive customer agility as the ability of an e-commerce platform to rapidly sense and respond to the online shopping needs presented by customers (e.g., Cenfetelli et al., 2008; Piccoli et al., 2004). Customers provide feedback to the platform through interactive tools (e. g., live chat), playing the role of a resource for supplying information (Nambisan, 2002). To develop reactive customer agility, e-commerce platforms rely on the achievement of system integration (Barua, Konana, Whinston, & Yin, 2004; Zhu, 2004) and the application of interactive technologies (Jiang & Benbasat, 2007; Jiang et al., 2010). This ability allows the platform to sense opportunities presented by customers and rapidly respond to customer needs. The achievement of reactive customer agility is reflected in the interactive e-commerce phase in our case.

Proactive customer agility is defined as the ability of an e-commerce platform to uncover the hidden needs of customers and customize products and services accordingly (e.g., Ho et al., 2011; Tam & Ho, 2005; Xiao & Benbasat, 2007). Customers serve as users in visiting the websites and purchasing products (Nambisan, 2002), while the platform records, collects and analyses a large quantity of customer data to study customer behaviours and preferences. The achievement of proactive customer agility relies on the collection of a large quantity of customer data and the application of personalization technologies (Mithas, Krishnan, & Fornell, 2005). This ability enables the platform to capture unexpected opportunities and surprise their customers by customizing products and services (Mithas et al., 2005). The achievement of proactive customer agility is reflected in the analytical e-commerce phase in our case.

Coactive customer agility refers to the ability of an e-commerce platform to enable and motivate customers to generate and share product and service knowledge to discover customer needs (e.g., Kumar et al., 2019; Porter & Donthu, 2008; Zhou et al., 2018). Customers play the role of co-creators in product and service knowledge generation and sharing (Nambisan, 2002), while the platform facilitates the creation and sharing process. Social media technologies make it possible to achieve coactive customer agility by enabling customers to generate and share their online shopping experiences with others easily (Kumar et al., 2019). This leads to "a shift from a perspective of exploiting customer knowledge by the firm to a perspective of knowledge co-creation with the customers" (Sawhney & Prandelli, 2000, p. 31). This ability allows the platform to leverage customer involvement for competitive actions

and discover new ideas from customer interactions (Zhou et al., 2018). The achievement of coactive customer agility is reflected in the social e-commerce phase in our case. Next, we explain the development of three types of platform-based customer agility in detail.

5.2. Development of reactive customer agility

As informed by the interactive e-commerce phase, to achieve reactive customer agility, e-commerce platforms should establish an integration structure, develop responsive capability, and instil information rapidity (see Fig. 2). Integration structure refers to integrated information systems that enable users to access relevant information timely, accurately, and reliably (Roberts & Grover, 2012). Integration structure is achieved by connecting isolated systems to enable seamless information exchange based on business needs, which leads to a complex information exchange network connecting every system in the organization. This information management structure is similar to the "information mesh" (e.g. Huang et al., 2014) that is characterized by a low level of centralization and bi-directional information flow. Establishing an integration structure creates better information flows to facilitate coordination, fulfilment, and inventory management in back offices and with external partners, leading to the fast response to customer changing needs (Zhu, 2004). B.com reconstructed and integrated many isolated systems to develop the integration structure, which improved information flows and enhanced the ability to respond.

Responsive capability is the ability of an e-commerce platform to apply interactive technologies for reacting rapidly to customer information needs. E-commerce platforms present customers with information on which they base their purchase decisions (Jiang et al., 2010). Responsive capability enables e-commerce platforms to meet customers' heterogeneous and dynamic needs for information by either allowing them to be appropriately selective in their own information needs (Ariely, 2000) or engaging in communication with customer representatives (Burgoon et al., 2002). This is achieved by developing technical features (e.g., a search engine, product navigation tools and online order tracking tools) and communication tools (e.g., online Q&A and live chat), as we observed in the case.

Information rapidity is the value that emphasizes rapid actions to use information for competitive activities. The contemporary business environment has become highly competitive and extremely dynamic, making timely information processing and quick response critical for

organizations' success in competitions (Mendelson & Pillai, 1998; Mithas et al., 2011). Organizations with the information rapidity recognize that customer needs keep changing so that fast actions are essential in capturing the opportunities created by customer feedback (Zeithaml, Parasuraman, & Malhotra, 2002). E-commerce websites offer customers very low information searching and switching costs, which further highlights the significance of fast response in retaining customers (Liu & Arnett, 2000). In our case, B.com attempted to upgrade e-commerce services and encouraged rapid actions in responding to customer needs, which further shaped information rapidity.

5.3. Development of proactive customer agility

As informed by the analytical e-commerce phase, proactive customer agility is achieved by establishing an analytical structure, developing customizing capability, and instilling information proactiveness (see Fig. 3). Analytical structure refers to data management systems (e.g., a data warehouse) that allow e-commerce platforms to collect, clean, transform, and store massive quantities of data (Wixom & Watson, 2001). Analytical structure relies on collecting and integrating data present in all the organization systems and storing data into a data warehouse, which makes analytical structure an "information star" structure (e.g. Huang et al., 2014; Pan et al., 2012). This structure is characterized by a high level of centralization (the data warehouse is in the centre of the structure) and unidirectional information flow. Establishing an analytical structure enables e-commerce platforms to use data more efficiently, improve decision making, and drive a higher conversion rate (Akter & Wamba, 2016). Establishing an analytical structure requires well-managed, highly skilled teams who can overcome issues that arise during the process (Sen, Ramamurthy, & Sinha, 2012; Wixom & Watson, 2001). As increasing data were gathered by the sales website and back-end systems, B.com established a central data warehouse and established two data management teams to manage and analyse the wealth of data for innovative competitive action opportunities.

Customizing capability refers to the ability of e-commerce platforms to tailor content, offerings, and services accord with online customers' habits and preferences (Ho et al., 2011). It leverages personalization technologies (e.g., recommendation agents) to "provide the right content in the right format to the right person at the right time" (Tam & Ho, 2005, p. 271). Increased choice in e-commerce websites has led to an increased amount of information that customers must process before making purchase decisions (Zhang et al., 2011). Recommendation agents help reduce the information overload facing customers, thus improving the quality of the purchase decisions made (Xiao & Benbasat, 2007). In the current case, we observed that B.com tailored promotion e-mails based on different customer segmentation and offered personalized recommendations for customers during the shopping process to improve the online shopping experience.

Information proactiveness is the value that encourages organizational members to actively seek out new information from the environment and to use this information to enhance existing and create new products and services (Choo et al., 2008; Marchand et al., 2000; Naseer, Khawaja, Qazi, Syed, & Shamim, 2021; Sundqvist & Svard, 2016). Organizations with information proactiveness emphasize the significance of members' proactive actions in deriving insights from the enormous quantity of data. This information culture echoes the "big-data oriented culture" proposed by Akter and Wamba (2016) and Wang, Wang, Su, and Ge (2020), which encourages using big-data analysis to support decision making. In addition, data management teams' efforts in understanding business and governance issues (McAfee, Brynjolfsson, Davenport, Patil, & Barton, 2012) contribute to the alignment of business and analytical technologies, reinforcing the value of using data to drive competitive actions (Akter & Wamba, 2016). This signals that achieving business-IT alignment might be an important factor that shapes information proactiveness.
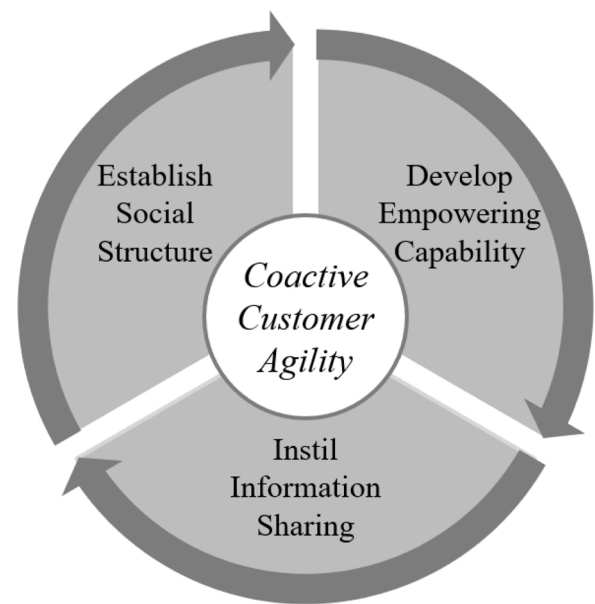

Fig. 4. The Development of Coactive Customer Agility.

5.4. Development of coactive customer agility

As informed by the social e-commerce phase, achieving coactive customer agility requires establishing a social structure, developing empowering capability, and promoting information sharing among customers (see Fig. 4). Social structure refers to social media and Web 2.0 tools that allow customers to share information and interact with other customers on an e-commerce website (Zhang & Benyoucef, 2016; Zhang, Lu, Gupta, & Zhao, 2014). Social structure is characterized by a high level of centralization (sales website is in the centre of the structure) and bi-directional information flow (customers can read and post information), which brings the focal platform an efficient structure to exchange information with customers. This structure is similar to the "information star" with bi-directional information flow (e.g. Huang et al., 2014; Pan et al., 2012). Establishing social structure creates a large quantity of user-generated content (e.g., customer reviews) that attracts customer visits, increases the time spent on the site, and creates a sense of community among frequent users (Mudambi & Schuff, 2010). Additionally, the large quantity of content generated by customers enables e-commerce platforms to explore diverse customer demands and capture innovative ideas (Zhou et al., 2018). B.com launched an online user community where customers can share their shopping experiences, discuss products and services, and make product recommendations, leading to an improved social shopping experience and a large quantity of valuable user-generated content.

Empowering capability is the ability of an e-commerce platform to give power or authority to relevant stakeholders, such as certified customers, third-party retailers, and marketers, to contribute information content of good quality (adapted from Füller, MüHlbacher, Matzler, & Jawecki, 2009). Empowering capability can be developed through the processes of reframing identity and increasing skills (Amichai-Hamburger, McKenna, & Tal, 2008). B.com reframed the identity of the customers who met the sharing criteria by giving the official title of "evaluator" to signal a source of reliable information. Furthermore, third-party retailers and certified marketers were given more tools to create richer content, such as enabling marketers to do live broadcasts for products, which indicates a way of increasing skills.

Information sharing is the value that emphasizes the free exchange of information between individuals in an appropriate and collaborative fashion (Choo et al., 2008; Marchand et al., 2000; Sundqvist & Svard, 2016). E-commerce platforms attempt to encourage their customers to
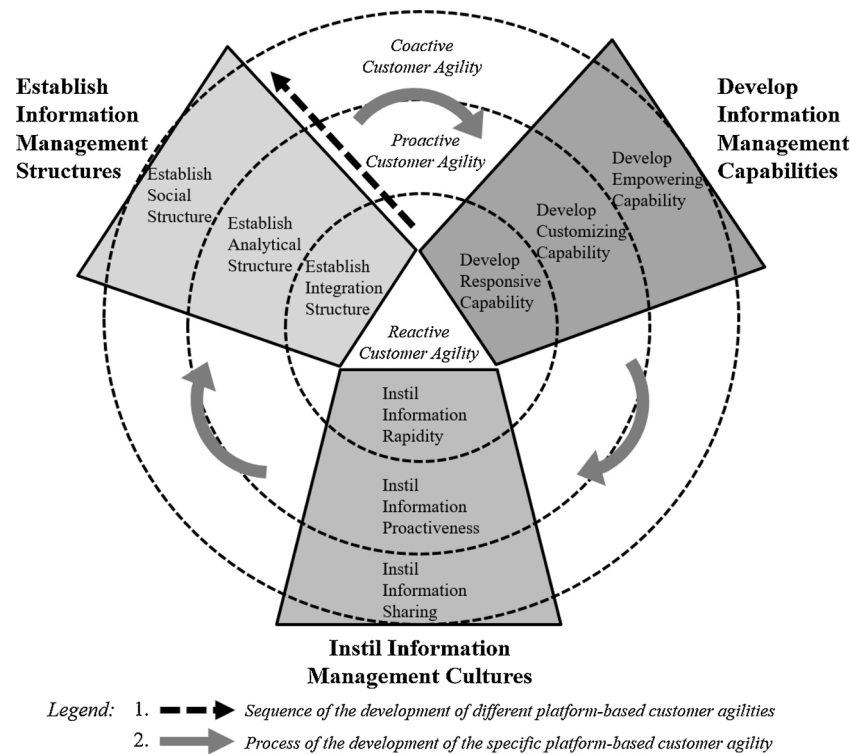
Fig. 5. An Integrative Process Model of Managing Information for Platform-based Customer Agility.

share product-related information because user-generated content provides potential customers with a sense of trust (Yoo, Sanders, & Moon, 2013). The behaviours of information sharing can be motivated by extrinsic and intrinsic motivations (Hong et al., 2017). Offering points for customer sharing behaviours indicates the application of extrinsic motivations that trigger sharing behaviour by reason of compensation (Yoo et al., 2013). On the other hand, B.com created different interest groups to encourage customers to share information, which reflects the application of intrinsic motivations that trigger sharing behaviour by reason of interest, enjoyment, and satisfaction (Wigfield, Guthrie, Tonks, & Perencevich, 2004).

In summary, we introduced three types of platform-based customer agility (see Table 4) and discussed the process through which they are developed (see Figs. 2–4). It is found that the incorporation of different e-commerce technologies results in a change in the way in which e-commerce platforms capture customer insights, leading to the development of different types of platform-based customer agility. B.com achieved three types of platform-based customer agility in a time-sequence, which follows the sequence of achieving reactive customer agility first, then proactive customer agility and finally, coactive customer agility, as indicated in the integrative process model (shown by the dashed arrow in Fig. 5). Furthermore, we found that platform-based customer agility is developed through the complementary intertwining of information management structure, information management capability and information management culture. Information management structure relies on information technologies and systems to collect and manage information, while information management capability provides the ability to leverage the information to achieve business goals. Information management culture shapes the information management behaviours of organizational members. More specifically, platform-based customer agility is developed by establishing an information management structure, developing information management capability, and instilling information management culture.

5.5. Theoretical contributions

The current research makes contributions to the literature in the following two aspects. First, this study contributes to the knowledge of customer agility. Existing research on customer agility mainly focuses on identifying and validating the antecedents and the performance impacts of customer agility (e.g., Roberts & Grover, 2012; Sambamurthy et al., 2003; Zhou et al., 2018), which fails to indicate the process through which customer agility is developed. Our study fills this theoretical gap by providing a process model of developing customer agility. Furthermore, we propose the concept of platform-based customer agility and introduce three types of platform-based customer agility (i.e., reactive customer agility, proactive customer agility, and coactive customer agility). Reactive customer agility centres on rapidly reacting to the needs presented by online customers (e.g., Cenfetelli et al., 2008; Piccoli et al., 2004). Proactive customer agility allows e-commerce platforms to conceive competitive activities by uncovering customers' preferences and customizing products and services accordingly (e.g., Ho et al., 2011; Tam & Ho, 2005; Xiao & Benbasat, 2007). Coactive customer agility facilitates the creation of innovative ideas by motivating customers to generate and share product and service knowledge (e.g., Kumar et al., 2019; Porter & Donthu, 2008; Zhou et al., 2018). The typology of platform-based customer agility enhances our understanding of different approaches used to sense and respond to customer-based opportunities (Roberts, 2009) and enriches the scarce literature on customer agility.

Secondly, a contribution to the information management literature is also made by the current study. We propose an integrative information management framework that synthesizes the findings of existing research. The value of this framework may be seen when we utilized the framework to analyse how platform-based customer agility is achieved. This responds to the research gaps noted by Anand, Manz, and Glick (1998), namely, that researchers are not taking the lead in developing conceptual and theoretical models of information management that can provide management implications. We show that e-commerce platforms can achieve platform-based customer agility by establishing an information management structure, developing information management

capability, and instilling information management culture. This finding indicates the significant impact of information management on customer agility, which is consistent with the finding of Ashrafi et al. (2019). The present study also resonates with the suggestion of Kohli and Grover (2008) and the finding of Mithas et al. (2011), that is, information management is indeed a foundation that enhances other organizational capabilities. Additionally, we observe and conceptualize many novel information management activities from the case. For example, information rapidity is conceptualized as an information management culture that emphases rapid actions to use information for competitive activities. As the contemporary business environment becomes highly competitive and extremely dynamic, information rapidity is crucial for sensing and responding to environmental changes. Future research is needed to examine the validity and boundary conditions of the framework, as well as new constructs.

5.6. Implications for practice

In terms of practical contributions, we follow the 3U framework proposed by Pan and Pee (2020) to develop usable recommendations and implementation guidelines that enable potential practitioners to leverage the value of information and develop customer agility. The 3U framework identifies *usable, in-use, and useful* research outputs as three levels of practice impact and provides checklist questions that help researchers design their studies (Pan & Pee, 2020). The checklist questions for usable research output help us refine the guidelines developed and enhance the practice impact of the research. The research output will benefit e-commerce platforms and other digital platforms that intend to develop customer agility.

1. Rethink customer agility. The current study illustrates different ways that an e-commerce platform interacts with customers in three phases, leading to the development of three types of platform-based customer agility. This observation expands our existing knowledge of customer agility and reminds practitioners to re-examine their efforts in developing customer agility. It is suggested that practitioners should assess the type of customer agility that they have already achieved and identify which kind of customer agility is missing and should be enhanced. Furthermore, the development of three types of platform-based customer agility is fundamentally rooted in the advancement of information and communication technologies which provide the e-commerce platform with more strategic choices to improve customer management processes. This finding highlights the significant impact of new technologies upon the development of customer agility and reminds practitioners to pay attention to the emerging technologies (e.g., artificial intelligence) that might change the way to interact with customers.

2. Rethink the value of information. One of the interviewees told us that, "*as an e-commerce company, the most valuable thing is information*". Our findings consolidate this idea. The e-commerce platform positions information as a critical strategic resource. Effective information management enables the platform to sense and respond to customer-based opportunities quickly, leading to the achievement of platform-based customer agility. Based on the above observations, it is suggested that practitioners should understand the value of information and facilitate effective information management to enhance other business capabilities (e.g., customer agility). Moreover, our research finds that platform-based customer agility is developed by establishing an information management structure, developing information management capability, and instilling information management culture. This finding reminds practitioners that effective information management is a complicated, multi-dimensional task, which is related to every aspect of organizational life, rather than merely applying IT to manage information.

3. Develop reactive customer agility. Our research indicates that customers play the role of a resource for supplying information (e.g., customer feedback) in reactive customer agility. So, when it comes to developing reactive customer agility, practitioners should focus on leveraging information provided by customers for competitive actions opportunities. Furthermore, based on the process model developed, in order to develop reactive customer agility, organizations should enhance organizational information systems integration, develop interactive technologies for quick response to customer needs, and encourage rapid actions in using information for competitive activities.

4. Develop proactive customer agility. This study shows that customers serve as users in visiting the websites and purchasing products, creating a large quantity of customer data (e.g., user behaviour data). In order to develop proactive customer agility, practitioners are suggested to leverage information (i.e., data) recorded by the websites and information systems to study customer behaviours and preferences, which brings about competitive actions opportunities. Moreover, our study suggests that organizations should develop data management systems, apply personalization technologies (e.g., recommendation agents), and encourage organizational members to actively leverage data to create new products and services that meet customer needs.

5. Develop coactive customer agility. It is found that customers play the role of co-creators in product and service knowledge generation and sharing (i.e., user-generated content) during the development of coactive customer agility. Practitioners should focus on accumulating and leveraging information created and shared by customers to capture competitive actions opportunities. Additionally, this research proposes that organizations should invest in social media and Web 2.0 tools, empower important stakeholders to create good information content, and motivate customers to share relevant product and service content to develop coactive customer agility.

5.7. Limitations and future research

Despite making several theoretical and practical contributions, this study has two limitations. First, although the three types of platform-based customer agility are derived from qualitative data and corroborated by the existing literature, the validity of the typology should be further examined by future research. Furthermore, the measurement of three customer agilities is not provided by the current study, and this should be addressed in the future so that the knowledge generated in this study can be consolidated. Second, the case company is an e-commerce platform whose interactions with customers are frequent and recordable. This enables the generation of considerable valuable customer information. This setting allows us to observe the significant theoretical phenomenon of information management. However, more studies should be conducted to validate the findings of the current research in other settings, such as studies on offline business environments. Except for the two research directions derived from the limitations, our literature review on information management reveals that more studies are needed on information management culture since the volume of this research is much less than those of the other two streams of studies. With the increasing salience of information in a turbulent and competitive environment, more information management phenomenon will be observed, which is likely to be a promising research direction.

6. Conclusion

Despite platform-based customer agility is considered critical to survival and prosperity in the hypercompetitive environment, little is known about how to develop this important capability. This study represents one of the first attempts to investigate how information management enables e-commerce platforms to achieve platform-based customer agility. It shows that platform-based customer agility is achieved by establishing information management structure, developing information management capability, and instilling information management culture. Furthermore, the present study identifies three types of platform-based customer agility: reactive customer agility, proactive customer agility and coactive customer agility. These findings enrich the knowledge of platform-based customer agility and indicate the crucial

role of information management in developing customer agility, serving as a basis for future theoretical development in the area of agility and information management.

CRediT authorship contribution statement

Pei-Ying Huang: Conceptualization, Methodology, Investigation, Data curation, Formal analysis, Writing - original draft, Writing - review & editing. **Ben Niu:** Funding acquisition, Supervision, Conceptualization, Writing - review & editing. **Shan L. Pan:** Conceptualization, Resources, Methodology, Investigation, Writing - review & editing.

Acknowledgements

Appendix A. Research protocol

Research Objectives: The current study attempts to investigate how platform-based customer agility is achieved by an e-commerce platform. Drawing on the information management literature, we develop an integrative information management framework composed of information management structure, information management capability and information management culture. The investigation will focus on the process by which information management enables e-commerce platforms to achieve platform-based customer agility.

Research Question: How does information management enable e-commerce platforms to achieve platform-based customer agility?

Theoretical Bases: Information Management and Customer Agility

Methodology: Case study

Main Data Collection Method: Semi-structured interviews

Other Data Sources: Internal publications, organizational documents, and field notes

General Interview Questions:

- What is your position? When were you hired? Please describe your daily work.
- What has changed in the company since you joined? What has changed in your department?
- What were the challenges encountered during the change in the company/your department? How did you/the company overcome these challenges?
- How did IT used by the company evolve? Did the new technologies incorporate a change in the way in which information was processed?
- As IT evolved, what kind of information management capability was developed? How did it occur?
- As IT evolved, what has changed in members' information management behaviours? How did this occur?
- As IT evolved, did the new technologies change the way in which the company interacted with its customers? How did this occur?
- Do you think the information systems are fulfilling the information needs of your daily job? How do they achieve this?

Appendix B. Informant details

Table B1

Table B1
Informant details and headcount.

Level of position	Details of position	Headcount
Top management	- Director, human resource department - Director, organizational training department - Director, Chendu research institute - Deputy director, Internet plus logistics business unit	4
Middle management	- Manager, logistics system development division, IT department - Manager, platform architecture division, IT department - Manager, back-end data management division, IT department - Manager, back-end HR division, IT department - Manager, back-end testing division, IT department - Manager, supply chain management division, IT department - Manager, website data management division, IT department - Manager, website product division, IT department - Manager, software quality assurance division, IT department - Manager, website product development division (transaction systems), IT department - Manager, website product development division (recommendation systems), IT department	11
Employees	- Director assistant 1, Internet plus logistics business unit - Director assistant 2, Internet plus logistics business unit - Director assistant, organizational training department	3
Total headcount		18

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