

ROLE OF REAL-TIME INFORMATION-SHARING (RTIS) THROUGH SAAS: AN INDUSTRY 4.0 PERSPECTIVE

ARSALAN MUJAHID GHOURI

Formatted: Font: Not Bold, Italic

Abstract

Middle-level managers' role in business success is crucial, and the perception of middle-level managers regarding operations-related technologies is imperative. However, previous studies have not addressed middle-level managers' perceptions of modern technologies and relative aspects such as the effects of real-time information sharing (RTIS) and software as a service (SaaS). This study analyzes middle-level managers' perceptions regarding RTIS with customers through SaaS technology and its impact on purchase behaviors. The analysis is based on primary data collected from 207 middle-level managers from 151 small businesses operating in wholesale and retail, food and beverages, and accommodation sectors. We also develop a theoretical framework with the relational view (RV) and theory of information-sharing (ToIS). Our results from path modelling indicate that RTIS is the key determinant of customer purchase behavior (CPB). Further, the results illustrate that customer orientation mediates the correlation between RTIS and CPB. Consequently, our findings provide a deeper understanding of RTIS and CPB, rooted in RV and ToIS. We then discuss theoretical and practical implications and provide suggestions for future research.

Keywords: Real-time information sharing, customer purchase behavior, middle-level manager, industry 4.0

1. Introduction

Industry 4.0 aims at establishing intelligent, self-regulating, and interconnected industrial value creation (Liao et al., 2017). Several studies suggested cloud computing (CC) is an integral tool of industry 4.0 (i.e. Pedone and Mezgâr 2018; Wang et al., 2016). Kryftis et al. (2016) suggested that CC integrates multiple technologies for maximizing capacity and performance of the existing infrastructure. According to Langmead and Nellore (2018) cloud computing provides different computing infrastructures i.e. software-as-a-service (SaaS) which helps to share information with stakeholders. Sharing information with customers facilitates business performance and increases trust, especially in-service industry. CC could help service businesses to interact with customers and enhance customer trust or purchase behavior, nonetheless, many sub-sectors have not employed it yet.

Past studies revealed that, on the one hand, information-sharing helps generate positive customer attitudes and behaviors (Heide and Miner, 1992; Özer et al., 2017; McEvily and Marcus, 2005; Uzzi, 1997; Zhang et al., 2017). On the other hand, middle-level managers' role in daily operations management, strategic planning and initiatives, and decision making is integral for business success. Middle-level managers provide valuable contributions to achieving radical change (Chen et al., 2017; Gatenby et al., 2015; Kuratko et al., 2005; Li, 2018; Van Rensburg, et al., 2014). Hence, middle-level managers' perceptions of operations-related technology are crucial. This paper intends to decipher middle-level managers' impression and input regarding the implementation

of real-time information-sharing (RTIS) through SaaS technology with customers and its influence on (likely) purchase behavior.

First, RTIS is not unique, it used in previous studies, as the capturing and sharing of real-time information is an essential tool to gauge employees' attitudes (Constant et al., 1994; Unger et al., 2017), improve supply chain performance (Calle et al., 2016; Devaraj et al., 2007), increase production (Co et al., 1998; Hu et al., 2016; Zhang et al., 2015), control traffic (Mahmassani and Jayakrishnan, 1991; Shahrababaki et al., 2018), and transport industries or businesses (Ge et al., 2017; Grotenhuis et al., 2007). However, the application of RTIS in food and beverages and accommodation sectors was limited due to various constrains i.e. govt policies, and sector preferences etc. In this study, a sincere attempt is made to explore the possible benefit of RTIS e.g. purchase behavior in wholesale and retail trade, food and beverages and accommodation sub-sectors of service sector.

We conceptualize RTIS as the sharing of real-time customer responses (through customer relationship management, or "CRM"; or customer experience management, or "CEM") after the service occurs. For example, these responses are gauged by the prior day's customer satisfaction level, the prior week's average order fulfillment time, or customer ratings about a product or service. These responses are gathered through the SaaS application's interaction with other customers, ultimately to enhance their purchase behaviors. Fig. 1 illustrates these information-sharing inter-relationships. Further, the RTIS concept in the service industry is quite unique. As Malaysia has implemented its 'Small and Medium Enterprises Working Group' (SMEWG) Strategic Plan for 2017–2020, and foster innovation in SMEs to strengthen business competitiveness, and help SMEs to build capabilities to take advantage of and compete effectively in the internet and digital economy are two objectives of priority area of this

project. We intend to discover middle-level managers' perceptions regarding RTIS in the service industry.

The payoff from IT investments has been a subject of long-standing academic research (Devaraj et al., 2007) and has been open for debate; the conflicting views in light of payoffs are referred to as the "IT paradox" (Brynjolfsson and Yang, 1996). Further, there is a paucity of scientific analysis that clearly establishes eBusiness technology's impact on strategic measures (e.g., Kauffman and Walden, 2001; Mukhopadhyay and Kekre, 2002). Davila et al. (2003) argued that managerial expectations are higher than actual performances for eBusiness technologies. On the one hand, some studies noted that managers define and manage information-sharing as a technology issue (e.g., Chatfield et al., 2004; Dubey et al., 2017). On the other hand, a strong belief exists that technological investments can meaningfully connect people and companies (e.g., Allmendinger and Lombreglia, 2005; Fawcett et al. 2007; Raguseo, 2018).

Moreover, Ravichandran et al. (2005) suggest that unique services with distinct customer benefits enable a firm's functionality-related competencies. Malhotra (2005) coined the phrase, "the right information to the right people at the right time, in real time," but the study's approach was limited to order delivery efficiency with real-time information. Wong et al.'s (2013) study observed the integration of marketing and production functions. The authors concluded that such an action enables quick decision making with production schedules, order sizes, and adherence to customer specifications, which may positively influence production efficiency. Maiga et al.'s (2015) study posited that managers should use information systems (IS) to achieve better performance. They further added that firms' managers should not only appreciate the importance of integrating IS internally and externally, but also recognize how each

specific aspect of information technology integration can improve their operations. He et al. (2018) initiated a study on the online-to-offline (O2O) food-ordering and delivery market. They concluded that the relationship between the restaurant's location decisions and customers' wait times is less significant in the O2O food-ordering market due to the presence of the online platform's equalizing delivery service.

Alsetoohy and Ayoun (2018) empirically investigated the influence of intelligent agent technology (IAT) on hotels' food procurement practices and performance, to reveal that IAT usage has a statistically significant, positive effect on both aspects. Additionally, the results indicated that food procurement practices positively influence food procurement performance. Mangina and Vlachos (2005) also showed positive results of IAT. However, Hostler, Yoon, and Guimaraes (2005) shared mixed results of intelligent software agents, and Backhouse and Dhillon (1996) pooled studies which show the negative consequences of over reliance on risk analysis of information system. Hence, studies are scarce regarding the interaction between RTIS, customer orientation (CO), and customer purchase behavior (CPB). Additionally, present study also check the impact of education level (EL) as moderator between RTIS, and CPB.

Based on the above discussion, this study specifically aims to address the following research questions: Whether or not real time information sharing (RTIS), in relation to middle level managers perspective, influence the customer behavior? And what role does customer orientation play between RTIS and customer behavior? Thus, the study contributes to the existing literature by theoretical and empirical basis. These contributions are three fold: First, previous literature lacks a discussion of middle-level managers' stance regarding RTIS, and middle-level managers are considered important in any business operation and customer relationship strategies, our research outcome contributes to the ongoing theory development efforts in this domain Second, it has

been unclear since the widespread adoption of eBusiness technologies whether RTIS would impact CPB, or if CO mediates this relationship. Further, most studies that consider the customer's perspective are restricted to analyzing order deliveries. Third, researchers have not substantially focused on the RTIS concept in a wholesale and retail trade, food and beverages and accommodation sub-sectors of service sector context; hence, this study enriches current knowledge and fills this gap. Last but not least, it is unclear in the literature that EL strengthen or weaken the relationship of RTIS and CPB.

The remainder of this paper is structured as follows: Section 2 presents the relevant theories and underlying concepts, with a brief literature review. Section 3 describes the hypothesis, and methodology and research design is presented in section 4. Section 5 discusses the results of analysis, reliability, validity tests and the results of path modeling. Section 6 concludes, and summarizes the key results, explains managerial implications, and provides directions for future research.

2. Underpinning Theories and Underlying Concepts

2.1. Theoretical foundation

This study is grounded on two theories: the relational view (RV) and the theory of information sharing (ToIS). The information-sharing concept is rooted in the firm's RV, and provides a foundation for its organizational practices (Dyer and Singh, 1998; Mellat-Parast and Digman, 2008; Wieland and Wallenburg, 2013). While most studies apply RV theory in both strategy and management, RV theory envisage that a firm's critical resources may span its boundaries and embed in inter-firm resources and relationships (Dyer and Singh, 1998). Further, Chen and Paulraj (2004) illustrated RV theory's focus on relationships and processes. Pettigrew (1972) called information as critical resource. On the other hand, Prahalad and Hamel (2006) also explained middle level managers as

critical resource for business. Thus, this research proposes a model based on the relational view; we focus on middle-level managers' perspectives on RTIS, and especially regarding whether their firm resources and capabilities allow them to share real-time data. This study further investigates middle-level managers' perceptions about the feasibility and impact of served customers' RTIS on other customers, to ultimately contribute to perceived value and trust when making purchases.

From the ToIS perspective, "organizational culture and policies as well as personal factors can influence people's attitudes about information-sharing" (Constant et al., 1994, p. 401). Moreover, ToIS provides an understanding of factors that enable and constrain information exchanges among individuals (Zaheer and Trkman, 2017), and different organizational approaches and technologies should be used to support different kinds of information-sharing (Constant et al., 1994). This is the norm, in that people or businesses think differently about product-related information and expertise, and that in sharing, each must receive some benefit (Chennamaneni et al., 2012; Constant et al., 1994; Seidmann and Sundararajan, 1998; Zhang et al., 2018). This theory further examines the purpose of sharing information and the benefits for information providers. However, the understanding of information-sharing values is still limited (Popovič et al., 2014). This research explores middle-level managers' perceptions of what they can gain from sharing their real-time data with customers.

Prior studies failed to investigate managers' perceptions about RTIS from the RV and ToIS perspectives; hence, this study contributes to literature on both theories.

2.2. Underlying concepts: *The importance of SaaS in information sharing*

The theme of the present study is to understand the real-time information sharing with customers with the help of latest available technology. Business organizations are increasingly attempting to draw on people's varied experience, skills, and creativity, regardless of their location. To facilitate this, a variety of collaboration technologies are being utilized to support an array of complex decisions and events (Jung et al., 2010). Electronic channels are extremely flexible, and allow firms to decrease their costs compared to offline channels, optimize the marketing mix, automatically suggest complementary products and services, and implement such relationship-friendly tools as aids for comparison (Andrade et al., 2002; Viswanathan et al., 2005). CC is one of the most original network services paradigms which provides large number of data-centric network applications, and consider one of the model which delivers computer services over the internet to the businesses (e.g., Buyya et al., 2009; Wu et al., 2018). CC services can be grouped in three main categories: Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS). SaaS refers to the provisioning of applications running on Cloud environments (Botta et al., 2016). The SaaS concept emerged when businesses started assembling and providing the necessary services to address a particular requirement of customers or other stakeholders. According to Turner et al. (2003), the SaaS vision involves providing a vital contribution to software development and delivery to facilitate business operations and information-sharing. Wohl (2010) suggested that from the value proposition perspective, SaaS services are administered to resellers. Financial and professional services as well as retail firms have been particularly aggressive in adopting the SaaS model (Chang, 2018; Godse and Mulik, 2009; Lian, 2015).

Aramand (2008) stated that SaaS software or app functionalities and features can use the Internet to deliver services to end-users. Retail and service firms can provide

a free SaaS app for end customers' use from any location, with application and data host availabilities determined by the service providers. Buyya et al. (2009) suggested that software such as SaaS provide personalized attention to customers, by, for example, enabling communication to keep customers informed and obtain their feedback, increasing the firm's access to customers as well as its approachability, and understanding customers' specific needs. Specifically, customer relationship management (CRM) and customer experience management (CEM) can encourage customers' trust and confidence by emphasizing the provider's credibility and customer courtesy.

2.3. Information as a service

Mathieu (2001) considered service as a profitable tool for businesses, and defined service to include independent delivery, which increases both revenue and profits. New technologies have changed how people interact with firms, and call for a radically new e-marketing approach within a broader multidisciplinary service science (Bardhan et al., 2010). When technological innovation is combined with service components, it is more likely to succeed in communicating with customers (Teece, 1986). The provision of services could include the dynamic creation and development of entirely new services that use existing ones (Turner et al., 2003). One possible benefit of such communication includes continuous revenue streams, higher profits, and new opportunities to differentiate the business (Wise and Baumgartner, 1999). Superior service increases both first-time and repeat sales, consequently enhancing market share (Alsetoohy and Ayoun, 2018; Cohen and Lee, 1990). These superior services are an effective way to maintain ongoing relationships (Evans and Laskin, 1994; Wang et al., 2017).

2.4. The importance of middle-level managers' perceptions

Managers “mediate” information, and often act as the final authority in determining the outcome of complicated decisions (Gattiker and Carter, 2010). Further, Kesner and Russell (2009) shared two managerial case studies related to estimating overall IT infrastructure’s effectiveness; the uses and need for business intelligence in cases, such as: data-driven decision making, customer relationship management, supply chain management, and the Internet-enabled disintermediation of more traditional business practices. Pfeffer and Salancik (1978) argued that businesses should emphasize the importance of information-processing tasks and accuracy in managers’ perceptions. Yasai-Ardekani (1986) expressed a similar view by calling for the development of models that explain managerial perceptions and reflect an objective environment. Starbuck, Greven, and Hedberg (1978) highlighted the importance of accurate managerial perceptions, in that inaccurate scanning may lead to an organizational crisis or failure. In a similar vein, Karim et al. (2016) argue that managers often delay their decisions because of a lack of subjectivity, confidence, and information. Weiss and Wittmann (2018) shared an issue with managers’ perceptions that ultimately leads to a gap between objective and perceived environmental conditions in businesses. Several studies also demonstrate the importance of scanning business opportunities and management’s perception (Hambrick and Mason, 1984; Ireland et al., 1987; Rafique et al., 2018; Shank et al., 1988; Weiss and Wittmann, 2018).

Bower (1970) was among the first scholars to highlight middle managers’ importance as agents of change in contemporary organizations. Hornsby et al. (2002) explained that middle-level managerial behavior is strongly linked to effective business strategies. Hornsby et al., (1993) discussed that combination of circumstances help managers to sustain and improve business performance. Ghoshal and Bartlett (1994)

recommended middle level managers as enablers of actions. Therefore, Bartlett and Ghoshal, (1996) argued that middle level managers facilitates businesses in linking and leveraging resources and capabilities across the organization to bring large company advantages to bear on the performance of front-line units. Quinn (1985) recognized middle managers' valuable contributions, and noted the important roles they can play in fostering communication to reveal businesses' priorities. Middle managers are perceived as reviewing, developing, and supporting various initiatives in their units (Bartlett and Ghoshal, 1996). Further, Burgelman (1983a) clarified middle managers' key role in shaping their businesses' strategic agenda by influencing the types and intensities of firms' entrepreneurial activities. Mair and Thurner (2008) suggested that medium-sized firms can actively manage middle managers' attitudes and behaviors, and by managing such perceptions, they can enable superior performance. Collier et al. (2004) shared the positive effects of middle managers' involvement based on their perceptions of the firm strategy. This focus on middle managers is consistent with the growing recognition of their key roles in promoting or stifling corporate entrepreneurship efforts (Burgelman, 1983b; Floyd and Woolridge 1992; Huy, 2001; Olsson et al., 2017). Hence, middle-level managers' perceptions, whether in focusing on either the customer or competitor, enhance the business' ability to create and sustain superior value for customers.

3. Hypothesis development

3.1. Real-time information sharing and customers' purchasing behavior

Klein (2007) posited that technological advances can be used to redefine relationships, share processes, and collaborate. Moreover, electronic channels can serve an important communication function in terms of both attracting new customers and

retaining current clients; these channels can also extend and leverage preexisting relationships through communications and offerings to individual consumers (Sawhney and Zabin, 2002; Steward et al., 2018). Businesses sharing behavior about operation information have impacts on operations, sales, marketing, technological developments, and production strategies (e.g. Costa et al., 2016).

Technology enables firms to record the details of any online customer interaction, which can then influence their marketing actions (Ahsan and Rahman, 2016). Wohl (2010) confirmed that businesses could exploit SaaS applications with different design philosophies, which may require different marketing plans. Further, scholars have long suggested that information-sharing can play a considerable role in improving customers' purchase behaviors (Kim and Ko, 2012; Lee and Whang, 2000; Mahmassani and Jayakrishnan, 1991). Jung et al., (2010) added that real-time feedback to internal customers effectively enhance the motivational affordance of group. Devaraj and Kohli (2003) proved that technology investments are related to outcomes such as hospital revenue and quality. DeLone and McLean (1992) provided the evidence that success of an information system using a variety of outcomes ranging from information satisfaction, to user satisfaction, and to actual use. A successful Web presence that yields actual sales requires an understanding of both information system and human computer interaction. Peter et al., (1999) exhibited that information search is essential tool in purchase behavior. Yoon (2002) found trust as the antecedents of online purchase decisions.

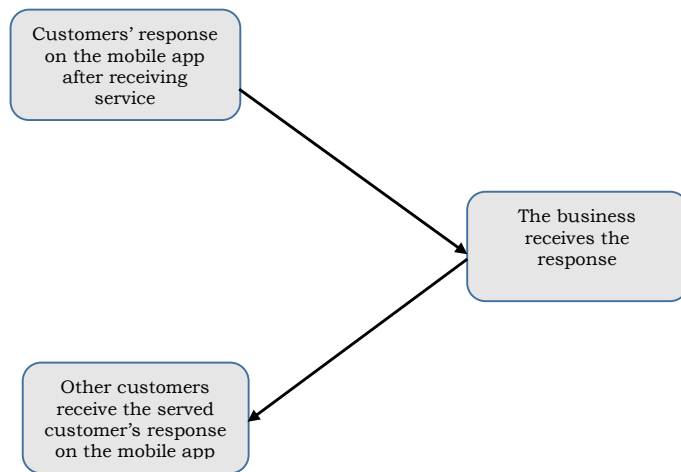


Figure 1. The flow of real time information

On the other hand, customers in this self-service environment have the power to control what, when, where, and how they will interact with retailers (Lee et al., 2006). Further, Mahmassani and Jayakrishnan (1991) provide evidence that customers prefer to make decisions based upon real-time information. A practical example shared by Kraemer et al. (2000) involves a recommendation that Dell's integration of real-time information to secure greater customer service, increase its revenue, and understand and enhance customers' buying patterns. Fulkerson and Shank's (2000) research also proved that RTIS can enhance purchase behavior. Mithieu (2001) explained that real-time information can be used to derive marketing benefits, while RTIS that involves the customer's system status can be used to enhance customer value (Artto et al., 2008).

Additionally, Fawcett et al. (2007) suggested that real-time connectivity helps businesses continuously monitor customer preferences and behaviors. If the behavioral response is shared with other customers, it could positively affect purchase and repurchase behaviors. Clearly, customers appreciate RTIS, and this research stream can reveal existing and potential customers' real-world behavior (Dziekan, 2004; Dziekan and Vermeulen, 2006). We extend this line of thinking to purchase behavior, and hypothesize the following

H1: The perceived benefits of real-time information sharing positively relates to overall perceived purchase behavior.

3.2. Real-time information sharing and customer orientation

Each customer has his or her own buying habits (Applebaum, 1951), and will act or react accordingly. This is businesses' obligation, in that they should become involved in CO by not only meeting customers' needs and expectations, but also solving their purchase problems before and after the sale. Businesses operate in increasingly competitive environments, and their informational resources play a major role in achieving their strategies and objectives (Ascarza et al., 2018; Flowerday and Von Solms, 2005; Brynjolfsson and Hitt, 1996). Vasarhelyi and Greenstein (2003) described that the "electronization of business" should absorb and integrate business processes, as consequent changes direct business practices more toward customers. Hammer (2004) suggested that service businesses should focus on customers rather than production. Further, Lee et al. (2006) argued that the Internet has significantly changed the relationship between customers and retailers; the authors also noted that the Internet provided retailers the opportunity to strengthen customer ties by offering more choices

as per requirement and providing an outstanding online experience. Riggins (1999) study emphasized on two concepts: interaction and relationship ideas with customers. Organizations use the Internet to improve customer relationships by providing easier access to information, and developing more flexibility to respond to customer information requests (Lederer et al., 2001; Shi et al., 2019; Ulmer, Heilig, and Voß, 2017). Further, Preece (2001) also highlighted on prompt information-sharing, which could enhance customer trust. Alba (1997) argued that electronic channels can attract new customers and retain current clients, while extending and leveraging preexisting relationships by personalizing communications and offerings to individual consumers.

Research found that people anticipate and enjoy new e-marketing techniques (Bardhan et al., 2010). Moreover, Kraemer et al. (2000) shared different online techniques to please customers, such as e-ordering and online support, among others. A firm's eBusiness capability involves its ability to use Internet technologies to share information, process transactions, coordinate activities, and facilitate collaborations with customers (Devaraj et al., 2007; Dziekan and Vermeulen, 2006). Businesses must be redesigned around the Internet's cost-saving and communication-facilitating benefits to provide additional services to customers (i.e. Ali et al., 2018; Lederer et al., 2001). The ability to quickly access data at any time and place is a feature that sets Internet marketing apart (Ba et al., 1997), and integrates it as a part of CO. The practice of providing personalized information to customers at the point of need in real-time may enhance Web users' satisfaction and loyalty (e.g. Feeny, 2001; Kenny and Marshall, 2000; Reichheld and Scheffer, 2000). Further, Allmendinger and Lombreglia (2005) illustrated that RTIS with customers can provide them additional value and intimacy. The quick, interactive access to large amounts of dynamic information to respond to customer queries, enabled by the Internet, has improved customer relationships

(Hoffman et al., 1995; Moss, 2017). Additionally, Fawcett et al. (2007) proposed that real-time connectivity and information helpful to maintain customers relationship and could provide competitive advantage. Given the discussed linkages between the perceived benefits of real-time information sharing (PBRTIS) and CO, we hypothesize

H2: The perceived benefits of real time information-sharing positively relates to customer orientation.

3.3. *Customer orientation and purchase behavior*

Businesses use technologies such as SaaS in customer relationship management (CRM) and customer experience management (CEM) to understand customers and their needs (Buttle, 2009). Slater and Narver (1998) argued that a customer-led company may be successful in relatively predictable environments operating in stable served market. Smith and Bolton (1998) refer to customer attitude and behavior as a learned predisposition to respond consistently in favorably or unfavorably manner. Customers who have affective predispositions toward a brand are more likely to choose the integrated resort brand's products or services (Ahn and Back, 2017). Further, MacKenzie and Lutz (1989) stated customer attitudes and behaviors could shape up by affected by information and experiences. They can focus more time and effort on improving the quality of existing services, creating new business opportunities, and improving the working relationships with their customers (Chang, 2018).

Syaekhoni et al. (2017) suggested that several customer-related factors, such as shopping habits, influence customer behaviors. Harris and Reynolds (2003) concluded that serving customers according to their need and enforce positive customer-related

policies produce happy customer experiences. Managing customer expectations is fundamental to effective service and perceptions of service quality (Boulding et al. 1993; Parasuraman et al., 1991). Beckers, van Doorn, and Verhoef (2018) illustrated customers “know what they want,” and it is appropriate for businesses to play a role in directing demand and get the reward in the end. Blut et al. (2015) noted that dissatisfied or disoriented customers do not tend to purchase or repurchase a product or service.

Poddar et al. (2009) explained that customer orientation related to web presence also impact purchase behaviors. Similarly, Newberry et al. (2003) offered a theory regarding purchase behaviors with customer orientation (CO) in the service industry. Others posited that CO factors—namely, information quality, user interface quality, and security perceptions affect purchase behaviors (Park and Kim, 2003). Gustafsson et al. (2005) postulated that situational and reactional factors act as triggers to facilitate repurchasing behavior. Zhang et al. (2011) determined that many customer-oriented initiatives including online relationship quality and perceived website usability influenced repurchase behaviors. In the same vein Macintosh and Lockshin (1997) posited that consumers’ trust of a business and its employees/ stakeholders creates positive relationships, with repeat purchase intentions. While marketing literature considers intentions and behavior as two separate entities and constructs, other studies have proven the close relationship between the two concepts (Bagozzi and Yi, 1989; Kim and Hunter, 1993). Based on the discussions, one can reasonably assume the positive role of customer orientation between PBRTIS and OPPB. Thus, we hypothesize the links between customer orientation (CO) and OPPB

H3: Customer orientation positively relates to overall perceived purchase behavior.

H4: Customer orientation positively mediates the relationship between the perceived benefits of real-time information sharing and overall perceived purchase behavior.

3.4. *Education level as moderator*

Level of education is important for managers (Stevens, et al., 1978). McLeay et al. (2017) argued that education enabled managers to rethink their business models as they strive to increase productivity and global competitiveness. Floyd (2016) explained that higher education and specially held core values linked to help managers to develop deep knowledge about surroundings. More educated managers tend to facilitate the customers by new ideas and dynamic manner (e.g., Bigdeli et al., 2013; Karim and Hussein, 2008). On the other hand, education is considered as a tool to understanding the customer behavior (e.g. Bell and Eisingerich, 2007; Petersen et al., 2018; Williams, 2007). Hence, we hypothesize the moderation role of EL between PBRTIS and OPPB.

H5: Education level of middle level managers moderate the relationship between the real-time information sharing and overall perceived purchase behavior.

3.5. *Control variables*

This study considers three control variables i.e. gender, business type, and business size. These variables were kept constant throughout the study to prevent confounding with the independent variable. Several studies showed the gender differences in adaptation of technology and information sharing (e.g. Wang et al. 2008; Hsu and Lin, 2008). Business type also create variation in adaptation of technology and

information sharing (Closs and Xu, 2000; Kolekofski Jr and Heminger, 2003). Similarly, business size or size of the organization plays a key role in technology adoption and information sharing (Loh and Venkatraman, 1992; Zhu et al., 2003). Hence, all three variables are reliably measured in past studies with information sharing.

Figure 2 depicts the conceptual model of the study that shows the relationship between RTIS (enabled by SaaS technology) and OPPB exerted by middle level managers. This model further elaborates that RTIS would increase innovation opportunity to serve customers, increased knowledge sharing opportunities and better customer experience, which are considered to be benefits of industry 4.0 (i.e. Fraga-Lamas et al., 2018; Gloet and Terziovski 2004; Müller et al., 2018).

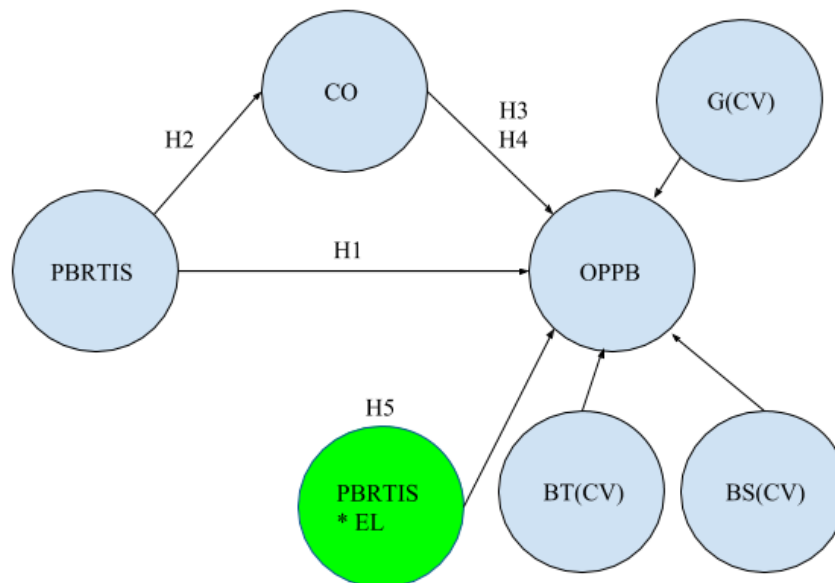


Figure 2. Conceptual model about middle level managers' response about PBRITIS, CO and OPPB

4. Methodology

4.1. Operationalizing constructs

In order to address the content validity, the expert panel was constituted that includes practitioners one each from beverages, food and accommodation sectors, and professors one each from Information science, marketing and operations streams. This is to ensure the determinants of whether empirical work speaks to the theoretical concerns of research (Zeller and Carmines, 1980). Studies suggest that academic subject experts could identify attributes which objectively realistic with specific constructs (i.e. Lawshe, 1975; Sireci, 1998). Additionally, several researches also recommended to take opinion of professional individual/ group who expected to have a greater understanding of the respective subject in industry (Skarlicki and Folger, 1997; Young, Rinehart, and Heneman, 1993). With the help of opinion from expert panel, the initial items were selected. These items further modified/reworded/re phrased to suit the specific needs of the industry and the research phenomenon under investigation. All variables were adopted from existing studies wherever possible, which reflect each construct's attributes; Table 3 describes the constructs and their items and sources. Each construct is measured on a Likert scale ranging from 1 to 5, where 1 is the lowest score and 5 the highest. The measures including gender, business type, and business size represent three control variables in the analysis. While the 1, 2 show the gender type (female, male), 1, 2 represent business size (medium, large), and 1, 2 denote business type (wholesale and retail trade, food and beverages and accommodation).

Independent t-tests method used to determine the non-response bias by using and comparing first 20 respondents and the last 20 respondents on all variables (i.e.

Armstrong and Overton, 1977). The results revealed that there was no significant difference between the early and late respondents which depicts non-response bias. For further purification of the results, we conducted the common method bias test. We adopted marker variable approach. We included unrelated variable (i.e. self efficacy) from current study in correlation analysis of the model as the marker variable (Lindell and Whitney, 2001; Lowry and Gaskin, 2014). The correlation values to the marker variable were fall into low (MV -> PPB =.029) to moderate (MV -> PBRTIS = .61); thus, the likelihood of common methods bias is low.

The PBRTIS (independent variable) was measured using three items, followed by the CO (mediator), which was assessed using six items. The second-order construct, OPPB (dependent variable), was measured with two sub-constructs: the perceived purchase behavior and perceived repurchase behavior, each consisting of three items. Table 1 presents the three control variables (gender, business type, and business size), which were used to ensure robustness. Table 2 presents the variables' details, including the source studies, a brief item description, and coding.

4.2. The establishment of a second-order construct

According to Chen et al. (2005), constructs that are seemingly distinct but related can be accounted for by one or more common underlying higher-order constructs. The perceived purchase behavior and perceived repurchase behavior in our study were highly correlated, and theoretically, both constructs are linked to overall purchase behavior (Fennis et al., 2011; Kahn and Schmittlein, 1992; Meyer-Waarden and Benavent, 2009; Mittal and Kamakura, 2001). Therefore, we establish the second-order construct, or overall perceived purchase behavior (OPPB). Fig. 2a illustrates the first-

order construct, which provides details to create the second-order construct, depicted by Fig. 2b.

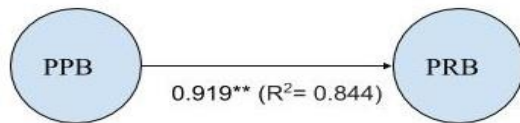


Fig. 2a. Structural results of verification for the second-order construct

Note: $n = 207$; saturated model SRMR = 0.0711, dULS = 0.9923 < HI99 = 1.932, dG = 0.7839 < 1.0365.

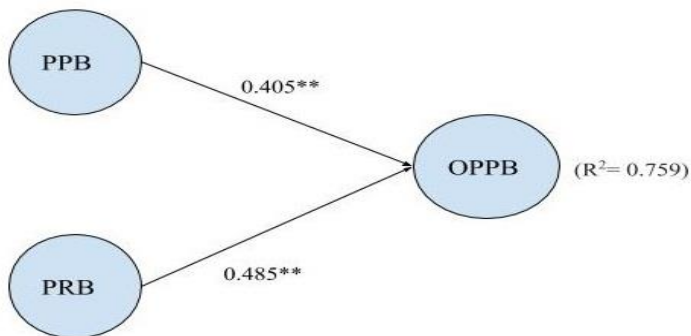


Fig. 2b. Structural results of the second-order construct

Note: $n = 207$; saturated model SRMR = 0.07021, dULS = 0.9722 < HI99 = 1.921, dG = 0.7611 < 0.96453.

Fig. 2a is the first-order construct for the overall perceived purchase behavior. All loadings were significant, with a t -value of PPB \rightarrow PRB = 67.079.

Fig. 2b is the second-order construct for overall perceived purchase behavior. All loadings were significant, with a t -value of PPB \rightarrow OPPB = 3.481 and PRB \rightarrow OPPB = 4.234.

4.3 Data collection and quality check

The sample consists of companies listed in SME Corporation Malaysia directory. According to the SME Corp Malaysia (2015) the threshold for SMEs are based on employment aspect of firm that employs below 75 workers. The selected sample queried 207 managers (151 businesses) from a field survey. The authors directly executed the survey with the cooperation of university personnel. Most of the respondents were well aware about the benefits of SaaS, which they illustrated in response of two items of questionnaire (Are you aware about SaaS technology; Do you understand the advantages of adaptation of SaaS technology). Malaysian government took many initiatives to educate the SMEs management about new technological trends and opportunities, i.e. SMEX 2018, ADVICE, BIDA 2.0, MITS etc. For the authentication of survey, literature related to SaaS shared with the respondents. Table 1 displays details about the businesses and their managers, while Table 2 further describes the sample.

The data was collected from service-providing companies that do not use SaaS, but plan to adopt it in the future. According to SMECorp Malaysia (2017), 2017 was the first year of Asia-Pacific Economic Corporation's SMEWG Strategic Plan for 2017–2020. One of its key priorities involves strengthening SMEs' competitiveness and innovation; this will be accomplished by enhancing their participation in the Internet and digital economy through electronic commerce and reducing the technological gap. Of Malaysia's SMEs, 87.9% belong to the service sector. The data was collected from sub-sectors operating in wholesale and retail, food and beverage, and accommodation, which were chosen because: i) there are no RTIS implications in those sectors, ii) the selected sub-sectors contributed 18% to the service sector, or 72.9% to the final service category

and 33.1% to the overall service industry (Ministry of Finance Malaysia, 2017). The unit of the study is individual in the study. The data consists of responses from middle-level managers who are directly involved in customer operations. The data collection took average 7.7 days from each business. The middle-level managers who responded to this study provided their answer regarding SaaS before implementing the idea in their businesses. Further, 307 manager responses were received from 202 targeted companies, with no online method used for data collection. Of the responses received, 102 manager responses were excluded due to an incomplete response or if the respondent was not a middle-level manager. 207 responses were valid for final analysis.

Commented [MV1]: Not convinced. What does it mean ?
Can you please rephrase?

Table 1. Description of businesses' respondents

Number of Businesses	Numbers	Frequency
2	4	8
8	3	24
34	2	68
107	1	107

We used a common-method variance test guideline to avoid the variations in responses caused by the instrument rather than the respondents' actual predispositions (i.e. Podsakoff et al., 2003). We also used maximum likelihood estimation and a multiple indicator approach guidance to minimize any bias effects (i.e. Anderson and Gerbing, 1982; 1984; 1988).

Table 2. Middle-level managers’ and businesses’ sample characteristics

Category		Numbers	%
Gender	Male	128	61.84
	Female	79	38.16
Education level	Never attended school	0	0
	Attended school	2	0.97
	Diploma	64	30.92
	Degree	114	55.07
	Masters	27	13.04
Company type	Wholesale and retail trade	57	37.75
	Food and beverages and accommodation	94	62.25

5. Data Analysis and Results

The model indicates the direct relationship of PBRTIS -> CO, CO -> OPPB, PBRTIS -> OPPB, and EL -> OPPB. Furthermore, the model also depicts the mediation relationship between PBRTIS -> CO -> OPPB, and moderation effect of PBRTIS * EL -> OPPB. We used partial least squares (PLS) for our data analysis. Chin (1998) considered the PLS technique suitable for analysis at a theory’s early formulation phase, and our study aims to reveal managers’ perspectives regarding real-time data sharing, which is

in an early stage. The ADANCO 2.0.1 software suite was used to conduct the PLS analysis. The gender, business type, and business size were the control variables of the model.

5.1. The constructs' validity and reliability

All items loaded with their respective construct. Afterwards, first, we employed a construct validity test to determine whether the all constructs were appropriate measures (Bagozzi et al., 1991; Happell et al., 2015). As all our constructs were measured on a reflective scale, we used convergent validity, with average variance extracted (AVE) and discriminant validity, with the Heterotrait-Monotrait ratio of correlation (HTMT) (Gefen et al., 2000; Henseler et al., 2015). We then used Jöreskog's rho to check reliability, as it reveals the results' level of consistency when the same measurement tool is used (Henseler et al., 2011; Nunnally and Bernstein, 1994). The AVE indicates the constructs' unidimensionality, while the HTMT indicates that the constructs have the strongest relationships with their own indicators (Hair et al., 2016; Hair et al., 2011). The Jöreskog's rho also illustrates that all constructs are reliable for further analysis. The AVE should be at least 0.5, HTMT at most 0.85, and Jöreskog's rho at least 0.7. Table 3 displays the details regarding sources and item descriptions for all validity and reliability test results, which significantly surpass the minimum threshold level (Dijkstra and Henseler, 2015; Hair et al., 2011; Henseler et al., 2016; Henseler et al., 2015; Nunnally and Bernstein, 1994).

Table 3. Validity and reliability results and evaluation of the measurement model

Construct	Source	Item Description	Item Coding	Loading	Jöreskog's rho (ρ_c)	AVE	HTMT
Perceived Benefits of RTIS (PBRTIS)	Benlian and Hess (2011); Gewald and Dibbern (2009)	Adopting a real-time information-sharing application has many advantages.	PBR1	0.787	0.880	0.709	< 0.85
		A real-time information-sharing application is a useful instrument for increasing operational excellence.	PBR2	0.913			
		Overall, I consider the adoption of real-time information-sharing to be a useful strategic option.	PBR3	0.846			
Customer Orientation (CO)	Narver and Slater (1990)	We are strongly committed to our customers.	CO1	0.915	0.931	0.693	< 0.85
		We look for ways to create value in our products.	CO2	0.856			
		We closely monitor and assess our level of commitment in serving customers' needs.	CO3	0.824			
		Our business objectives are driven by customer satisfaction.	CO4	0.886			

		We closely focus on after-sales service.	CO5	0.743				
Overall	<i>Second Order</i>							
Perceived	<i>Construct</i>							
Purchase								
Behavior								
(OPPB)								
		Perceived Purchase Behavior	OPB1	0.702	0.791	0.806	< 0.85	
		Perceived Repurchase Behavior	OPB2	0.809				
Perceived	Dodds,							
Purchase	Monroe, and							
Behavior	Grewal (1991)							
(PPB)								
		The likelihood of customers purchasing our product(s) is:	PB1	0.924	0.915	0.781	< 0.85	
		The probability that customers would consider buying the product(s) is:	PB2	0.890				
		Customers' willingness to buy the product(s) is:	PB3	0.835				
Perceived	Parasuraman,							
Repurchase	Zeithaml, and							
Behavior	Malhotra							
(PRB)	(2005)							
		Customers would like to continue purchasing our product(s).	PRB1	0.891	0.902	0.755	< 0.85	
		It is likely that customers will continue to purchase these product(s) in the future.	PRB2	0.850				
		Customers intend to continue	PRB3	0.863				

Table 4. Descriptive statistics and correlation matrix of underlying constructs

Construct	Mean	SD	PBRTIS	CO	PPB	PRB	G	BT	BS	OPPB
<i>Perceived Benefits of RTIS</i>	3.83	1.65	1.000							
Customer Orientation (CO)	3.97	2.15	0.667*	1.000						
Perceived Purchase Behavior	2.99	1.72	0.817*	0.637*	1.000					
Perceived Repurchase	3.21	2.19	0.798*	0.595*	0.547	1.000				
Gender (G)	1.28	1.94	0.281	4.479*	0.078	0.094	1.000			
Business type (BT)	1.31	1.11	0.117	0.269	0.097	0.081	0.212	1.000		
Business size (BS)	1.24	1.38	0.133	0.514*	0.124	0.119	0.172	0.201	1.000	
Overall Perceived Purchase Behavior (OPPB)	3.10	1.76	0.536*	0.414*	0.580*	0.562*	0.417*	0.192	0.135	1.000

Note: * = correlations are significant at $p < 0.08$.

5.2. Robustness test

We conducted a robustness test to rule out possible problems stemming from a ‘reverse causality’, and reran the test without controls (i.e. Ali, Ng and Kulik, 2014; Heckman, 1979). This reverse causality test is about the possibility that the PBRTIS is not the cause of OPPB but its effect. To address this problem, we reversed the temporal order of our independent variable and dependent variable for Hypothesis 1, 2, and 3 without control variables. The results of the reverse-order regression analysis are shown in Table 5 and we do not find any statistically significant relationships between the two lagged variables of Hypothesis 1, 2, and 3.

Table 5. Validity and reliability results and evaluation of the measurement model

Variables	PBRTIS	CO	<i>t</i> -value
OPPB (H1)	0.118	-	0.397
CO (H2)	0.024	-	0.071
OPPB (H3)	-	0.143	0.478

5.3 Model analysis

We used a path analysis with a bootstrap option to test the hypothesized model's statistical significance. We observed the explanatory power of our study's structural model, the amount of variance explained by the independent variable over the dependent variable, and its paths' magnitude and strength. None of the control variables has a significant effect on OPPB. The results are kept before and after including the control variables, which gives our analysis robustness. Fig. 3 depicts the relevant saturated model results, and Table 6 displays the effect size (i.e., Cohen's f^2) and each relationship's direct and indirect effect(s).

Hypothesis 1 proposes that the PBRTIS positively relates to OPPB. This hypothesis is supported at a t -value > 1.96 , with $\beta = 0.438$ (Cohen et al., 2013; Hair et al., 2010). Hypothesis 2 (the perceived benefits of real-time information sharing positively relate to customer orientation) and Hypothesis 3 (customer orientation

positively relates to overall perceived purchase behavior) are also supported at t -value > 1.96, with $\beta = 0.144$ and $\beta = 0.434$, respectively.

Hypothesis 4 (customer orientation mediates the relationship between perceived benefits of real-time information-sharing and overall perceived purchase behavior) is supported, with a medium effect size at t -value > 1.96, $\beta = 0.554$, and Cohen's $f^2 = 0.501$ (Cohen, 1992). The result indicates that the PBRTIS remains significant with OPPB after including CO as a mediator, with $\beta = 0.173$ (indirect effect) and $\beta = 0.554$ (total effect) (PBRTIS \rightarrow CO \rightarrow OPPB mediation effect = 0.312). However, the PBRTIS effect on OPPB is explained through the CO mediator. Thus, a partial mediation relationship is verified (Hair et al., 2013).

Hypothesis 5 (education level of middle level managers moderate the relationship between the perceived benefits of real-time information sharing and overall perceived purchase behavior.) is supported as well, with a medium effect size at t -value > 1.96, $\beta = 0.294$, and Cohen's $f^2 = 0.447$ (Cohen, 1992). The result indicates that the EL strengthen the relationship of PBRTIS with OPPB. Thus, a moderation relationship is verified (Hair et al., 2013) which illustrated in Fig. 4. Fig. 4 defining that with low EL, there is minor difference in managers' understanding about the OPPB in the presence of low or high PBRTIS. While, higher EL enables managers' better understand of the OPPB as PBRTIS increases from low to high. Additionally, the note to Fig. 2 provides the fit indices, with R^2 values ranging from 2.1% to 61.7%; this supports the final model (Hosmer et al., 2013).

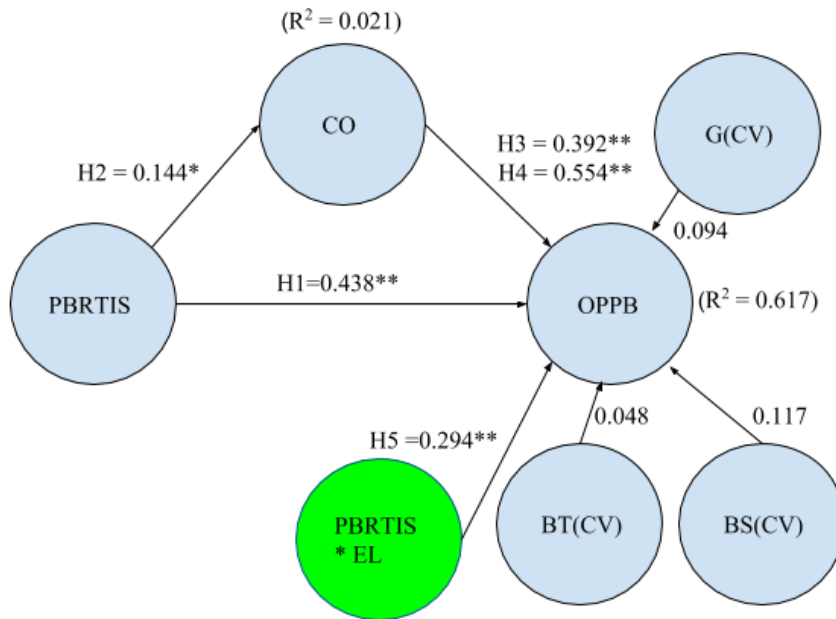


Fig. 3. Structural results for hypothesis testing, R^2 values, and fit indices

Note: a) $n = 207$; saturated model $SRMR = 0.0607$, $dULS = 0.9073 < HI99 = 1.452$, $dG = 0.6786 < 0.8277$; Estimated model $SRMR = 0.0647$, $dULS = 0.9627 < HI99 = 1.554$, $dG = 0.6933 < 0.9554$
b) Results of the PLS estimation (* = $p < 0.10$, ** = $p < 0.05$, one-tailed test).

Table 6. Validity and reliability results and evaluation of the measurement model

Effect	Cohen's f^2	Direct Effect			Indirect Effect			Total Effect		
		β	Mean	t-value	β	Mean	t-value	β	Mean	t-value
PBRTIS -> CO	0.021	0.144	0.152	2.031	-	-	-	0.144	0.152	2.031
CO -> OPPB	0.214	0.434	0.432	8.820	-	-	-	0.392	0.431	7.178
PBRTIS -> OPPB	0.501	0.438	0.438	7.941	0.173	0.174	2.278	0.554	0.557	7.468
G (CV)-> OPPB	0.017	0.094	0.099	.0974	-	-	-	0.094	0.099	.0974
BT (CV) -> OPPB	0.107	0.048	0.051	0.741	-	-	-	0.048	0.051	0.741
BS (CV) -> OPPB	0.034	0.117	0.119	1.264	-	-	-	0.117	0.119	1.264
PBRTIS * EL ->	0.447	0.294	0.299	5.471	-	-	-	0.294	0.299	5.471

*All effects tested on a saturated model

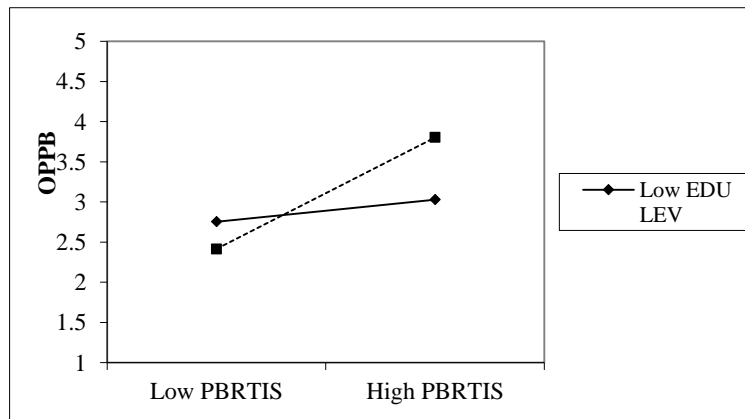


Fig. 4. Plots two-way interaction effects for standardised variables

6. Discussion

This study's primary aim was to explore a relationship between PBRTIS, CO, and OPPB regarding middle-level managers' perspectives. Explore the relationship between constructs provides the insights about particular issue or problem (e.g., Granger and Terasvirta, 1993; Hair et al., 2011). Information sharing behavior of businesses provides edge on operations, processes, sales and marketing, (e.g. Kraemer, 2000). Additionally, middle level managers input in reviewing, developing, and supporting organization's initiatives is pivotal and inevitable (e.g., Bartlett and Ghoshal, 1996; Ghoshal and Bartlett, 1995). This study provides the insights into the 'positive' role of CC technology, which is considered as an integral tool of industry 4.0 in enhancement of customer experience. CC provides different applications (i.e., SaaS) to share information to stakeholders. Hence, we gather the responses of middle level managers of wholesale and retail trade, food and beverages and accommodation business about implication of SaaS technology in the business to share real-time information about their specific operations and processes of business.

We found that PBRTIS positively related to both CO and OPPB, while CO was positively associated with OPPB. Moreover, the CO indicated a partial mediating role between PBRTIS and OPPB, and the EL specified the moderation effect between PBRTIS and OPPB. This study also provides the insight about the adaptation of RTIS in those sub-sectors of service industry which never implemented CC (SaaS) for customer perspective. Middle level managers believe that customer's interest to hear and share from the service businesses to make better decisions on spending. These relationship support our underpinning theories, theoretical framework, and hypothesis.

This study contributes to the existing debate on the importance of RTIS in four important ways. First, this paper's findings provide important insights to both underpinning theories—RV and ToIS—by indicating the relationship between PBRTIS, CO, and OPPB from middle-level managers' perspective. The use of underpinning theories and their appropriateness in the order of use to help to undertake rigor in a study (Iyamu, 2013). Several studies gauge middle-level managers importance in finding business opportunities, scanning the environment, and implementing top management's stance (Gattiker and Carter, 2010; Hambrick and Mason, 1984; Pfeffer and Salancik, 1978; Rafique et al., 2018; Shank et al., 1988; Weiss and Wittmann, 2018); however, a paucity of research exists to measure middle-level managers' perceptions about RTIS, which links to RV and ToIS. Thus, we examined middle-level managers' perceptions, to understand the current state of small businesses and facilitate the implementation of the SMEWG Strategic Plan for 2017–2020: to enhance participation in a digital economy through electronic commerce and decrease the technological gap. Specifically, we emphasized an understanding of the perspectives of middle-level managers—from wholesale and retail trade as well as food and beverages and accommodation businesses—about sharing real-time information to customers through SaaS technology. This study contributes to the existing literature on RTIS in particular industries by providing specific, deeper insight about OPPB (purchase + repurchase behavior) and CO implementation as a mediator.

6.1. Theoretical contribution

Recently, several past studies of RV theory have explored information-sharing in businesses to enrich RV literature (Dobrzykowski et al., 2015; Dyer et al., 2018; Mamonov and Triantoro, 2018; Okazaki et al., 2015). These studies emphasized

information-sharing from different perspectives: information-sharing with business partners, information-sharing and customer engagement, and information-sharing and patient satisfaction. However, few prior studies integrate RTIS with RV literature (Chang, 2010; Patnayakuni et al., 2006), and RV literature has not yet explored middle-level managers' perspectives regarding RTIS and purchase behavior, which our study explores, thereby contributing to ongoing theory building efforts on RV and ToIS using industry 4.0 technologies. As literature suggests that information is a critical resource, and sharing of information according to middle level managers is beneficial in wholesale and retail trade, food and beverages and accommodation sub-sectors of service sector. Our results suggest that RTIS with customers can play an important role in building positive purchase behavior, which is consistent with the popular view of RV, in that the effective use of business resources can build relationships and processes. We further demonstrate that RV realizes the collective RTIS with CO attribute and its impact on CPB.

Both earlier (Constant et al., 1994; Jarvenpaa and Staples, 2001; Liu et al., 2016) and more recent studies have emphasized ToIS (Evans and Weninger, 2014; Feller et al., 2017; Yang et al., 2016), but have failed to address RTIS impact from middle-level managers' perspective. Our study contributes to this literature, in that RTIS using CC enhances the CPB from this perspective. The implications of recent technological advancements—such as CC (i.e., SaaS)—in business information-sharing include enhancing business performance and positively impacting individuals' behavior. This study also provides the insight that RTIS would provide flexibility to customers to access information. Additionally, customer can perceive the quality of product/ service by the feedback of other customer. Hence, this study answers a critical question regarding

ToIS: “Why should I share information, and what is in it for me?” This study further expands ToIS knowledge by its competitor orientation toward RTIS and CPB.

6.2. Implications for practice

This study’s findings have important implications for managers and policy-makers, as business operations are meant to attract customers to spend more on their product or services. Understandably, middle-level managers have close customer relationships, and can provide a better understanding of customer behavior. Hence, our findings suggest that middle-level managers strongly believe that businesses should adopt RTIS(Cloud computing) to improve CPB. According to Theorin et al. (2016) industries are still holding doubts in implementing these CC related technologies, because of unclear possible benefits, lack of clear implementation details, and the seemingly large investments required, but these technologies provide potential benefits on adoption. Sharing of customer behavior/ feedback on cell phone app (CC) would be beneficial to attract new or potential customers. Businesses could also share routine operations information (average order fulfill time, average delivery time etc.) on cell phone app to bridge the gap(s) between customer requirements and the firm’s product offerings. Thus, businesses would benefit from investing in new technology (i.e., SaaS) in terms of customer satisfaction, and ultimately trust and value. This study finding also suggest that SaaS would offer flexibility (with the efficiency) to customers to access the information related to their future decision. The firm’s in food, beverages, and accommodation sectors can use this empirical model and insights to proactively invest in industry 4.0 technologies (CC) that would foster positive customer behavior in the downstream operations

Education level plays a major role in broadening the understanding of the middle level managers about the aspects of business. Therefore, businesses should pay attention to the attitudes of middle level managers (Spreitzer and Quinn, 1996) and use their valuable inputs in decision making. This would also serve the Malaysian government's objective, and specifically, the SMEWG's Strategic Plan for 2017–2020. Further, this study's outcomes also indicate that customers prefer to receive updated business information, such as the prior day's customer experiences in a particular geographical area, or current level of customer satisfaction in particular business. Consequently, customers can use RTIS to decide the better place to spend their money and time. With RTIS, customers can observe how a particular business will address their needs and expectations. Finally, RTIS investments can improve firm's IT-related capabilities, which is important for developing and enhancing operational dimensions as well as customer trust and value.

This research has the specific policy implications to Malaysia. Policy-makers in Malaysia should closely focus on the availability and affordability of SaaS technology for small businesses. Government might play a role to devise a standard application for specific sector/ sub-sector and provide complete solution to businesses. It would facilitate businesses to adopt the technology and maintain their standards of production and service. Additionally, one particular department (i.e. customer care department) could handle queries regarding such a technological upgrade suggestion by customer, which would attract businesses to implement this technology and ultimately benefit the common citizen. They further encourage firms to create policies and strategies to retain employees on long term basis and provide them the opportunities to improve education level. In turn these employees can serve as an effective decision makers and forecasters for enhancing business performance. Additionally, the public sector educational

institutions can encourage students to build SaaS applications as entrepreneurs, or under the umbrella of their university's commercial department for specific industry or business. Thus, students could discover a path to learning in a real-world environment. This will allow students to learn and earn, which will ultimately benefit businesses. This study also provides the ways for governments in developing, under developed countries and other stake holders to avail benefits of SaaS.

7. Conclusion

The objective of the study was to analyze middle-level managers' perceptions on real time information sharing (RTIS) with customers through SaaS technology and its impact on purchase behaviors. This study contributes to existing RTIS literature in two fold. First, it focuses on the implementation of RTIS (Malhotra, 2005), and prove that perceived benefits of RTIS leads to overall perceived purchase behavior (OPPB) measured by perceived purchase behavior (PPB) and perceived repurchase behavior mediated by customer orientation, thereby bridging a theoretical void (i.e. Sahin and Robinson, 2002) and shares potential benefits. Second, this study proposes an empirical framework that can help to understand the relationship between utilizing RTIS with CO and OPPB. Third, this study shows the importance of education of middle level managers, which enhance their ability to think differently. Fourth, we advance purchase behavior literature by creating a second-order construct, which we subsequently tested against RTIS. The results provide evidence that RTIS is an antecedent of CPB. Finally, this article provides important insights into the underlying mechanisms through which RTIS impacts OPPB by proposing CO's mediating effect, moreover, education creates difference in middle level managers' capabilities and thinking about current technology and their customers - which also provides an important basis for future studies.

7.1. Limitations and future research directions

Despite its important theoretical and practical contributions, this research has several limitations that offer important opportunities for future research. First, this study involves middle-level managers' perceptions about the implementation of RTIS through SaaS technology. Future studies may consider responses from the CEO or any higher authority regarding the implementation of RTIS through SaaS technology. Second, our study is based on two service industry sub-sectors in the "final service" category; hence, future research would benefit from subsequent studies in other "final service" category sub-sectors, such as utilities or private education and health, given that the underlying constructs can behave differently in different subsectors. Additionally, the same approach can be implemented in the immediate services (including finance and insurance, real estate and business services, information and communications, and transport and storage) and "government services" categories, and in other geographical or industry contexts. Third, although the present study's results consist of middle-level managers' perceptions, customers' responses regarding firm's RTIS adaptation could also be pivotal. Fourth, future studies can use our framework with other dependent variables, such as customer satisfaction or customer loyalty, among others, as these variables ultimately linked to purchase and repurchase behavior. Furthermore, these also show the trust and perceived value level of customers.

References

- Ahsan, K., S. Rahman. 2016. An investigation into critical service determinants of customer to business (C2B) type product returns in retail firms. *International Journal of Physical Distribution & Logistics Management*, 46(6/7), 606-633. <https://doi.org/10.1108/IJPDLM-09-2015-0235>
- Alba, J., J. Lynch, B. Weitz. C. Janiszewski. R. Lutz. A. Sawyer. S. Wood. 1997. Interactive home shopping: consumer, retailer, and manufacturer incentives to participate in electronic marketplaces. *Journal of Marketing*, 61(3), 38-53. <https://doi.org/10.2307/1251788>
- Ali, M., Y. L. Ng, C. T. Kulik 2014. Board age and gender diversity: A test of competing linear and curvilinear predictions. *Journal of Business Ethics*, 125(3), 497-512. <https://doi.org/10.1007/s10551-013-1930-9>
- Ali, O., A. Shrestha, J. Soar, S. F. Wamba. 2018. Cloud computing-enabled healthcare opportunities, issues, and applications: A systematic review. *International Journal of Information Management*, 43, 146-158. <https://doi.org/10.1016/j.ijinfomgt.2018.07.009>
- Allmendinger, G., R. Lombreglia. 2005. Four strategies for the age of smart services. *Harvard Business Review*, 83(10). Retrieved from http://www.cdrlm.com/press_releases/Harbor%20Research%20HBR%20Article%20October%202005.pdf.
- Alsetoohy, O., B. Ayoun. 2018. Intelligent agent technology: the relationships with hotel food procurement practices and performance. *Journal of Hospitality and Tourism Technology*, 9(1), 109-124. <https://doi.org/10.1108/JHTT-04-2017-0028>

- Anderson, J. C., D. W. Gerbing. 1982. Some methods for respecifying measurement models to obtain unidimensional construct measurement. *Journal of Marketing Research*, 19(4), 453-460. <https://doi.org/10.2307/3151719>
- Anderson, J. C., D. W. Gerbing. 1984. The effect of sampling error on convergence, improper solutions, and goodness-of-fit indices for maximum likelihood confirmatory factor analysis. *Psychometrika*, 49(2), 155-173. <https://doi.org/10.1007/BF02294170>
- Anderson, J. C., D. W. Gerbing. 1988. Structural equation modeling in practice: a review and recommended two-step approach. *Psychological Bulletin*, 103(3), 411-423. Retrieved from <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.540.4887&rep=rep1&type=pdf>
- Andrade, E. B., V. D. Kaltcheva, B. A. Weitz. 2002. Self-disclosure on the web: the impact of privacy policy, reward, and company reputation. *Advances in Consumer Research*, 29(1), 350-353. Retrieved from https://www.researchgate.net/publication/247481361_Self-Disclosure_on_the_Web_The_Impact_of_Privacy_Policy_Reward_and_Company_Reputation
- Applebaum, W., 1951. Studying customer behavior in retail stores. *Journal of Marketing*, 16(2), 172-178. <https://doi.org/10.2307/1247625>
- Aramand, M., 2008. Software products and services are high tech? New product development strategy for software products and services. *Technovation*, 28(3), 154-160. <https://doi.org/10.1016/j.technovation.2007.10.004>

- Armstrong, J. S., T. S. Overton. 1977. Estimating nonresponse bias in mail surveys. *Journal of Marketing Research*, 14(3), 396-402.
<https://doi.org/10.2307/3150783>
- Artto, K., K. Wikström, M. Hellström, J. Kujala. 2008. Impact of services on project business. *International Journal of Project Management*, 26(5), 497-508.
<https://doi.org/10.1016/j.ijproman.2008.05.010>
- Ascarza, E., S. A. Neslin, O. Netzer, Z. Anderson, P. S. Fader, S. Gupta, B. G. S. Hardie, A. Lemmens, B. Libai, D. Neal, F. Provost, R. Schrift. 2018. In pursuit of enhanced customer retention management: review, key issues, and future directions. *Customer Needs and Solutions*, 5(1-2), 65-81.
<https://doi.org/10.1007/s40547-017-0080-0>
- Backhouse, J., G. Dhillon. 1996. Structures of responsibility and security of information systems. *European Journal of Information Systems*, 5(1), 2-9.
<https://doi.org/10.1057/ejis.1996.7>
- Bagozzi, R. P., Y. Yi. 1989. The degree of intention formation as a moderator of the attitude-behavior relationship. *Social Psychology Quarterly*, 52(4), 266-279.
<https://doi.org/10.2307/2786991>
- Bagozzi, R. P., Y. Yi, L. W. Phillips. 1991. Assessing construct validity in organizational research. *Administrative Science Quarterly*, 36(3), 421-458. .
<https://doi.org/10.2307/2393203>
- Bardhan, I. R., H. Demirkan, P. K. Kannan, R. J. Kauffman, R. Sougstad. 2010. An interdisciplinary perspective on IT services management and service science. *Journal of Management Information Systems*, 26(4), 13-64.
<https://doi.org/10.2753/MIS0742-1222260402>

- Baron, R. M., D. A. Kenny. 1986. The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51(6), 1173-1182. <http://dx.doi.org/10.1037/0022-3514.51.6.1173>
- Bartlett, C. A., S. Ghoshal. 1996. Release the entrepreneurial hostages from your corporate hierarchy. *Strategy Leadership*, 24(2), 36-42. <https://doi.org/10.1108/eb054563>
- Beckers, S. F., J. van Doorn, P. C. Verhoef. 2018. Good, better, engaged? The effect of company-initiated customer engagement behavior on shareholder value. *Journal of the Academy of Marketing Science*, 46(3), 366-383. <https://doi.org/10.1007/s11747-017-0539-4>
- Bell, S. J., A. B. Eisingerich. 2007. The paradox of customer education: Customer expertise and loyalty in the financial services industry. *European Journal of Marketing*, 41(5/6), 466-486. <https://doi.org/10.1108/03090560710737561>
- Benlian, A., T. Hess. 2011. Opportunities and risks of software-as-a-service: findings from a survey of IT executives. *Decision Support Systems*, 52(1), 232-246. <https://doi.org/10.1016/j.dss.2011.07.007>
- Bennett, K., M. Munro, N. Gold, P. Layzell, D. Budgen, P. Brereton. 2001. An architectural model for service-based software with ultra-rapid evolution. In: IEEE Computer Society. *Proceedings of the IEEE International Conference on Software Maintenance*, pp. 292-300. <https://doi.org/10.1109/ICSM.2001.972742>
- Bigdeli, A. Z., M. M. Kamal. S. De Cesare. 2013. Electronic information sharing in local government authorities: Factors influencing the decision-making

process. *International Journal of Information Management*, 33(5), 816-830.
<https://doi.org/10.1016/j.ijinfomgt.2013.05.008>

Blut, M., C. M. Frennea, V. Mittal, D. L. Mothersbaugh. 2015. How procedural, financial and relational switching costs affect customer satisfaction, repurchase intentions, and repurchase behavior: A meta-analysis. *International Journal of Research in Marketing*, 32(2), 226-229.
<https://doi.org/10.1016/j.ijresmar.2015.01.001>

Botta, A., W. De Donato, V. Persico, A. Pescapé. 2016. Integration of cloud computing and internet of things: a survey. *Future Generation Computer Systems*, 56(C), 684-700. <https://doi.org/10.1016/j.future.2015.09.021>

Boulding, W., A. Kalra, R. Staelin, V. A. Zeithaml. 1993. A dynamic process model of service quality: from expectations to behavioral intentions. *Journal of Marketing Research*, 30(1), 7-27. <http://dx.doi.org/10.2307/3172510>

Bower, J. L., 1970. *Managing the resource allocation process*. Boston, MA: Harvard Business School Press.

Brynjolfsson, E., S. Yang 1996. Information technology and productivity: a review of the literature. *Advances in Computers*, 43, 179-214.
[https://doi.org/10.1016/S0065-2458\(08\)60644-0](https://doi.org/10.1016/S0065-2458(08)60644-0)

Brynjolfsson, E., L. M. Hitt. 2000. Beyond computation: information technology, organizational transformation and business performance. *Journal of Economic Perspectives*, 14(4), 23-48. <https://doi.org/10.1257/jep.14.4.23>

Burgelman, R. A., 1983a. Corporate entrepreneurship and strategic management: insights from a process study. *Management Science*, 29(12), 1349-1364.
<https://doi.org/10.1287/mnsc.29.12.1349>

- Burgelman, R. A., 1983b. A process model of internal corporate venturing in the diversified major firm. *Administrative Science Quarterly*, 28(2), 223-244. <https://doi.org/10.2307/2392619>
- Buttle, F., 2009. *Customer relationship management: concepts and technology*. London: Routledge.
- Buyya, R., C. S. Yeo, S. Venugopal, J. Broberg, I. Brandic. 2009. Cloud computing and emerging IT platforms: vision, hype, and reality for delivering computing as the 5th utility. *Future Generation Computer Systems*, 25(6), 599-616. <https://doi.org/10.1016/j.future.2008.12.001>
- Calle, M., P. L. González, J. M. Leon, H. Pierreval, D. Canca. 2016. Integrated management of inventory and production systems based on floating decoupling point and real-time information: a simulation based analysis. *International Journal of Production Economics*, 181(A), 48-57. <https://doi.org/10.1016/j.ijpe.2016.08.001>
- Chang, H. L., 2010. A roadmap to adopting emerging technology in e-business: an empirical study. *Information Systems and E-Business Management*, 8(2), 103-130. <https://doi.org/10.1007/s10257-009-0111-y>
- Chang, V., 2018. An overview, examples, and impacts offered by emerging services and analytics in cloud computing virtual reality. *Neural Computing and Applications*, 29(5), 1243-1256. <https://doi.org/10.1007/s00521-017-3000-1>
- Chatfield, D. C., J. G. Kim, T. P. Harrison, J. C. Hayya. 2004. The bullwhip effect—impact of stochastic lead time, information quality, and information sharing: a simulation study. *Production and Operations Management*, 13(4), 340-353. <https://doi.org/10.1111/j.1937-5956.2004.tb00222.x>

- Chen, C. A., E. M. Berman. C. Y. Wang. 2017. Middle managers' upward roles in the public sector. *Administration & Society*, 49(5), 700-729. <https://doi.org/10.1177/0095399714546326>
- Chen, F.F., K. H. Sousa. S. G. West. 2005. Teacher's corner: testing measurement invariance of second-order factor models. *Structural Equation Modeling*, 12(3), 471-492. https://doi.org/10.1207/s15328007sem1203_7
- Chen, I. J., A. Paulraj. 2004. Towards a theory of supply chain management: the constructs and measurements. *Journal of Operations Management*, 22(2), 119-150. <https://doi.org/10.1016/j.jom.2003.12.007>
- Chennamaneni, A., J. T. Teng, M. K. Raja. 2012. A unified model of knowledge sharing behaviours: theoretical development and empirical test. *Behaviour & Information Technology*, 31(11), 1097-1115.
- Chin, W. W., 1998. The partial least squares approach for structural equation modeling. In: Marcoulides, G.A., Mahwah, N.J., (Eds.). *Modern methods for business research*. Mahwah, NJ: Lawrence Erlbaum Associates, 295-336.
- Closs, D. J., X. Xu. 2000. Logistics information technology practice in manufacturing and merchandising firms—an international benchmarking study versus world class logistics firms. *International Journal of Physical Distribution & Logistics Management*, 30(10), 869-886. <https://doi.org/10.1108/09600030010351264>
- Co, H. C., B. Eddy Patuwo, M. Y. Hu. 1998. The human factor in advanced manufacturing technology adoption: an empirical analysis. *International Journal of Operations & Production Management*, 18(1), 87-106. <https://doi.org/10.1108/01443579810192925>

- Collier, N., F. Fishwick, S. W. Floyd. 2004. Managerial involvement and perceptions of strategy process. *Long Range Planning*, 37(1), 67-83.
<https://doi.org/10.1016/j.lrp.2003.11.012>
- Constant, D., S. Kiesler, L. Sproull. 1994. What's mine is ours, or is it? A study of attitudes about information sharing. *Information Systems Research*, 5(4), 400-421. <https://doi.org/10.1287/isre.5.4.400>
- Cohen, J., P. Cohen, S. G. West, L. S. Aiken. 2013. *Applied multiple regression/correlation analysis for the behavioral sciences*. New York: Routledge.
- Cohen, J., 1992. A power primer. *Psychological Bulletin*, 112(1), 155-159. Retrieved from <http://www.bwgriffin.com/workshop/Sampling%20A%20Cohen%20tables.pdf>
- Cohen, M. A., H. L. Lee. 1990. Out of touch with customer needs? Spare parts and after sales service. *MIT Sloan Management Review*, 31(2), 55-66. Retrieved from https://www.researchgate.net/profile/Morris_Cohen3/publication/215915541_Out_of_Touch_With_Customer_Needs_Spare_Parts_and_After_Sales_Service/links/54982f9a0cf2519f5a1dcac4/Out-of-Touch-With-Customer-Needs-Spare-Parts-and-After-Sales-Service.pdf
- Costa, E., A. L. Soares, J. P. de Sousa. 2016. Information, knowledge and collaboration management in the internationalisation of SMEs: a systematic literature review. *International Journal of Information Management*, 36(4), 557-569.
<https://doi.org/10.1016/j.ijinfomgt.2016.03.007>
- Davila, A., M. Gupta, R. Palmer. 2003. Moving procurement systems to the internet: The adoption and use of e-procurement technology models. *European Management Journal*, 21(1), 11-23. [https://doi.org/10.1016/S0263-2373\(02\)00155-X](https://doi.org/10.1016/S0263-2373(02)00155-X)

- Davis, D. F., S. L. Golicic, A. Marquardt. 2009. Measuring brand equity for logistics services. *The International Journal of Logistics Management*, 20(2), 201-212. <https://doi.org/10.1108/09574090910981297>
- Dawes, S. S. 1996. Interagency information sharing: Expected benefits, manageable risks. *Journal of Policy Analysis and Management*, 15(3), 377-394. [https://doi.org/10.1002/\(SICI\)1520-6688\(199622\)15:3<377::AID-PAM3>3.0.CO;2-F](https://doi.org/10.1002/(SICI)1520-6688(199622)15:3<377::AID-PAM3>3.0.CO;2-F)
- DeLone, W. H., E. R. McLean. 1992. Information systems success: The quest for the dependent variable. *Information Systems Research*, 3(1) 60-95. <https://doi.org/10.1287/isre.3.1.60>
- Devaraj, S., R. Kohli. 2003. Performance impacts of information technology: Is actual usage the missing link? *Management Science*, 49(3) 273-289. <https://doi.org/10.1287/mnsc.49.3.273.12736>
- Devaraj, S., L. Krajewski, J. C. Wei. 2007. Impact of eBusiness technologies on operational performance: the role of production information integration in the supply chain. *Journal of Operations Management*, 25(6), 1199-1216. <https://doi.org/10.1016/j.jom.2007.01.002>
- Dijkstra, T. K., J. Henseler. 2015. Consistent and asymptotically normal PLS estimators for linear structural equations. *Computational Statistics & Data Analysis*, 81(1), 10-23. <https://doi.org/10.1016/j.csda.2014.07.008>
- Dobrzykowski, D. D., S. K. Callaway, M. A. Vonderembse. 2015. Examining pathways from innovation orientation to patient satisfaction: a relational view of healthcare delivery. *Decision Sciences*, 46(5), 863-899. <https://doi.org/10.1111/dec.12161>

- Dubey, R., A. Gunasekaran, S. J. Childe, T. Papadopoulos, Z. Luo, D. Roubaud. 2017. Upstream supply chain visibility and complexity effect on focal company's sustainable performance: Indian manufacturers' perspective. *Annals of Operations Research*, 1-25. <https://doi.org/10.1007/s10479-017-2544-x>
- Dyer, J.H., H. Singh. 1998. The relational view: Cooperative strategy and sources of interorganizational competitive advantage. *Academy of Management Review*, 23(4), 660-679. <https://doi.org/10.5465/amr.1998.1255632>
- Dyer, J. H., H. Singh, W. S. Hesterly. 2018. The relational view revisited: a dynamic perspective on value creation and value capture. *Strategic Management Journal*, 1-23. <https://doi.org/10.1002/smj.2785>
- Dziekan, K., 2004. *Customer perceptions and behavioural responses to IT-based public transport information: literature review and what the experts say (No. 04-012)*, Sweden: KTH Royal Institute of Technology.
- Dziekan, K., A. Vermeulen. 2006. Psychological effects of and design preferences for real-time information displays. *Journal of Public Transportation*, 9(1), 1-19. <http://doi.org/10.5038/2375-0901.9.1.1>
- Dodds, W. B., K. B. Monroe, D. Grewal. 1991. Effects of price, brand, and store information on buyers' product evaluations. *Journal of Marketing Research*, 28(3), 307-319. <https://doi.org/10.2307/3172866>
- Edwards, J. R., L. S. Lambert. 2007. Methods for integrating moderation and mediation: a general analytical framework using moderated path analysis. *Psychological Methods*, 12(1), 1-22. <https://doi.org/10.1037/1082-989X.12.1.1>
- Evans, J. R., R. L. Laskin. 1994. The relationship marketing process: a conceptualization and application. *Industrial Marketing Management*, 23(5), 439-452. [https://doi.org/10.1016/0019-8501\(94\)90007-8](https://doi.org/10.1016/0019-8501(94)90007-8)

- Evans, K. S., Q. Weninger. 2014. Information sharing and cooperative search in fisheries. *Environmental and Resource Economics*, 58(3), 353-372. <https://doi.org/10.1007/s10640-013-9701-8>
- Fawcett, S. E., P. Osterhaus, G. M. Magnan, J. C. Brau, M. W. McCarter. 2007. Information sharing and supply chain performance: the role of connectivity and willingness. *Supply Chain Management: An International Journal*, 12(5), 358-368. <https://doi.org/10.1108/13598540710776935>
- Feller, J., R. Gleasure, S. Treacy. 2017. Information sharing and user behavior in internet-enabled peer-to-peer lending systems: an empirical study. *Journal of Information Technology*, 32(2), 127-146. <https://doi.org/10.1057/jit.2016.1>
- Fennis, B. M., M. A. Adriaanse, W. Stroebe, B. Pol. 2011. Bridging the intention-behavior gap: inducing implementation intentions through persuasive appeals. *Journal of Consumer Psychology*, 21(3), 302-311. <https://doi.org/10.1016/j.jcps.2010.12.003>
- Feeny, D. (2001). Making business sense of the e-opportunity. *MIT Sloan Management Review*, 42(2), 41-51. Retrieved from <https://search.proquest.com/docview/224968335?pq-origsite=gscholar>
- Flowerday, S., R. Von Solms. 2005. Real-time information integrity = system integrity + data integrity + continuous assurances. *Computers & Security*, 24(8), 604-613. <https://doi.org/10.1016/j.cose.2005.08.004>
- Floyd, A., 2016. Supporting academic middle managers in higher education: Do we care?. *Higher Education Policy*, 29(2), 167-183. <https://doi.org/10.1057/hep.2015.11>

- Floyd, S. W., B. Wooldridge. 1992. Middle management involvement in strategy and its association with strategic type: a research note. *Strategic Management Journal*, 13(S1), 153-167. <https://doi.org/10.1002/smj.4250131012>
- Fraga-Lamas, P., T. M. Fernández-Caramés, O. Blanco-Novoa, M. A. Vilar-Montesinos. 2018. A review on industrial augmented reality systems for the industry 4.0 shipyard. *IEEE Access*, 6, 13358-13375. <https://doi.org/10.1109/ACCESS.2018.2808326>
- Fulkerson, B., M. Shank. 2000. The new economy electronic commerce, and the rise of mass customization. In: Shaw, M., Blanning, R., Strader, R., Whinston, A. (Eds.). *Handbook on electronic commerce*. Heidelberg: Springer-Verlag Berlin Heidelberg, 411-430. https://doi.org/10.1007/978-3-642-58327-8_19
- Gatenby, M., C. Rees, C. Truss, K. Alfes, E. Soane. 2015. Managing change, or changing managers? The role of middle managers in UK public service reform. *Public Management Review*, 17(8), 1124-1145. <https://doi.org/10.1080/14719037.2014.895028>
- Gattiker, T. F., C. R. Carter. 2010. Understanding project champions' ability to gain intra-organizational commitment for environmental projects. *Journal of Operations Management*, 28(1), 72-85. <https://doi.org/10.1016/j.jom.2009.09.001>
- Ge, Y., P. Jabbari, D. MacKenzie, J. Tao. 2017. Effects of a public real-time multi-modal transportation information display on travel behavior and attitudes. *Journal of Public Transportation*, 20(2), 40-65. <http://doi.org/10.5038/2375-0901.20.2.3>
- Gewald, H., J. Dibbern. 2009. Risks and benefits of business process outsourcing: a study of transaction services in the German banking industry. *Information & Management*, 46(4), 249-257. <https://doi.org/10.1016/j.im.2009.03.002>

- Gefen, D., D. Straub, M. C. Boudreau. 2000. Structural equation modeling and regression: guidelines for research practice. *Communications of the Association for Information Systems*, 4(1), 7. Retrieved from <https://aisel.aisnet.org/cgi/viewcontent.cgi?article=2531&context=cais>
- Ghoshal, S., C. A. Bartlett. 1995. Building the entrepreneurial corporation: new organizational processes, new managerial tasks. *European Management Journal*, 13(2), 139-155. [https://doi.org/10.1016/0263-2373\(95\)00002-3](https://doi.org/10.1016/0263-2373(95)00002-3)
- Ghoshal, S., C. A. Bartlett. 1994. Linking organizational context and managerial action: The dimensions of quality of management. *Strategic Management Journal*, 15, 91-112. <https://doi.org/10.1002/smj.4250151007>
- Gloet, M., M. Terziovski. 2004. Exploring the relationship between knowledge management practices and innovation performance. *Journal of Manufacturing Technology Management*, 15(5), 402-409. <https://doi.org/10.1108/17410380410540390>
- Gnyawali, D. R., R. Madhavan. 2001. Cooperative networks and competitive dynamics: A structural embeddedness perspective. *Academy of Management Review*, 26(3), 431-445. <https://doi.org/10.5465/amr.2001.4845820>
- Godse, M., S. Mulik. 2009. An approach for selecting software-as-a-service (SaaS) product. In: *IEEE International Conference on Cloud Computing, 2009. IEEE Computer Society*, 155-158. <https://doi.org/10.1109/CLOUD.2009.74>
- Granger C. W., T. Terasvirta 1993. *Modelling non-linear economic relationships*. Oxford; Oxford University Press.
- Grotenhuis, J. W., B. W. Wiegman, P. Rietveld. 2007. The desired quality of integrated multimodal travel information in public transport: customer needs for time and

effort savings. *Transport Policy*, 14(1), 27-38.
<https://doi.org/10.1016/j.tranpol.2006.07.001>

Gustafsson, A., M. D. Johnson, I. Roos. 2005. The effects of customer satisfaction, relationship commitment dimensions, and triggers on customer retention. *Journal of Marketing*, 69(4), 210-218.
<https://doi.org/10.1509/jmkg.2005.69.4.210>

Hair, J. F., G. T. M. Hult, C. Ringle, M. Sarstedt. 2016. *A primer on partial least squares structural equation modeling (PLS-SEM)*. Thousand Oaks, California: Sage Publications.

Hair, J. F., C. M. Ringle, M. Sarstedt. 2013. Partial least squares structural equation modeling: rigorous applications, better results and higher acceptance. *Long Range Planning*, 46(1-2), 1-12. <https://doi.org/10.1108/EBR-10-2013-0128>

Hair, J. F., C. M. Ringle, M. Sarstedt. 2011. PLS-SEM: indeed a silver bullet. *Journal of Marketing Theory and Practice*, 19(2), 139-152.
<https://doi.org/10.2753/MTP1069-6679190202>

Hair, J. F., W. C. Black, B. J. Babin, R. E. Anderson. 2010. *Multivariate data analysis (7th ed.)*. Upper Saddle River, NJ: Pearson Prentice Hall.

Hambrick, D. C., P. A. Mason. 1984. Upper echelons: the organization as a reflection of its top managers. *Academy of Management Review*, 9(2), 193-206.
<https://doi.org/10.5465/amr.1984.4277628>

Hammer, M., 2004. Deep change. *Harvard Business Review*, 82(4), 84-93. Retrieved from <https://hbr.org/2004/04/deep-change-how-operational-innovation-can-transform-your-company>

- Happell, B., C. J. Gaskin, C. Platania-Phung. 2015. The construct validity of the work-related flow inventory in a sample of Australian workers. *The Journal of Psychology*, 149(1), 42-62. <https://doi.org/10.1080/00223980.2013.838539>
- Harris, L. C., K. L. Reynolds. 2003. The consequences of dysfunctional customer behavior. *Journal of Service Research*, 6(2), 144-161. <https://doi.org/10.1177/1094670503257044>
- He, Z., G. Han, T. C. E. Cheng, B. Fan, J. Dong. 2018. Evolutionary food quality and location strategies for restaurants in competitive online-to-offline food ordering and delivery markets: an agent-based approach. *International Journal of Production Economics*, in press. <https://doi.org/10.1016/j.ijpe.2018.05.008>
- Heckman, J. J., 1979. Sample selection bias as a specification error. *Econometrica: Journal of the Econometric Society*, 153-161. <https://doi.org/10.3386/w0172>
- Henseler, J., G. Hubona, P. A. Ray. 2016. Using PLS path modeling in new technology research: updated guidelines. *Industrial Management & Data Systems*, 116(1), 2-20. <https://doi.org/10.1108/IMDS-09-2015-0382>
- Henseler, J., C. M. Ringle, M. Sarstedt. 2015. A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, 43(1), 115-135. <https://doi.org/10.1007/s11747-014-0403-8>
- Henseler, J., T. K. Dijkstra, M. Sarstedt, C. M. Ringle, A. Diamantopoulos, D. W. Straub, D. J. Ketchen Jr, H. F. Hair, G. T. M. Hult, R. J. Calantone. 2014. Common beliefs and reality about PLS: comments on Rönkkö and Evermann (2013). *Organizational Research Methods*, 17(2), 182-209. <https://doi.org/10.1177/1094428114526928>

- Heide, J. B., A. S. Miner. 1992. The shadow of the future: effects of anticipated interaction and frequency of contact on buyer-seller cooperation. *Academy of Management Journal*, 35(2), 265-291. <https://doi.org/10.5465/256374>
- Hitt, L. M., E. Brynjolfsson. 1996. Productivity, business profitability, and consumer surplus: three different measures of information technology value. *MIS Quarterly*, 20(2), 121-142. <https://doi.org/10.2307/249475>
- Hoffman, D. L., T. P. Novak, P. Chatterjee. 1995. Commercial scenarios for the web: opportunities and challenges. *Journal of Computer-Mediated Communication*, 1(3). Retrieved from <https://academic.oup.com/jcmc/article/1/3/JCMC136/4584317>
- Hornsby, J. S., D. F. Kuratko, S. A. Zahra. 2002. Middle managers' perception of the internal environment for corporate entrepreneurship: Assessing a measurement scale. *Journal of Business Venturing*, 17, 49-63. [https://doi.org/10.1016/S0883-9026\(00\)00059-8](https://doi.org/10.1016/S0883-9026(00)00059-8)
- Hornsby, J. S., D. W. Naffziger, D. F. Kuratko, R. V. Montagno. 1993. An interactive model of the corporate entrepreneurship process. *Entrepreneurship Theory and Practice*, 17(2), 29-37. <https://doi.org/10.1177/104225879301700203>
- Hosmer Jr., D. W., S. Lemeshow, R. X. Sturdivant. 2013. *Applied logistic regression (Vol. 398)*. Hoboken, New Jersey: John Wiley & Sons.
- Hostler, R. E., V. Y. Yoon, T. Guimaraes. 2005. Assessing the impact of internet agent on end users' performance. *Decision Support Systems*, 41(1), 313-323. <https://doi.org/10.1016/j.dss.2004.07.002>
- Hsu, C. L., J. C. C. Lin. 2008. Acceptance of blog usage: The roles of technology acceptance, social influence and knowledge sharing motivation. *Information & Management*, 45(1), 65-74. <https://doi.org/10.1016/j.im.2007.11.001>

- Hu, H., T. Huang, Q. Zeng, S. Zhang. 2016. The role of institutional entrepreneurship in building digital ecosystem: A case study of Red Collar Group (RCG). *International Journal of Information Management*, 36(3), 496-499. <https://doi.org/10.1016/j.ijinfomgt.2015.12.004>
- Huy, Q. N., 2001. In praise of middle managers. *Harvard Business Review*, 79(8), 72-79. Retrieved from <https://hbr.org/2001/09/in-praise-of-middle-managers>
- Ireland, R. D., M. A. Hitt, R. A. Bettis, D. Porras, D. Auld. 1987. Strategy formulation processes: differences in perceptions of strength and weaknesses indicators and environmental uncertainty by managerial level. *Strategic Management Journal*, 8(5), 469-485. <https://doi.org/10.1002/smj.4250080506>
- Iyamu, T., 2013. Underpinning theories: order-of-use in information systems research. *Journal of Systems and Information Technology*, 15(3), 224-238. <https://doi.org/10.1108/JSIT-11-2012-0064>
- Jarvenpaa, S. L., D. S. Staples. 2001. Exploring perceptions of organizational ownership of information and expertise. *Journal of Management Information Systems*, 18(1), 151-183. <https://doi.org/10.1080/07421222.2001.11045673>
- Jung, J. H., C. Schneider, J. Valacich. 2010. Enhancing the motivational affordance of information systems: The effects of real-time performance feedback and goal setting in group collaboration environments. *Management Science*, 56(4), 724-742. <https://doi.org/10.1287/mnsc.1090.1129>
- Kahn, B. E., D. C. Schmittlein. 1992. The relationship between purchases made on promotion and shopping trip behavior. *Journal of Retailing*, 68(3), 294-315. Retrieved from https://www.researchgate.net/profile/Barbara_Kahn/publication/226620265

[Shopping Trip Behavior An Empirical Investigation/links/570a989108aed09e91713d9f/Shopping-Trip-Behavior-An-Empirical-Investigation.pdf](#)

- Karim, N. S. A., R. Hussein. 2008. Managers' perception of information management and the role of information and knowledge managers: The Malaysian perspectives. *International Journal of Information Management*, 28(2), 114-127. <https://doi.org/10.1016/j.ijinfomgt.2007.08.003>
- Karim, S., T. N. Carroll, C. P. Long. 2016. Delaying change: examining how industry and managerial turbulence impact structural realignment. *Academy of Management Journal*, 59(3), 791-817. <https://doi.org/10.5465/amj.2012.0409>
- Kauffman, R. J., E. A. Walden. 2001. Economics and electronic commerce: survey and directions for research. *International Journal of Electronic Commerce*, 5(4), 5-116. <https://doi.org/10.1080/10864415.2001.11044222>
- Kenny, D., J. F. Marshall. 2000. Contextual marketing. *Harvard Business Review*, 78(6), 119-25. Retrieved from <https://hbr.org/2000/11/contextual-marketing-the-real-business-of-the-internet>
- Kesner, R. M., B. Russell. 2009. Enabling business processes through information management and IT systems: the FastFit and Winter Gear distributors case studies. *Journal of Information Systems Education*, 20(4), 401-405. Retrieved from <http://jise.org/Volume20/n4/JISEv20n4p401.pdf>
- Kim, A.J., E. Ko. 2012. Do social media marketing activities enhance customer equity? An empirical study of luxury fashion brand. *Journal of Business Research*, 65(10), 1480-1486. <https://doi.org/10.1016/j.jbusres.2011.10.014>

- Kim, H. B., W. G. Kim. 2005. The relationship between brand equity and firms' performance in luxury hotels and chain restaurants. *Tourism Management*, 26(4), 549-560. <https://doi.org/10.1016/j.tourman.2004.03.010>
- Kim, M. S., J. E. Hunter. 1993. Relationships among attitudes, behavioral intentions, and behavior: A meta-analysis of past research, part 2. *Communication Research*, 20(3), 331-364. <https://doi.org/10.1177/009365093020003001>
- Klein, R., 2007. Customization and real time information access in integrated eBusiness supply chain relationships. *Journal of Operations Management*, 25(6), 1366-1381. <https://doi.org/10.1016/j.jom.2007.03.001>
- Kolekofski Jr, K. E., A. R. Heminger. 2003. Beliefs and attitudes affecting intentions to share information in an organizational setting. *Information & Management*, 40(6), 521-532. [https://doi.org/10.1016/S0378-7206\(02\)00068-X](https://doi.org/10.1016/S0378-7206(02)00068-X)
- Kraemer, K. L., J. Dedrick, S. Yamashiro. 2000. Refining and extending the business model with information technology: Dell Computer Corporation. *The Information Society: An International Journal*, 16(1), 5-21. <https://doi.org/10.1080/019722400128293>
- Kryftis, Y., G. Mastorakis, C. X. Mavromoustakis, J. M. Batalla, E. Pallis, G. Kormentzas, G. 2016. Efficient entertainment services provision over a novel network architecture. *IEEE Wireless Communications*, 23(1), 14-21. <https://doi.org/10.1109/MWC.2016.7422401>
- Kuratko, D. F., R. D. Ireland, J. G. Covin, J. S. Hornsby. 2005. A model of middle-level managers' entrepreneurial behavior. *Entrepreneurship Theory and Practice*, 29(6), 699-716. <https://doi.org/10.1111/j.1540-6520.2005.00104.x>

- Langmead, B., A. Nellore. 2018. Cloud computing for genomic data analysis and collaboration. *Nature Reviews Genetics*, 19(4), 208-2019. <https://doi.org/10.1038/nrg.2017.113>
- Lawshe, C. H., 1975. A quantitative approach to content validity. *Personnel Psychology*, 28(4), 563-575. <http://dx.doi.org/10.1111/j.1744-6570.1975.tb01393.x>
- Lederer, A. L., D. A. Mirchandani, K. Sims. 2001. The search for strategic advantage from the world wide web. *International Journal of Electronic Commerce*, 5(4), 117-133. <https://doi.org/10.1080/10864415.2001.11044223>
- Lee, H. L., S. Whang. 2000. Information sharing in a supply chain. *International Journal of Manufacturing Technology and Management*, 1(1), 79-93. <https://doi.org/10.1504/IJMTM.2000.001329>
- Lee, M. K., C. M. Cheung, K. H. Lim, C. L. Sia. 2006. Understanding customer knowledge sharing in web-based discussion boards: An exploratory study. *Internet Research*, 16(3), 289-303. <https://doi.org/10.1108/10662240610673709>
- Leonard-Barton, D., 1992. Core capabilities and core rigidities: A paradox in managing new product development. *Strategic Management Journal*, 13(S1), 111-125. <https://doi.org/10.1002/smj.4250131009>
- Li, P. Y., 2018. Top management team characteristics and firm internationalization: The moderating role of the size of middle managers. *International Business Review*, 27(1), 125-138. <https://doi.org/10.1016/j.ibusrev.2017.05.011>
- Liao, Y., F. Deschamps, E. D. F. R., Loures, L. F. P., Ramos. 2017. Past, present and future of Industry 4.0-a systematic literature review and research agenda

proposal. *International Journal of Production Research*, 55(12), 3609-3629.
<https://doi.org/10.1080/00207543.2017.1308576>

Lian, J. W. 2015. Critical factors for cloud based e-invoice service adoption in Taiwan: An empirical study. *International Journal of Information Management*, 35(1), 98-109. <https://doi.org/10.1016/j.ijinfomgt.2014.10.005>

Lindell, M. K., D. J. Whitney. 2001. Accounting for common method variance in cross-sectional research designs. *Journal of Applied Psychology*, 86(1), 114-121.
<http://dx.doi.org/10.1037/0021-9010.86.1.114>

Liu, L., C. M. Cheung, M. K. Lee. 2016. An empirical investigation of information sharing behavior on social commerce sites. *International Journal of Information Management*, 36(5), 686-699. <https://doi.org/10.1016/j.ijinfomgt.2016.03.013>

Loh, L., N. Venkatraman. 1992. Determinants of information technology outsourcing: a cross-sectional analysis. *Journal of Management Information Systems*, 9(1), 7-24.
<https://doi.org/10.1080/07421222.1992.11517945>

Lowry, P. B., J. Gaskin. 2014. Partial least squares (PLS) structural equation modeling (SEM) for building and testing behavioral causal theory: When to choose it and how to use it. *IEEE Transactions on Professional Communication*, 57(2), 123-146.
<https://doi.org/10.1109/TPC.2014.2312452>

MacKenzie, S. B., R. J. Lutz. 1989. An empirical examination of the structural antecedents of attitude toward the ad in an advertising pretesting context. *Journal of Marketing*, 53(2), 48-65. <https://doi.org/10.2307/1251413>

Macintosh, G., L. S. Lockshin. 1997. Retail relationships and store loyalty: a multi-level perspective. *International Journal of Research in Marketing*, 14(5), 487-497.
[https://doi.org/10.1016/S0167-8116\(97\)00030-X](https://doi.org/10.1016/S0167-8116(97)00030-X)

- Mägi, A.W., 2003. Share of wallet in retailing: the effects of customer satisfaction, loyalty cards and shopper characteristics. *Journal of Retailing*, 79(2), 97-106. [https://doi.org/10.1016/S0022-4359\(03\)00008-3](https://doi.org/10.1016/S0022-4359(03)00008-3)
- Mahmassani, H. S., R. Jayakrishnan. 1991. System performance and user response under real-time information in a congested traffic corridor. *Transportation Research Part A: General*, 25(5), 293-307. [https://doi.org/10.1016/0191-2607\(91\)90145-G](https://doi.org/10.1016/0191-2607(91)90145-G)
- Maiga, A. S., A. Nilsson, C. Ax. 2015. Relationships between internal and external information systems integration, cost and quality performance, and firm profitability. *International Journal of Production Economics*, 169, 422-434. <https://doi.org/10.1016/j.ijpe.2015.08.030>
- Mair, J., C. Thurner. 2008. Going global: how middle managers approach the process in medium-sized firms. *Strategic Change*, 17(3-4), 83-99. <https://doi.org/10.1002/jsc.818>
- Malhotra, Y., 2005. Integrating knowledge management technologies in organizational business processes: getting real time enterprises to deliver real business performance. *Journal of Knowledge Management*, 9(1), 7-28. <https://doi.org/10.1108/13673270510582938>
- Mamonov, S., T. M. Triantoro. 2018. The strategic value of data resources in emergent industries. *International Journal of Information Management*, 39, 146-155. <https://doi.org/10.1016/j.ijinfomgt.2017.12.004>
- Mangina, E., I. P. Vlachos. 2005. The changing role of information technology in food and beverage logistics management: beverage network optimisation using intelligent agent technology. *Journal of Food Engineering*, 70(3), 403-420. <https://doi.org/10.1016/j.jfoodeng.2004.02.044>

- Mathe, H., R. D. Shapiro. 1993. *Service and strategic direction*. Cergy: CERESSEC.
- Mathieu, V., 2001. Service strategies within the manufacturing sector: benefits, costs and partnership. *International Journal of Service Industry Management*, 12(5), 451-475. <https://doi.org/10.1108/EUM00000000006093>
- McEvily, B., A. Marcus. 2005. Embedded ties and the acquisition of competitive capabilities. *Strategic Management Journal*, 26(11), 1033-1055. <https://doi.org/10.1002/smj.484>
- McLeay, F., A. Robson, M. Yusoff. 2017. New applications for importance-performance analysis (IPA) in higher education: Understanding student satisfaction. *Journal of Management Development*, 36(6), 780-800. <https://doi.org/10.1108/JMD-10-2016-0187>
- Meier, H., W. Massberg. 2004. Life cycle-based service design for innovative business models. *CIRP Annals-Manufacturing Technology*, 53(1), 393-396. [https://doi.org/10.1016/S0007-8506\(07\)60724-0](https://doi.org/10.1016/S0007-8506(07)60724-0)
- Mellat-Parast, M., L. A. Digman. 2008. Learning: the interface of quality management and strategic alliances. *International Journal of Production Economics*, 114(2), 820-829. <https://doi.org/10.1016/j.ijpe.2008.04.003>
- Meyer-Waarden, L., C. Benavent. 2009. Grocery retail loyalty program effects: self-selection or purchase behavior change? *Journal of the Academy of Marketing Science*, 37(3), 345-358. <https://doi.org/10.1007/s11747-008-0123-z>
- Ministry of Finance Malaysia 2017. *Economic performance and prospects (chapter 3)*. 2018 Economic Report. Retrieved from <http://www.treasury.gov.my/pdf/economy/er/1718/chapter3.pdf>
- Mittal, V., W. A. Kamakura. 2001. Satisfaction, repurchase intent, and repurchase behavior: investigating the moderating effect of customer characteristics. *Journal*

of *Marketing Research*, 38(1), 131-142.
<https://doi.org/10.1509/jmkr.38.1.131.18832>

Moss, G., 2017. *Gender, design and marketing: How gender drives our perception of design and marketing*. London: Routledge.

Mukhopadhyay, T., S. Kekre. 2002. Strategic and operational benefits of electronic integration in B2B procurement processes. *Management Science*, 48(10), 1301-1313. <https://doi.org/10.1287/mnsc.48.10.1301.273>

Müller, J. M., O. Buliga, K. L. Voigt. 2018. Fortune favors the prepared: How SMEs approach business model innovations in Industry 4.0. *Technological Forecasting and Social Change*, 132, 2-17. <https://doi.org/10.1016/j.techfore.2017.12.019>

Narver, J. C., S. F. Slater. 1990. The effect of a market orientation on business profitability. *Journal of Marketing*, 54(4), 20-35.
<https://doi.org/10.2307/1251757>

Newberry, C. R., B. R. Klemz, C. Boshoff. 2003. Managerial implications of predicting purchase behavior from purchase intentions: A retail patronage case study. *Journal of Services Marketing*, 17(6), 609-620.
<https://doi.org/10.1108/08876040310495636>

Nunnally, J. C., I. H. Bernstein. 1994. *Psychometric theory (3rd ed.)*. New York: McGraw-Hill.

Okazaki, S., A. M. Diaz-Martín, M. Rozano, H. D. Menéndez-Benito. 2015. Using Twitter to engage with customers: A data mining approach. *Internet Research*, 25(3), 416-434. <https://doi.org/10.1108/IntR-11-2013-0249>

Olsson, O. V., H. Aronsson, E. Sandberg. 2017. Middle management involvement in handling variable patient flows. *Management Research Review*, 40(9), 1007-1024.
<https://doi.org/10.1108/MRR-05-2016-0114>

- Özer, Ö., U. Subramanian. Y. Wang 2017. Information sharing, advice provision, or delegation: what leads to higher trust and trustworthiness?. *Management Science*, 64(1), 474-493. <https://doi.org/10.1287/mnsc.2016.2617>
- Parasuraman, A., V. A. Zeithaml, A. Malhotra. 2005. ES-QUAL: a multiple-item scale for assessing electronic service quality. *Journal of Service Research*, 7(3), 213-233. <https://doi.org/10.1177/1094670504271156>
- Parasuraman, A., L. L. Berry, V. A. Zeithaml 1991. Refinement and reassessment of the SERVQUAL scale. *Journal of Retailing*, 67(4), 420-450. <https://doi.org/10.1111/j.1438-8677.2010.00335.x>
- Park, C. H., Y. G. Kim. 2003. Identifying key factors affecting consumer purchase behavior in an online shopping context. *International Journal of Retail & Distribution Management*, 31(1), 16-29. <https://doi.org/10.1108/09590550310457818>
- Patnayakuni, R., A. Rai. N. Seth. 2006. Relational antecedents of information flow integration for supply chain coordination. *Journal of Management Information Systems*, 23(1), 13-49. <https://doi.org/10.2753/MIS0742-1222230101>
- Pedone, G., I. Mezgár. 2018. Model similarity evidence and interoperability affinity in cloud-ready Industry 4.0 technologies. *Computers in Industry*, 100, 278-286. <https://doi.org/10.1016/j.compind.2018.05.003>
- Peter, J. P., J. C. Olson, K. G. Grunert. 1999. *Consumer behaviour and marketing strategy*. London: McGraw-Hill.
- Petersen, J. A., V. Kumar, Y. Polo, F. J. Sese. 2018. Unlocking the power of marketing: Understanding the links between customer mindset metrics, behavior, and

profitability. *Journal of the Academy of Marketing Science*, 46(5), 813-836.
<https://doi.org/10.1007/s11747-017-0554-5>

Pettigrew, A. M. 1972. Information control as a power resource. *Sociology*, 6(2), 187-204. <https://doi.org/10.1177/003803857200600202>

Pfeffer, J., G. R. Salancik. 1978. *The external control of organizations: a resource dependence approach*. New York: Harper and Row Publishers.

Poddar, A., N. Donthu. Y. Wei. 2009. Web site customer orientations, web site quality, and purchase intentions: the role of web site personality. *Journal of Business Research*, 62(4), 441-450. <https://doi.org/10.1016/j.jbusres.2008.01.036>

Podsakoff, P. M., D. W. Organ. 1986. Self-reports in organizational research: Problems and prospects. *Journal of Management*, 12(4), 531-544.
<https://doi.org/10.1177/014920638601200408>

Podsakoff, P. M., S. B. MacKenzie, J. Y. Lee, N. P. Podsakoff. 2003. Common method biases in behavioral research: a critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88(5), 879-903.
<https://doi.org/10.1037/0021-9010.88.5.879>

Popović, A., R. Hackney, P. S. Coelho. J. Jaklič. 2014. How information-sharing values influence the use of information systems: an investigation in the business intelligence systems context. *The Journal of Strategic Information Systems*, 23(4), 270-283. <https://doi.org/10.1016/j.jsis.2014.08.003>

Prahalad, C., K. G. Hamel. 2006. The core competence of the corporation. In Hahn, D. & Taylor, B. (eds.), *Strategische Unternehmensplanung - Strategische Unternehmensführung. Stand und Entwicklungstendenzen*. Berlin, Heidelberg; Springer, pp. 275-292. https://doi.org/10.1007/3-540-30763-X_14

- Preece, J., 2001. Sociability and usability in online communities: determining and measuring success. *Behaviour & Information Technology*, 20(5), 347-356. <https://doi.org/10.1080/01449290110084683>
- Quinn, J. B., 1985. Managing innovation: controlled chaos. *Harvard Business Review*, 63(3), 73-84. Retrieved from <https://hbr.org/1985/05/managing-innovation-controlled-chaos>
- Rafique, M., S. Hameed, M. H. Agha. 2018. Commonality, conflict, and absorptive capacity: clarifying middle manager roles in the pharmaceutical industry. *Management Decision*. Retrieved from <https://www.emeraldinsight.com/doi/full/10.1108/MD-11-2017-1086>
- Raguseo, E. (2018). Big data technologies: An empirical investigation on their adoption, benefits and risks for companies. *International Journal of Information Management*, 38(1), 187-195. <https://doi.org/10.1016/j.ijinfomgt.2017.07.008>
- Ravichandran, T., C. Lertwongsatien, C. Lertwongsatien. 2005. Effect of information systems resources and capabilities on firm performance: a resource-based perspective. *Journal of Management Information Systems*, 21(4), 237-276. <https://doi.org/10.1080/07421222.2005.11045820>
- Reichheld, F. F., P. Schefter. 2000. E-loyalty: your secret weapon on the web. *Harvard Business Review*, 78(4), 105-113. Retrieved from <https://hbr.org/2000/07/e-loyalty-your-secret-weapon-on-the-web>
- Riggins, F. J., 1999. A framework for identifying web-based electronic commerce opportunities. *Journal of Organizational Computing and Electronic Commerce*, 9(4), 297-310. https://doi.org/10.1207/S153277440904_4

- Sahin, F., E. P. Robinson. 2002. Flow coordination and information sharing in supply chains: review, implications, and directions for future research. *Decision Sciences*, 33(4), 505-536. <https://doi.org/10.1111/j.1540-5915.2002.tb01654.x>
- Sawhney, M., J. Zabin. 2002. Managing and measuring relational equity in the network economy. *Journal of the Academy of Marketing Science*, 30(4), 313-332. <https://doi.org/10.1177/009207002236908>
- Seidmann, A., A. Sundararajan. 1998. Sharing logistics information across organizations: technology, competition and contracting. In: Kemerer, C. F., (Ed.). *Information technology and industrial competitiveness*. Boston, MA: Springer, 107-136.
- Shahrbabaki, M. R., A. A. Safavi, M. Papageorgiou, I. Papamichail. 2018. A data fusion approach for real-time traffic state estimation in urban signalized links. *Transportation Research Part C: Emerging Technologies*, 92, 525-548. <https://doi.org/10.1016/j.trc.2018.05.020>
- Shank, M.E., C. P. Zeithmlal, R. S. Blackburn, A. C. Boyton 1988. Predictors of top management team environmental perception accuracy: a model and propositions. In: *Academy of management proceedings (Vol. 1988, No. 1)*. Briarcliff Manor, NY: Academy of Management, 37-41. <https://doi.org/10.5465/ambpp.1988.4979645>
- Shi, S., Y. Cao, Y. Chen, W. S. Chow. 2019. How social media brand pages contribute to functional conflict: The central role of commitment. *International Journal of Information Management*, 45, 95-106. <https://doi.org/10.1016/j.ijinfomgt.2018.11.007>
- Sireci, S. G., 1998. The construct of content validity. *Social indicators research*, 45(1-3), 83-117. <https://doi.org/10.1023/A:1006985528729>

- Skarlicki, D. P., R. Folger. 1997. Retaliation in the workplace: The roles of distributive, procedural, and interactional justice. *Journal of Applied Psychology*, 82(3), 434-443. <http://dx.doi.org/10.1037/0021-9010.82.3.434>
- Slater, S. F., J. C. Narver. 1998. Customer-led and market-oriented: let's not confuse the two. *Strategic Management Journal*, 19(10), 1001-1006. [https://doi.org/10.1002/\(SICI\)1097-0266\(199810\)19:10<1001::AID-SMJ996>3.0.CO;2-4](https://doi.org/10.1002/(SICI)1097-0266(199810)19:10<1001::AID-SMJ996>3.0.CO;2-4)
- SMECorp Malaysia 2015. *New Definition of SMEs* retrieved from <http://www.smecorp.gov.my/index.php/en/resources/2015-12-21-11-03-46/entrepre-news/162-entrepre-news/tahun-2013/328-new-definition-of-smes-an-additional-8-120-establishments-set-to-be-classified-as-smes-bringing-the-share-of-smes-to-total-establishments-from-97-3-to-98-5>SMECorp Malaysia 2017. *SME developments and outlook*.
- Smith, A. K., R. N. Bolton. 1998. An experimental investigation of customer reactions to service failure and recovery encounters: paradox or peril? *Journal of Service Research*, 1(1), 65-81. <https://doi.org/10.1177/109467059800100106>
- Spreitzer, G. M., R. E. Quinn. 1996. Empowering middle managers to be transformational leaders. *The Journal of Applied Behavioral Science*, 32(3), 237-261. <https://doi.org/10.1177/0021886396323001>
- Starbuck, W., A. Greven, B. L. T. Hedberg. 1978. Responding to crises. *Journal of Business Administration*, 9, 111-137. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2708264

- Stevens, J. M., J. M., Beyer, H. M. Trice. 1978. Assessing personal, role, and organizational predictors of managerial commitment. *Academy of Management Journal*, 21(3), 380-396. <https://doi.org/10.5465/255721>
- Steward, M. D., J. A. Narus, M. L. Roehm. 2018. An exploratory study of business-to-business online customer reviews: external online professional communities and internal vendor scorecards. *Journal of the Academy of Marketing Science*, 46(2), 173-189. <https://doi.org/10.1007/s11747-017-0556-3>
- Sweeney, J. C., G. N. Soutar. 2001. Consumer perceived value: the development of a multiple item scale. *Journal of Retailing*, 77(2), 203-220. [https://doi.org/10.1016/S0022-4359\(01\)00041-0](https://doi.org/10.1016/S0022-4359(01)00041-0)
- Syaekhoni, M. A., G. Alfian, Y. S. Kwon. 2017. Customer purchasing behavior analysis as alternatives for supporting in-store green marketing decision-making. *Sustainability*, 9(11), 2008. <https://doi.org/10.3390/su9112008>
- Teece, D. J., 1986. Profiting from technological innovation: implications for integration, collaboration, licensing and public policy. *Research Policy*, 15(6), 285-305. [https://doi.org/10.1016/0048-7333\(86\)90027-2](https://doi.org/10.1016/0048-7333(86)90027-2)
- Tien, J. M., 2003. Toward a decision informatics paradigm: a real-time, information-based approach to decision making. *IEEE Transactions on Systems, Man, and Cybernetics, Part C (Applications and Reviews)*, 33(1), 102-113. <https://doi.org/10.1109/TSMCC.2003.809345>
- Turner, M., D. Budgen, P. Brereton. 2003. Turning software into a service. *Computer*, 36(10), 38-44. <http://dx.doi.org/10.1109/MC.2003.1236470>
- Ulmer, M. W., L. Heilig, S. Voß. 2017. On the value and challenge of real-time information in dynamic dispatching of service vehicles. *Business & Information*

Systems Engineering, 59(3), 161-171. <https://doi.org/10.1007/s12599-017-0468-2>

Unger, H., F. Börner, E. Müller. 2017. Context related information provision in Industry 4.0 environments. *Procedia Manufacturing*, 11, 796-805. <https://doi.org/10.1016/j.promfg.2017.07.181>

Uzzi, B., 1997. Social structure and competition in interfirm networks: the paradox of embeddedness. *Administrative Science Quarterly*, 42(1), 35-67. <https://doi.org/10.2307/2393808>

Van Rensburg, M. J., A. Davis, P. Venter. 2014. Making strategy work: The role of the middle manager. *Journal of Management & Organization*, 20(2), 165-186. <https://doi.org/10.1017/jmo.2014.33>

Vasarhelyi, M., M. Greenstein. 2003. Underlying principles of the electronization of business: A research agenda. *International Journal of Accounting Information Systems*, 4(1), 1-25. [https://doi.org/10.1016/S1467-0895\(03\)00002-2](https://doi.org/10.1016/S1467-0895(03)00002-2)

Venkatesh, V., R. Agarwal. 2006. Turning visitors into customers: A usability-centric perspective on purchase behavior in electronic channels. *Management Science*, 52(3), 367-382. <https://doi.org/10.1287/mnsc.1050.0442>

Viswanathan, M., J. A. Rosa, J. E. Harris. 2005. Decision making and coping of functionally illiterate consumers and some implications for marketing management. *Journal of Marketing*, 69(1), 15-31. <https://doi.org/10.1509/jmkg.69.1.15.55507>

Wang, C., Z. Zhou, X. L. Jin, Y. Fang, M. K. Lee. 2017. The influence of affective cues on positive emotion in predicting instant information sharing on microblogs: gender as a moderator. *Information Processing & Management*, 53(3), 721-734. <https://doi.org/10.1016/j.ipm.2017.02.003>

- Wang, S., J. Wan, D. Zhang, D. Li, C. Zhang. 2016. Towards smart factory for industry 4.0: a self-organized multi-agent system with big data based feedback and coordination. *Computer Networks*, 101, 158-168. <https://doi.org/10.1016/j.comnet.2015.12.017>
- Wang, Y. S., M. C. Wu. H. Y. Wang. 2009. Investigating the determinants and age and gender differences in the acceptance of mobile learning. *British Journal of Educational Technology*, 40(1), 92-118. <https://doi.org/10.1111/j.1467-8535.2007.00809.x>
- Ware, C., 2012. *Information visualization: perception for design*. San Francisco, California: Morgan Kaufmann Publishers Inc.
- Weenig, M. W., C. J. Midden. 1991. Communication network influences on information diffusion and persuasion. *Journal of Personality and Social Psychology*, 61(5), 734-742. <http://dx.doi.org/10.1037/0022-3514.61.5.734>
- Weiss, M., C. Wittmann. 2018. Objective environmental conditions and perceived environmental uncertainty: cognitive models as explanation for a perceptual gap. *Journal of Accounting & Organizational Change*, 14(1), 33-60. <https://doi.org/10.1108/JAOC-11-2016-0079>
- Wieland, A., C. M. Wallenburg. 2013. The influence of relational competencies on supply chain resilience: a relational view. *International Journal of Physical Distribution & Logistics Management*, 43(4), 300-320. <https://doi.org/10.1108/IJPDLM-08-2012-0243>
- Williams, T. 2007. Empowerment of whom and for what? Financial literacy education and the new regulation of consumer financial services. *Law & Policy*, 29(2), 226-256. <https://doi.org/10.1111/j.1467-9930.2007.00254.x>
- Wise, R., P. Baumgartner. 1999. Go downstream: the new profit imperative in manufacturing. *Harvard Business Review*, 7,133-141. Retrieved from

<https://hbr.org/1999/09/go-downstream-the-new-profit-imperative-in-manufacturing>

- Wohl, A., 2010. Software as a service (SaaS). In: Simon, P., (Ed.). *The next wave of technologies: opportunities from chaos*. New York: John Wiley & Sons, Inc., 97-113.
- Wong, C. W., C. Y. Wong. S. Boon-Itt. 2013. The combined effects of internal and external supply chain integration on product innovation. *International Journal of Production Economics*, 146(2), 566-574.
<https://doi.org/10.1016/j.ijpe.2013.08.004>
- Wu, Z., L. Tian, P. Li, T. Wu, M. Jiang, C. Wu. 2018. Generating stable biometric keys for flexible cloud computing authentication using finger vein. *Information Sciences*, 433, 431-447. <https://doi.org/10.1016/j.ins.2016.12.048>
- Yang, X., X. Zhang, K. P. Gallagher. 2016. The moderating effect of online community affiliation and information value on satisfaction with online travel communities in China. *Journal of Global Information Technology Management*, 19(3), 190-208.
<https://doi.org/10.1080/1097198X.2016.1217136>
- Yasai-Ardekani, M., 1986. Structural adaptations to environments. *Academy of Management Review*, 11(1), 9-21. <https://doi.org/10.5465/amr.1986.4282607>
- Yoon, S., 2002. The antecedents and consequences of trust in online-purchase decisions. *Journal of Interactive Marketing*, 6(2), 47-63.
<https://doi.org/10.1002/dir.10008>
- Young, I. P., J. Rinehart, H. G. Heneman. 1993. Effects of job attribute categories, applicant job experience, and recruiter sex on applicant job attractiveness ratings. *Journal of Personnel Evaluation in Education*, 7(1), 55-66.
<https://doi.org/10.1007/BF00972349>

- Zaheer, N., P. Trkman. 2017. An information sharing theory perspective on willingness to share information in supply chains. *The International Journal of Logistics Management*, 28(2), 417-443. <https://doi.org/10.1108/IJLM-09-2015-0158>
- Zeller, R. A., E. G. Carmines. 1980. *Measurement in the Social Sciences: The link between theory and data*. Cambridge, UK: Cambridge University Press.
- Zhang, H., L. Zhao, S. Gupta. 2018. The role of online product recommendations on customer decision making and loyalty in social shopping communities. *International Journal of Information Management*, 38(1), 150-166. <https://doi.org/10.1016/j.ijinfomgt.2017.07.006>
- Zhang, M., L. Guo, M. Hu, W. Liu. 2017. Influence of customer engagement with company social networks on stickiness: Mediating effect of customer value creation. *International Journal of Information Management*, 37(3), 229-240. <https://doi.org/10.1016/j.ijinfomgt.2016.04.010>
- Zhang, Y., Y. Fang, K. K. Wei, E. Ramsey, P. McCole, H. Chen. 2011. Repurchase intention in B2C e-commerce—A relationship quality perspective. *Information & Management*, 48(6), 192-200. <https://doi.org/10.1016/j.im.2011.05.003>
- Zhang, Y., G. Zhang, J. Wang, S. Sun, S. Si, T. Yang. 2015. Real-time information capturing and integration framework of the internet of manufacturing things. *International Journal of Computer Integrated Manufacturing*, 28(8), 811-822. <https://doi.org/10.1080/0951192X.2014.900874>
- Zhu, K., K. Kraemer, S. Xu. 2003. Electronic business adoption by European firms: a cross-country assessment of the facilitators and inhibitors. *European Journal of Information Systems*, 12(4), 251-268. <https://doi.org/10.1057/palgrave.ejis.3000475>