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Assessing the Impacts of Crowdsourcing in Logistics and Supply Chain Operations

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Assessing the Impacts of Crowdsourcing in Logistics and Supply Chain Operations

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Abstract

Crowdsourcing models, whereby firms start to delegate supply chain operations activities to a mass of actors in the marketplace, have grown drastically in recent years. 85% of the top global brands have reported to use crowdsourcing in the last ten year with top names such as Procter & Gamble, Unilever, and Nestle. These emergent business models, however, have remained unexplored in extant SCM literature. Drawing on various theoretical underpinnings, this dissertation aims to investigate and develop a holistic understanding of the importance and impacts of crowdsourcing in SCM from multiple perspectives.

Three individual studies implementing a range of methodological approaches (archival data, netnography, and field and scenario-based experiments) are conducted to examine potential impacts of crowdsourcing in different supply chain processes from the customer's, the crowdsourcing firm's, and the supply chain partner's perspectives. Essay 1 employs a mixed method approach to investigate "how, when, and why" crowdsourced delivery may affect customer satisfaction and behavioral intention in online retailing. Essay 2 uses a field experiment to address how the framing of motivation messages could enhance crowdsourced agents' participation and performance level in crowdsourced inventory audit tasks. Lastly, Essay 3 explores the impact of crowdsourcing activities by the manufacturers on the relationship dynamics within the manufacturer-consumers-retailer triads.

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I. Introduction

Supply chain collaboration, which emphasizes the process of two or more firms working jointly to achieve mutual benefits (Mentzer et al., 2001), has become a critical concept in supply chain literature in the past decades (Cao and Zhang, 2012). Through this collaborative mechanism, firms gain access and control of valuable resources and capabilities by either developing internally or engaging in collaboration with external partners (Cook, 1977; Galaskiewicz, 1985). Supply chain collaboration has been shown to lead to a wide range of potential outcomes for firms, ultimately enhancing firm performance (Leuschner et al., 2013).

Recent changes in the business environment and technological advancement (e.g. Web 2.0, mobile applications) have increasingly enabled individual consumers in the marketplace to participate in a wide range of business activities (Kohler et al., 2011). The term "consumers" has been used in the literature to refer to people who use a product or service in opposition to producers, which are defined as entities that make or supply products or services for sale (Humphreys and Greyson, 2008). However, the distinctions between consumers and producers and between customers and employees have been said to be blurring over time (Tapscott and William, 2006). For example, Brudney and England (1983) distinguished between "regular producers", or people who do their work as professionals, and "consumer production", i.e. voluntary efforts of individuals or groups to enhance the quality and/or quantity of services. Increasingly, individuals who have traditionally been defined as "consumers" are producing exchange value for companies (Prahalad and Ramaswamy, 2000; Ramirez, 1999; Vargo and Lusch, 2004). For example, consumers submit new ideas for the firms (e.g. P&G Quirky), and develop new products for firms (e.g. Threadless.com) (Walker, 2007; Ta et al., 2015). In

capturing this new change in the development of consumers, *consumers herein are defined broadly as independent individuals in the consumer marketplace*

These examples reflect the new role of consumers, which as Lusch et al. (2007, p.6) remarked, "product users do not just add value at the end of the process, they are an "operant resource" for the firm, "a collaborative partner who co-creates value with the firm". In capturing the notion of consumers as "resources for the firm" and the new role of consumers as active participants in firms' supply chain processes, Ta et al. (2015) has introduced the concept of business-to-consumer (B2C) collaboration, which refers to "*the involvement of individuals in the consumer marketplace in supply chain management and execution activities in the creation of exchange value for companies*".

The involvement of a network of individuals in the marketplace has recently grown beyond marketing and new product development activities such as video content and product ideas, and into other supply chain processes such as demand management, or order fulfillment management (Ta et al., 2015). This is exemplified by the rise of companies and services such as UberRush, AmazonFlex, Deliv, and Postmates, which utilize individuals to deliver products and packages for others. In another example, other companies such as Field Agent, Gigwalk, and WeGolook, have relied on a large network of individuals on the marketplace to perform shelf-auditing tasks or supplier compliance tasks traditionally done by firms' employees. These individuals, however, may not be firms' "consumers" in the traditional sense as direct users of firms' offerings and thus may be better captured by the term "crowd", which denotes "a general collection of people that can be targeted by firms" (Prpic et al., 2015, p.78).

In this dissertation, the term "B2C collaboration", in its broadest meaning, refers to "*the involvement of a network of independent individuals in the marketplace in supply chain*

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management and execution activities in the creation of exchange value for companies". B2C collaboration herein encompasses both a network of "consumers" in its traditional sense and a network of external individuals ("crowd") in the marketplace. Figure 1 depicts the overall concept of B2C collaboration.

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                    │    B2C Collaboration    │
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     │  Business-to-Consumer     │   │    Business-to-Crowd      │
     │  users of firms' offerings │   │ non-users of firms' offerings │
     └──────────────────────────┘   └──────────────────────────┘
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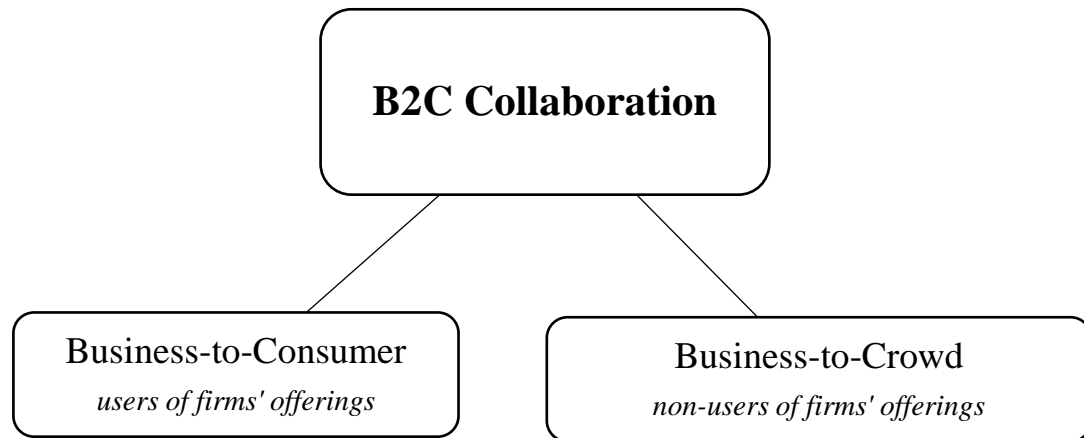
Figure 1. B2C collaboration

Theoretical foundation

From a theoretical perspective, the relational view (RV) (Dyer and Singh, 1998) is one of the widely used lenses to explore resources as sources of firm's competitive advantage (Newbert, 2007). The relational view (RV) postulates that firms' resources are not only vested within a firm, but also embedded in inter-firm linkages or alliances (Dyer and Singh, 1998). Therefore, in lieu of an internal focus, firms are better off collaborating to jointly utilize the resources spanning across firm boundaries. Such an inter-firm alliance has the potential to generate relational rents, which refer to the jointly generated supernormal profit, for a firm in addition to internal rents derived from a firm's own resources (Lavie, 2006). In other words, an alliance

partner can be considered a co-producer and co-creator of value for the firm. The RV further elaborates four mechanisms that firms can generate relational rent through external collaboration. They include relation-specific assets, knowledge-sharing routines, complementary resources and capabilities, and effective governance (Dyer and Singh, 1998).

In extending the relational view of firm resources, this research argues that firm resources not only span across firm boundaries but also reside within the consumer marketplace. Herein, a resource, in its broadest sense, is defined in strategic management literature as strengths that firms can use to conceive of and implement their strategies (Porter, 1981; Barney, 1991). The notion of consumers as a resource is not new. Literature has regarded consumer loyalty, consumer goodwill as competitive advantages of a firm (Farquhar, 1989; Aarker, 2009). In the management literature the most thoroughly documented role of consumer as resources has been that of supplying information and wealth to firms (Lengnick-Hall, 1996).

However, as discussed earlier, radical changes in technology and the rise of a new generation of active consumers have changed the role of individuals in the consumer marketplace. Consumers are not only passive static resources for the firm; they transform into an actor within a firm's network with influential collective power and resources (Nambisan, 2002). The inclusion of consumers and crowd as collaborative partners in firms' network, as captured in the concept of B2C collaboration, thus expands the argument of RV to beyond firms' level and firms' boundaries.

Drawing on the theoretical tenets of RV, but extending the boundary of the theory beyond firms' boundaries and building on the concept of B2C collaboration, this dissertation *aims to investigate and develop a holistic understanding of the implications of B2C collaboration in SCM for multiple supply chain echelons.* Three individual studies implementing

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various methodological approaches and a number of appropriate theoretical lenses are proposed to examine potential impacts of B2C collaboration in different supply chain processes for the customer, the focal firm, and the supplier. Figure 2 presents an overview of the dissertation. Integrating multiple theoretical lenses and employing mixed method approaches, the three individual studies in this dissertation will address the following research questions:

1) How does crowdsourced delivery impact customer satisfaction? What are potential issues that firms need to consider in developing crowdsourced delivery from customers' perspectives?

2) How do different motivation message framing affect crowdsourcing performance under various task complexity in supply chain operations?

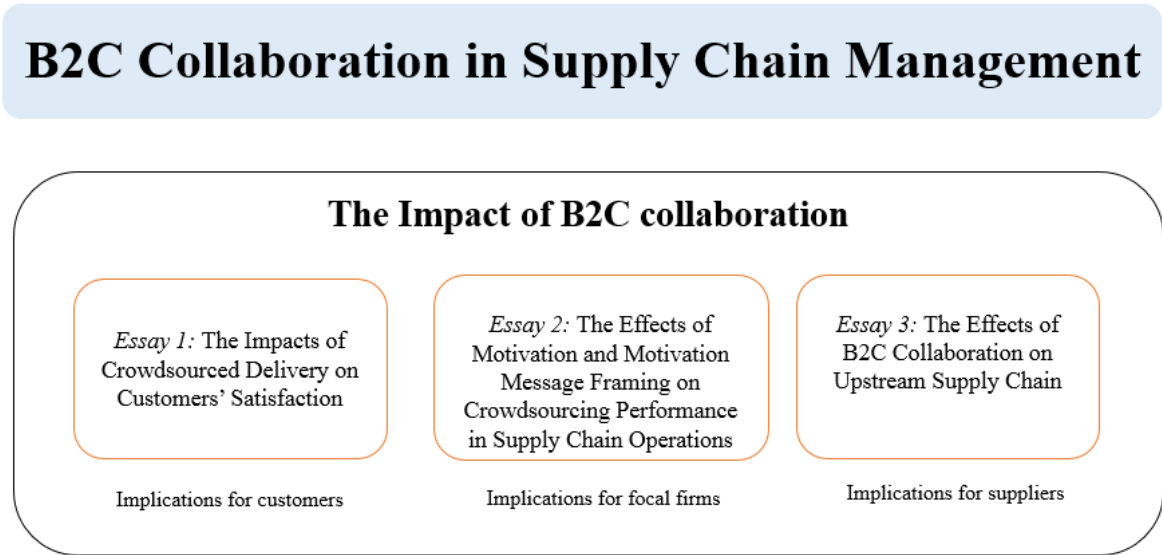3) How does B2C collaboration affect the relationship dynamics in manufacturer-retailer-consumer triad?

Figure 2. Dissertation overview

Foundational Literature Review

In light of the definition proposed in this study, B2C collaboration both commonalities and differences with other seemingly-related concepts in the current literature (See table 1). As illustrated in Figure 3, the comparison between B2C collaboration and other related concepts in the current literature is evaluated based on three main characteristics: the scope of activities, the value creation, and the degree of joint involvement between firms and consumers/ crowds. The scope of activities ranges from a narrow focus on marketing function (e.g. product ideas, designs, word-of-mouth) to a broader focus on all supply chain functions (e.g. logistics, operations, supplier relationships). The value creation dimension dishtinguishes between whether the main purpose of an activity is to create consumption benefits for consumers (use value) and whether to create revenues for the firms (exchange value) (Priem, 2007). Lastly, the degree of joint involvement refers to the extent to which firms and consumers provide equal input and share equal responsibilities in the value creation process (Fang et al., 2008).
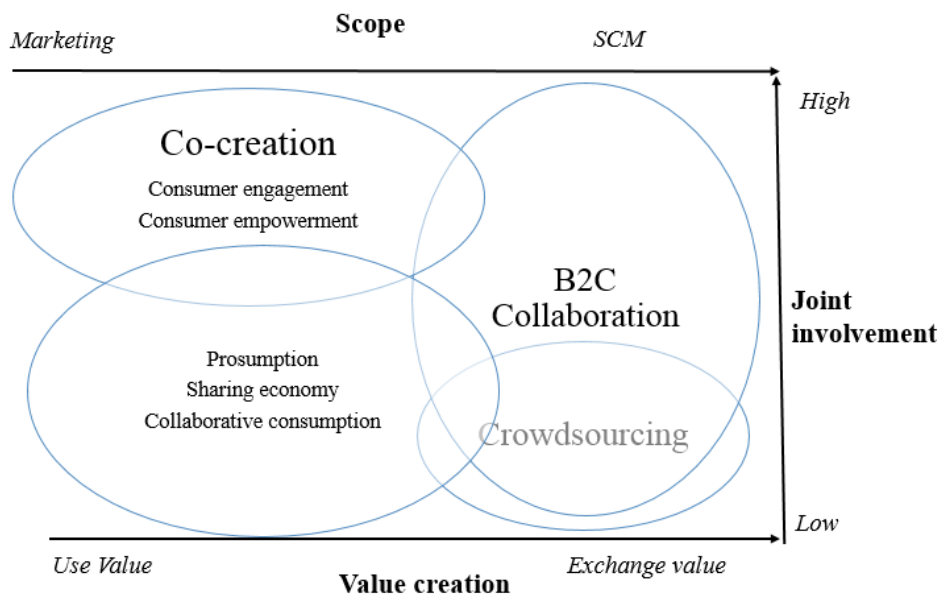

Figure 3. B2C collaboration in relations to other related concepts in the literature

Based on these three dimensions, B2C collaboration shares the least commonalities with concepts such as "prosumption" (Xie, 2013), "sharing economy" (Hamari et al., 2015), or "collaborative consumption" (Belk, 2014). While these concepts also allude to the participation of consumers in production activities, they do not necessarily require the involvement of a firm, therefore the degree of joint involvement is low. These concepts also focus on the creation of use value for consumers rather than exchange value for firms .

The notion of B2C collaboration is also closely related to the concept of "consumer engagement, and consumer empowerment" in marketing literature. Consumer engagement refers to "the intensity of an individual's participation in and connection with an organization's offerings and/or organizational activities, which either the customer or the organization initiate" (Vivek et al., 2012). Similarly, consumer empowerment describes consumers' perceived influence on product design and decision making (Füller et al., 2009). However, these terms take the perspective of individual consumers rather than a supply chain perspective. More importantly, these terms broadly cover both the creation of exchange value and use value as the end goals.

Consumer Co-creation

Another concept in which B2C collaboration has its root is "value co-creation". Originating from service dominant logic, value co-creation is defined as a consumer's "participation in the creation of [a business's] core offering" (Lusch & Vargo, 2006, p. 284). Even though co-creation is defined broadly to encompass the any business activities, research on co-creation primarily focuses on the involvement of consumers at various phases of new product development (NPD) (Fang, 2008). In the ideation stage (e.g., idea generation, concept testing), firms engage customers to obtain their needs-related knowledge, evaluate the potential of new

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product ideas, and refine and often select promising ideas for further consideration (e.g., Lego Ideas) (Dahl and Moraeu, 2007; Simonson, 2005). In the product development stage (e.g., product design and engineering), customers can provide solution-related knowledge such as technical advice or design skills (e.g., Threadless.com) (Franke et al., 2009; Lakhani et al., 2014). In the launch stage (e.g., prototype testing and market launch), customers are frequently invited to test prototypes in a real-use setting (e.g., Nokia's beta-testing community) and to help launch new products.

B2C collaboration shares the same essence of co-creating value between firms and consumers. However, B2C collaboration goes beyond the existing form of product co-creation. B2C collaboration also transgresses a firm's internal process, encompassing a whole supply chain system and processes. Firms can work in close cooperation with consumers not only in product development and manufacturing, but also in distribution and channel relationship management. For example, Deliv and Amazon Flex are examples of B2C collaboration in the delivery process by having consumers deliver packages to other consumers (Ta et al., 2015). In the supplier relationship management process, B2C can also become an effective and low cost way of screening potential suppliers or monitoring existing supply base just as in the case of Field Agent, or WeGoLook (Ta et al., 2015). B2C collaboration is also broader than coproduction or co-creation as the former concept covers a wide range of the degree of joint contribution between consumers and firms. In co-creation, the balance of joint involvement between a firm and consumers is high as the firm and consumers provide joint input and are responsible for joint outcomes (Cook, 2013; Etgar, 2008; Prahalad and Ramaswamy, 2004). In this sense, we consider co-creation or coproduction as one type of B2C collaboration.

In general, previous literature offers empirical evidence for the benefits of co-creation in NPD. Overall, successful co-created services provide consumers with higher level of customization, superior economic benefits accruing from, for example, greater control, increased goal achievement, reduced financial and performance risks, and enhanced relational benefits resulting from more empathy for consumers' needs on behalf of the service provider (Chan et al., 2010; Claycomb et al., 2001; Xie et al,. 2008). In a meta-analysis, Chang (2016) shows that reveals that involving consumers in the ideation and launch stages of NPD improves new product financial performance directly as well as indirectly through acceleration of time to market, whereas consumer participation in the development phase slows down time to market, deteriorating new product financial performance. Furthermore, the benefits of consumer participation on NPD performance are greater in technologically turbulent NPD projects, in emerging countries, in low-tech industries, for business customers, and for small firms (Chang, 2016). However, some research has revealed that co-creation might trigger negative consumer reactions when unexpected outcomes of co-creation occurs, such as in the case of service failures (Gebauer et al., 2013; Heidenreich et al., 2015). Research also found that utilizing co-creation in post-service failure in that case might help restore consumer satisfaction (Heidenreich et al., 2015).

In addition, a large body of research within co-creation focuses on motivation of consumers to participate in co-creation activities. Since most of co-creation literature focus on NPD activities, participation motivation in this realm is mainly related to creative activities such as idea development, and design contest. These co-creation activities require consumers to put in monetary and non-monetary costs of time, resource, physical and psychological efforts to learn and participate. Previous studies have identified that financial (money, rewards, visibility,

reputation), social (recognition, social esteem, good citizenship, social ties), technical (technology or product or service knowledge, information), and psychological factors (self-expression, pride, enjoyment, altruism) all play a role (Fuller, 2008; Nambisan and Baron, 2009; Evans and Wolf, 2005; Etgar, 2008).

Literature on co-creation is more developed than crowdsourcing literature. Lots of insights can be borrowed from this stream of literature. However, the majority of them focuses on NPD. Since the focus of this dissertation is on consumer participation in supply chain activities, I emphasize more on crowdsourcing activities and the literature in that domain.

Crowdsourcing

At the other end of the joint contribution spectrum, crowdsourcing can be considered as another type of B2C collaboration. Crowdsourcing is defined as the act of outsourcing a task to a mass network of external individuals in the marketplace (i.e. the "crowd") in the form of an open call (Howe, 2008; Jeppesen and Lakhani, 2010). In light of this definition, crowdsourcing is one form of B2C collaboration in which firms are problem initiators, and consumers are problem solvers. In crowdsourcing, the balance of joint involvement is low since a task is completely outsourced to consumers. It is worth noting that the extant literature also proposed different types of crowdsourcing that are not considered B2C collaboration. For example, internal crowdsourcing in which companies tap into their employee pool (Simula and Ahola, 2014) is not B2C collaboration since consumers are considered external to a firm and not subject to a hierarchical control. Thus, crowdsourcing as a form of B2C collaboration refers only to community and open crowdsourcing where a task is outsourced to an external network of individuals.

Research on both crowdsourcing and co-creation has mainly focused on activities in new product development and marketing, including new idea and innovation creation (Howe, 2008; Leimeister et al., 2009; Poetz and Schreier, 2012; Piller and Walcher, 2006; Bockstedt et al., 2015), design contests (Lampel et al., 2012; Djelassi and Decoopman, 2013), problem solving (Brabham, 2008; Chesbrough, 2003, 2011; Jeppesen and Lakhani, 2010), new product development (Afuah and Tucci, 2012; Tran et al., 2012) and marketing, advertising, and brand building purposes (Burmann, 2010; Whitla, 2009). Recently, crowdsourcing models have been applied to logistics activities whereby a mass of individual actors are utilized to deliver products for companies (Rouges and Montreuil, 2014; Mladenow et al., 2015; Paloheim, 2016). Crowdsourcing models in other operations activities such as supplier audit, shelf audit, even though have emerged in practice (e.g. Field Agent, WeGoLook), but have not been explored in academic research.

Research in crowdsourcing, in general, is still in its infancy and exploratory in nature. The first main stream of crowdsourcing literature focuses on developing the conceptualization and taxonomy of crowdsourcing. In general, there is a variety of definitions as well as classifications of crowdsourcing in the literature. For example, Geiger et al. (2011) have proposed a taxonomic framework for crowdsourcing processes from an organizational perspective. Their four fundamental dimensions of crowdsourcing comprise pre-selection of contributors, accessibility of peer contributions, aggregation of contributors, and remuneration for contributions. From a network perspective, Simula and Ahola (2014) proposed four distinct configurations of crowdsourcing: internal crowdsourcing, community crowdsourcing, open crowdsourcing, and crowdsourcing via a broker. Previous literature theorizes that the advantages for a firm of outsourcing to a crowd rather than performing operations in-house is that firms can

gain access to a very large community of potential workers who have a diverse range of skills and expertise and who are willing and able to complete activities within a short time-frame and often at a much reduced cost as compared to performing the task in-house (Howe, 2006).

However, crowdsourcing performance depends on the quantity and quality of the crowd (Boudreau and Lakhani, 2009). Increasing participation of the crowd, thus, is critical for crowdsourcing (Antikainen et al., 2010). That is why motivation participation has been another major topic in crowdsourcing (Leimeister et al., 2009). Frequently, firms organize formal contests that reward innovative ideas monetarily (Terwiesch and Xu, 2008). However, incentives for actors to participate can be more diverse than monetary alone. Extant studies have identified several motives that they classified into two distinct categories: extrinsic (e.g., monetary; increasing knowledge and skill-level; building of personal reputation) or intrinsic (e.g., enjoyment; intellectual stimulation; being part of the common good) (e.g. Boudreau and Lakhani, 2009; Antikainen and Vaataja, 2008; Antikainan et al., 2010; Lemeister et al., 2009; Bryant et al., 2005; Lakhani and Wolf 2005; Bagozzi and Dholakia, 2002). Most studies in motivation thus far focus on crowdsourcing of creative ideas or crowdsourcing of micro-tasks such as participating on Amazon's Mechanical Turk, even though different task nature calls for different kind of incentives. Even though researchers understand the importance of motivation in planning crowdsourcing activities, the various types of motivation in different crowdsourcing contexts as such have not been explored sufficiently (Hossain and Kauranen, 2015).

Crowdsourced delivery, as one type of crowdsourcing, is based on the idea that firms can utilize a network of individuals to deliver goods to other individuals (Rouges and Montreuil, 2014; Paloheimo, 2016). Crowdsourced delivery has emerged in the past few years and is often included in the "uberization" phenomenon. Due to its newness, little attention has been given to

crowdsourced delivery in the existing literature. All of research in the realm are conceptual and case-based, and mainly discuss the potential benefits of crowdsourced delivery. In their exploratory study, Rouges and Montreuil (2014) proposes that crowdsourced delivery can be an answer to the increasing demand for faster, more personalized, and cost efficient delivery services. Examining the sustainability benefits of crowdsourced delivery in a case study of existing library deliveries in Finland, Paloheim (2016) suggest that crowdsourced delivery can help reduce transportation footprints. A variety of critical questions related to crowdsourced delivery, however, remain unanswered.

Table 1. A review of related constructs and definitions

Construct	Definition
Empowerment	"a strategy firms use to give customers a sense of control over its product selection process, allowing them to collectively select the final products the company will later sell to the broader market" (Fuchs et al., 2010)
Coproduction	"engaging customers as active participants in the organization's work" (Lengnick-Hall et al., 2000)
	"constructive customer participation in the service creation and delivery process and clarify that it requires meaningful, cooperative contributions to the service process." (Auh et al., 2013)
	"consumers participate in the performance of the various activities performed in one or more stages of the network chain." (Fang, 2015)
Customer participation	"the degree to which the customer is involved in producing and delivering the service" (Dabholkar, 1990, p. 484)
	Customer participation refers to both the breadth and depth of the customer's involvement in the NPD process (Fang, 2015)
Co-creation	a consumer's "participation in the creation of [a business's] core offering" (Lusch and Vargo, 2006, p. 284).
	"cocreation refers to consumers cocreate use value with the firms, coproduction refers to consumers cocreate exchange value for the firms. 'Collective production' describes contexts in which consumers collaborate with other consumers to produce things of value to the consumer community. 'Company–consumer production' refers to contexts in which consumers and companies collaborate to produce things of value. (Humphrey, 2014).
	"customer co-creation, which we define as a collaborative NPD activity in which customers actively contribute and/or select the content of a new product offering". (Ohern, 2015)

Table 1. (Cont.)

Construct	Definition
Co-creation	Co-creation is the participation of consumers along with producers in the creation of value in the marketplace. Sponsored co-creation comprises co-creation activities conducted by consumer communities or by individuals at the behest of an organization (termed the producer). In autonomous co-creation, individuals or consumer communities produce marketable value in voluntary activities conducted independently of any established organization, although they may be using platforms provided by such organizations, which benefit economically (Zwass, 2013)
Prosumption	"value creation activities undertaken by the consumer that result in the production of products they eventually consume and that become their consumption experiences." (Xie, 2013)
Sharing economy	The peer- to-peer-based activity of obtaining, giving, or sharing the access to goods and services, coordinated through community-based online services (Hamari et al., 215)
Collaborative consumption	CC as an "economic model based on sharing, swapping, trading, or renting products and services, enabling access over ownership" (Botsman, 2013). CC as "the acquisition and distribution of a resource for a fee or other compensation" (Belk, 2014, p. 1597).
Crowdsourcing	"an act of a company or institution taking a function once performed by employees and outsourcing it to an undefined (and generally large) network of people in the form of an open call" (Howe, 2006) a crowdsourcing system "enlists a crowd of humans to help solve a problem defined by the system owners (Doan et al., 2011)

Structure of the dissertation

To address the research questions outlined earlier, three individual essays utilizing different methodological approaches are proposed. Essay one examines the impact of crowdsourcing in one supply chain activity – last-mile delivery on customers' satisfaction using a mixed method approach. Essay two addresses the question of how to improve the performance of crowdsourcing in supply chain operation tasks using a field experiment. Lastly, essay three investigates the impacts of different B2C collaboration levels by the manufacturers on their relationships with other actors in the manufacturer-retailer-consumer triads.

Essay One

Drawing on the Appraisal framework (Lazarus, 1991) and literature on logistics service quality (LSQ) and crowdsourcing, this study aims to tackle two research questions using a mixed-method and multi-study approach across three studies. The first question focuses on how crowdsourced delivery impacts consumer satisfaction and is investigated in Study 1 and 2. Specifically, Study 1 and 2 examines the mechanism through which crowdsourced delivery may influence consumers' outcomes using archival data from Amazon.com and Bizrate.com, a consumer rating website. Bizrate routinely surveys verified customers of online retailers for their evaluation of fifteen aspects of online retailers' services. Specifically, I argue that crowdsourced delivery will lead to higher on-time delivery and better shipping charges, which subsequently leads to higher consumer satisfaction. The model is test based on a comparison between a "treatment" group of customer ratings from six companies that have used crowdsourced delivery services in their logistics operations to a "control" group of customer ratings from six similar companies that have not used crowdsourced delivery.

Study two addresses the second research question regarding the potential crowdsourced delivery issues from the customer perspective. Customer reviews from Amazon Prime Now will be analyzed using "netnography" method (Kozinets, 2002) and a coding process following grounded theory approach guidelines (Strauss and Corbin, 1994). Amazon Prime Now is an Amazon service launched in December 2014 that offers two-hour and one-hour delivery services in some areas exclusively to Amazon Prime members. Amazon Prime Now data is selected for this study because it is one of the few programs that utilizes Amazon Flex, an Amazon crowdsourced delivery service, for its deliveries. The sample from Amazon Prime includes 424 customers' ratings and reviews of Amazon Prime Now service from December 18th, 2014 to January 9th, 2017. The rich insights from the qualitative study in Study 3 complement the results of the first study by providing a more comprehensive understanding of crowdsourced delivery from customers' perspective.

Essay Two

The success of B2C collaboration activities, including co-creation and crowdsourcing, hinges on both participation and performance of crowdsourced agents (Zheng et al., 2015), which in turn depend on their motivation to participate and perform (Lakhani and Von Hippel, 2003). Research has suggests that providing the participants with the right mix of incentives can enhance their motivation and their subsequent behaviors (Shah et al., 1998; Lemeister et al., 2009). However, the influence of motivation on behaviors depends not only on the types of motivation but also the framing of the motivation messages (i.e. the manner in which the incentives are presented) (Kahneman and Tversky, 1979; Thaler, 1980). Drawing on Self-determination theory and literature on framing theory, this essay will explore how different motivation and different motivation message framings affect participation and performance in

crowdsourcing operations activities. Specifically, this essay will investigate how different types of motivation messages increase crowdsourcing outcomes such as participation, quality, and satisfaction in supply chain operations tasks. Furthermore, this essay will also examine the moderation effects of task complexity on the effects of motivation on crowdsourcing outcomes.

Essay 2 employs field experiment method to isolate the causal effects of the independent variables of interest in a natural setting. Experimental stimuli will be carefully developed through extensive pretesting to ensure that the manipulations work as intended (Perdue and Summers, 1986). The experiment is a3x2x2 between subject experimental design. Three variables: identification messages (consumer identification, crowdsourcing platform identification, crowdsourcing firm identification) x goal framing (positive, negative) x task complexity (low, high) are manipulated. Crowdsourced agents are recruited through a crowdsourcing platform and participate in a real inventory audit task designed by the researcher.

Essay Three

The introduction of the consumer crowd into a manufacturer-retailer dyad creates a new triangular relationship involving a manufacturer, consumer crowd, and a retailer, which may negatively affect the retailer. Drawing on Balance theory (Heider, 1958; Cartwright and Harary, 1956), essay three aims to explore the impact of B2C collaboration by a manufacturer in supply chain operations activities on the retailers' collaborative behaviors with other actors in retail supply chain triad. Specifically, it is hypothesized that B2C collaboration by the manufacturer will lead to higher future information sharing with the supplier and lower future collaboration with consumers. The effects, however, will depend on the relationship magnitude and type of partnership between the manufacturer and the retailer.

Essay 3 uses scenario-based experimental methods to address the proposed research questions. Experiments allow for an examination of causal relationships in a controlled environment with a high level of precision (Thomas, 2011). In addition, experimentation offers an opportunity to study the interdependence of interactions (Rungtusanatham et al., 2011).

The experiment manipulates the independent variables of interest: B2C collaboration (no B2C collaboration, low B2C collaboration, and high B2C collaboration) x M-R relationship magnitude (positive vs. negative) x M-R partnership (cooperative vs. coopetitive). This results in a 3x2x2 between subject experimental design. The dependent variables of interest are the retailer's future information sharing with the manufacturer and future collaboration with consumers, all of which are measured by survey items. The sample consists of 291 MBA alumni from an US southern public university.

Contributions and Implications

The current supply chain literature has primarily overlooked the role of consumers and crowds as active participants in supply chain processes, thus failed to address emerging phenomena such as crowdsourcing, co-production, or co-creation in practice. Consequently, there is a dearth of insights from extant literature vis-à-vis the new B2C or crowdsourcing models as well as their potential impacts on different supply chain members. This dissertation address this gap in current literature by exploring the impact of crowdsourcing, as one specific type of B2C collaboration, on three different echelons in the supply chains. As such, this dissertation will provide comprehensive insights into this emerging phenomenon.

Essay One

Essay one will explore the impact of crowdsourced delivery on customer satisfaction. By doing so, this study expects to make several contributions to extant literature. First, it empirically explores the potential benefits of crowdsourced delivery in online retailing context. Prior research has theorized that crowdsourced delivery may be advantageous for online retailers and their customers due to lower costs and faster services; however, these statements lack empirical evidence.

Second, this study provides insights into issues in crowdsourced delivery that may not be encountered in traditional delivery models using common carriers. More importantly, this study contributes to extant logistics and physical distribution service literature by identifying specific dimensions that are deemed not relevant or important to traditional delivery services in online retailing but may play a critical role in crowdsourced delivery context such as relational factors (e.g. responsiveness, assurance, and empathy).

In addition, this study employs a mixed method approach with a combination of quantitative and qualitative data extracted from online sources, which is rare in supply chain management research (Golicic and Davis, 2012). A mixed method research is beneficial because it can overcome shortcomings of one single methodology, strengthening the robustness and comprehensiveness of research findings (Bryman, 2007). As such, this research also specifically addresses Tangpong's (2011) call for the use of content analysis tool in operations management research.

Essay Two

Essay 2 contributes to current SCM literature by examining different ways to improve crowdsourcing performance in supply chain operations. First, the study provides insights into the use of crowdsourcing models, which have not been addressed in supply chain literature. The crowdsourcing models, which utilize consumers-agents, possess some fundamental characteristics that are different from the traditional business model. Specifically, the consumers-agents are neither employees of the firms nor independent contractors (Krueger and Harris, 2015). They are independent individuals on the marketplace that are not legally bound to any firms. However, their actions have important implications on the operational performance of the firms. Therefore, this study provides needed insights into how to motivate consumers-agents in this new context.

Second, this essay contributes to crowdsourcing and consumer collaboration literature by examining relational framing as a new mechanism to motivate consumers-agents. While extant literature in crowdsourcing and co-creation have explored various motivations of why people participate in such activities, current studies only focus on either extrinsic factors such as rewards, or intrinsic factor such as enjoyment, creativity (Antikainen and Anohen, 2010). The unique role that the consumers-agents play as an intermediary and their relationships with both the firms and the consumer community have not been explored.

Furthermore, this research also contributes to the current literature on Self-determination theory and framing by investigating task complexity as a potential boundary condition of the framing effects. Lastly, the use of field experiment in the study responds to the call by DeHoratius and Rabinovich (2011) for more field and action research in the realm of operations and SCM to rigorously address managerial-relevant research questions in a rich natural setting.

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Essay Three

By investigating the impact of B2C collaboration on supply chain members, the study provides a holistic understanding of the impact of B2C collaboration on different echelons in the supply chain. While current crowdsourcing and co-creation literature may suggest potential benefits of B2C collaboration for the consumers-agents, the broader consumer community, and the focal firm, there exist no insights into the "chain effect" of B2C collaboration.

In addition, the study contributes to the current literature by examining the power and relationship dynamics within the manufacturer-consumer-retailer triad. By doing so, the study also contributes to the service triad literature in the operations management by exploring it in a new crowdsourcing context, which may reveal new interesting insights that are different from the interfirm buyer-supplier-supplier triad commonly seen in supply chain literature.

Furthermore, Essay 3 also examines the moderation effect of relationship magnitude and perceived coopetition between the manufacturer and the retailer. This provides firms with additional insights into how B2C collaboration can influence their existing relationship with the retailers given the current relationship level. The findings will also help firms understand how to leverage their current relationship with the retailers in order to achieve the desired B2C collaboration outcomes.

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II. Essay 1

The Impact of Crowdsourced Delivery on Customers' Satisfaction in Online Retailing:

A Mixed Method Study

1. Introduction

Increasing competition and technological advances have transformed the retailing landscape, causing the last mile delivery to consumers to become a key competitive edge for retailers (Murfield et al., 2017). Together with the rapid growth of online retailing, customers' expectations of logistics service quality (LSQ) are also rising. In a recent survey, 95% of consumers consider fast shipping as either same day or next day delivery, and 25% of consumers will abandon their carts if there is no same-day delivery shipping option (Ivory and Barker, 2016). Another survey conducted by Dropoff (2018) also reveals that 47% of consumers paid extra for same day delivery in 2017 and 65% want the same on-demand delivery options as Amazon or are willing to shop elsewhere (Renfrow, 2018). To win the final mile market in online retail, retailers and carriers, therefore, need to not only handle massive volumes, but also master same day and on-demand delivery. In light of these changes, crowdsourced delivery has emerged as an innovative solution to the current challenges of last-mile logistics.

Crowdsourced delivery (CD) denotes the outsourcing of last-mile delivery services to a mass of individual actors in the marketplace, commonly referred to as "the crowd", through technology-based platforms (Mehmann et al., 2015; Carbone et al., 2017). The CD process begins with customers placing orders on the retailers' websites and selecting the same day delivery options, in most cases, during check-out. The retailers then forward the orders to the crowdsourcing platform firms, which in turn crowdsource the orders to a network of active users (a.k.a. crowdsourced drivers). If the drivers accept the orders, information about the drivers and the order tracking will be sent to the customers. The CD ends when the drivers complete the delivery process.

Prominent CD platforms such as Uber Eats, Amazon Flex, Deliv, Instacart, JoyRun, Didi, DoorDash, and Postmates, have rendered the use of crowdsourced delivery a viable service operations for firms. Retailers can connect with the crowd either through their directly-owned CD platform (e.g. in the case of Amazon via Amazon Flex), or through a third-party CD platforms (e.g. in the case of Walmart via DoorDash). Anecdotal evidence of potential benefits of the CD model exists. For example, China's JD Daoja, one of the largest Chinese ecommerce platforms, has reported higher customer repurchase rates since their adoption of CD (Perez, 2016). Amazon also estimates significant cost savings due to the use of their CD services, Amazon Flex, and has been planning to expand the services to a number of Amazon programs (Kitroeff, 2016).

Academic literature and scientific evidence, however, are lacking due to the emerging nature of the CD model, particularly from the customers' perspective (Carbone et al., 2017). At the same time, theoretical explanations as to *how* CD can impact customers are equivocal and polarized. On one hand, customers may be more satisfied thanks to better service value and higher service availability under the CD model (Matzler et al., 2015). On the other hand, customers may suffer higher service inconsistencies due to unstable driver supply and a heterogeneous crowd of non-professionally trained drivers (Kannangara and Uguccioni, 2013; Ndubisi et al., 2016), which could negatively impact customer experiences. The current literature, as such, provides little understanding of the impacts as well as the mechanisms of the impacts of CD on customers. Given the mixed arguments, the question of *when* CD might have positive impacts on customers' outcomes also requires particular attention.

More interestingly, whether the CD model might possess distinctive characteristics that require a reconceptualization of customers' perception of service quality remains unexplored.

For instance, one of the key differences associated with the CD model is the characteristics of crowdsourced drivers. Because the technology allows for the contracting of services from individuals drawn from a heterogeneous pool of providers that are independent of the crowdsourcing firm, the crowdsourced drivers are more often identified explicitly as individuals, as "Scott" or "Tracy," for example, instead of by the organization identity such as "FedEx or UPS guys". The salience of drivers' individual identity amplified by the independent status of the drivers and the unique service-oriented features, such as the provision of real-time tracking, driver name and photo, and driver direct contact information, can heighten the social dynamics between the customers and the drivers. This new dynamic may affect customers' perceptions of service quality in the CD context.

Given the nascent state of the CD literature and mixed evidence of the benefits of the model, the current research seeks to shed light on this matter by empirically investigating the impact of CD on customer satisfaction. The Appraisal framework (Lazarus, 1991) and LSQ literature suggest that customers' judgment of certain dimensions of LSQ, such as timeliness and costs, could affect customer satisfaction and behavioral intentions. Applying this theoretical lens, I employ a mixed-method and multi-study approach across three studies to propose positive effects of the CD model on customers' perceived costs and timeliness of the delivery service, as well as on customer satisfaction and behavioral intentions. While Study one explores the baseline impact of CD on customer satisfaction using archival data from a large e-retailer, Study two expands the model in study one and seeks to explain the underlying mechanisms through which CD influences customers' outcomes using archival data from Bizrate.com, a consumer rating website. Lastly, Study three employs qualitative method to explore additional insights into

customers' perceptions of LSQ associated with the CD model, supplementing a more comprehensive understanding of CD from the customer viewpoint.

The findings make several contributions to extant literature. First, the study provides empirical evidence of benefits of CD to customers in online retailing context. The results illuminate contradicting theorized arguments regarding the emerging CD model. By demonstrating the mediation effects of perceived timeliness and costs, the study also addresses the question of how the CD model can enhance customers' satisfaction and outcomes. Also, this study contributes to the crowdsourcing and logistics literature by showing that the CD model could have differential effects depending on the types of products.

Furthermore, this study provides insights into potential aspects of CD that may not be encountered in traditional delivery methods that use common carriers. Specifically, the salient role of crowdsourced drivers and the increased intimacy between the drivers and the customers in this context may make certain features of the customer interface platform more relevant and have implications for customers' logistics performance assessment. More importantly, this study contributes to extant logistics and physical distribution service literature by identifying specific dimensions of service quality that might uniquely pertain to the CD context.

In addition, this study employs a mixed method approach with a combination of quantitative and qualitative data extracted from online sources, which is scarce in supply chain management research (Golicic and Davis, 2012). Mixed method research is beneficial because it can overcome shortcomings of one single methodology, strengthening the robustness and comprehensiveness of research findings (Bryman, 2007). In doing so, this research also specifically addresses Tangpong's (2011) call for the use of content analysis tools in operations management research.

2. The sharing economy and crowdsourced delivery

Crowdsourced delivery (a.k.a. crowdsourced logistics, crowd logistics), a technology-enabled phenomenon, is one type of crowdsourcing based on the idea that firms can utilize a network of individuals to deliver goods to other individuals (Paloheimo, 2016; Rouges and Montreuil, 2014). It is rooted in the sharing economy, which refers to "peer-to-peer based activity of obtaining, giving, or sharing access to goods and services, coordinated through community-based online services (Hamari et al., p.1). The sharing nature of CD lies in the sense that individuals (i.e. end customers) obtain access to delivery services (i.e. sharing) from other individuals through community-based online services (i.e. platform companies) (Hamari et al., 2015).

Due to the nascent state of the sharing economy and crowdsourcing in practice, current research in this area is rudimentary. Extant literature mostly focuses on the model's conceptual development and human motivations to participate in sharing or crowdsourcing tasks in areas such as innovation contests, accommodation sharing, and ride sharing (Hamari et al. 2015; Antikainen and Anohen 2010, Bockstedt et al. 2015; Zhao and Xia 2016; Mohlmann 2015; Weber 2014; Hawlitschek et al. 2016). Fewer insights have been given to CD.

Among a handful number of studies in the CD, most center on the conceptual discussion of CD. Specifically, Carbone et al. (2017) define and classify different types of crowd logistics, including CD. Rouges and Montreuil (2014) propose that CD can be an answer to the increasing demand for faster, more personalized, and cost efficient delivery services. CD firms may enjoy the temporary use of resources (e.g. vehicles and drivers) without associated capital investment and fixed costs, which may translate into more cost savings for customers (Matzler et al., 2015). In addition, unique technology-enabled features in CD, including real-time GPS-based tracking,

driver photo and name, and driver direct contact, allow customers to visually see the drivers and interact with the drivers before the order is delivered (Ta et al., 2018). Other research suggests that CD can have sustainability benefits by reducing transportation footprints (Paloheim, 2016). However, no empirical evidence has been provided. One exception is Castillo et al. (2017), who use simulation data to show that a CD fleet could accomplish more total deliveries than a dedicated fleet.

Alternatively, some research has brought up possible drawbacks with the sharing economy and crowdsourcing models, which are also applicable to CD. Specifically, the utilization of external resources from the crowd implies lower control for firms over the supply (Ndubisi et al., 2016). This may introduce potential supply variability into the systems, which can result in higher outcome uncertainty for firms (Kannangara and Uguccioni, 2013). Indeed, simulation results suggest that on-time performance could be lower for a CD fleet compared to a dedicated fleet, particularly for a tight delivery window (Castillo et al., 2017). Moreover, since crowdsourced drivers are independent individuals on the market that are not subject to formal training and legal attachment to the firms, the quality variability may also be higher than the traditional fleet, which ultimately could undermine customer experiences (Kannangara and Uguccioni, 2013). Altogether, the current literature discusses some distinctive characteristics of CD that might have conflicting implications for service quality, and subsequently potential effects on customers. However, whether CD enhances or impairs customer satisfaction remains undetermined.

3. Study 1

Study 1 aims to explore the baseline impact of CD on customer satisfaction. Despite some opposition, arguments for the positive effect of CD on customer satisfaction seem to

prevail. First, customers may be more satisfied with the adoption of CD as they get lower shipping prices and faster delivery services as the model leverages a massive scale of "idled" independent drivers at lower costs (Carbone et al., 2017). Second, CD might also help increase customer satisfaction as customers would receive a wider variety of delivery options enabled by the flexible and on-demand nature of CD (Rouges and Montreuil, 2014). In fact, a CD fleet was found to be able to deliver more orders than a traditional fleet (Castillo et al., 2017). Furthermore, customers might also appreciate the interactive features that enhance the connections between the customers and the drivers in the CD model (Ta et al., 2018). Prior literature has established that delivery is a critical component of customers' online retail experiences and customers' perceptions of delivery services could enhance customers' satisfaction with the whole shopping experiences as well as with the retailer (Murfield et al., 2017; Rao et al., 2011). The improvement to customers' experiences enabled by the CD model, therefore, could increase customer satisfaction. Taken all together, I hypothesize that:

Hypothesis 1 (H1). Crowdsourced delivery adoption is associated with higher customer satisfaction with the retailer than traditional delivery methods.

3.1. Method

3.1.1 Sample selection

Study 1 explores the impact of CD offering on customer satisfaction using archival data from Amazon Prime Now. Amazon Prime Now is an Amazon service launched in December 2014 that offers free 2-hour delivery service and one-hour delivery service in some areas for $7.99 exclusively to Amazon Prime members. Amazon Prime Now data is selected for this study because the program started to utilize Amazon Flex, a CD platform owned by Amazon, for its

deliveries in September 2015. Amazon Flex calls on a network of individuals in the marketplace to deliver packages for Amazon via a mobile app. The sample from the Amazon Prime Now includes 3,765 customers' ratings of the Amazon Prime Now service from December 18th, 2014 to January 9th, 2017. Customer ratings measure the level of customer satisfaction with Amazon Prime Now on a scale from 1 to 5, with 5 being the highest satisfaction level.

3.1.2. Data analysis

To examine the effect of the CD adoption on customer satisfaction, an interrupted time series analysis is conducted. The interrupted time series method is appropriate for examining longitudinal effects of an intervention and whether factors other than the intervention could explain the change in an outcome (Wagner et al., 2002). The interrupted time series model is set up as follows:

$$Rating_t = \beta_0 + \beta_1 * time_t + \beta_2 * CDadoption_t + \beta_3 * CDadoption * (time - 43) + \beta_4 * Rating_{t-1} + \varepsilon_t$$

Here, $Rating_t$ is the mean customer rating per week; $time_t$ is a continuous variable indicating the count of weeks at time t from the start if the observation period; $CDadoption_t$ is an indicator for time t occurring before ($CDadoption = 0$)or after ($CDadoption = 1$) the adoption of the crowdsourced delivery model, which was implemented at week 43 in the series; and $Rating_{t-1}$ is a lagged variable of weekly customer rating. The results are presented in Table 1. *CDadoption* (b=1.05, se=0.28, p<0.001) is shown to have a positive and significant effect on the average customer ratings. The results indicate an increase in customer satisfaction associated with the adoption of the CD model, providing support for Hypothesis 1.

Table 1. Study 1's results

	Coef.	S.E.	t-Value	p-Value	95% CI
CDadoption	0.95	0.29	3.2	0.00	[0.37, 1.5]
time	0.0035	0.007	0.52	0.61	[-0.009, 0.02]
CDadoption*(time-43)	-0.003	0.009	-0.31	0.75	[-0.02, 0.01]
Rating (lagged)	-0.35	0.07	-4.93	0.00	[-0.48, -0.2]
cons	3.3	0.14	22.9	0.00	[3.01, 3.58]

3.2. Discussion

Our exploratory finding supports the positive association between the use of CD and customer satisfaction. Based on the previous literature, customers' positive reaction to the use of CD might be attributed to faster delivery and lower costs (Rouges and Montreuil, 2014; Matzler et al., 2015), "personalized" service experiences (Rouges and Montreuil, 2014), and other factors pertaining to the innovativeness and distinctiveness of the CD model. While Study 1 highlights the positive influence of the adoption of the CD model on customer satisfaction, which can further impact the e-retailers' performance and competitive advantages, it does not explain through which mechanisms the effect occurs. The questions of how and when CD model can yield such an effect on customer satisfaction, thus, remain unanswered. Additionally, Study 1's finding is limited to the context of Amazon Flex, which is a CD platform owned and controlled directly by the retailer- Amazon. One could argue that the level of control that retailers have over a CD platform when dealing with a third party-owned CD platform, such as Deliv or DoorDash, would be lower and could have different impacts on service quality and customer satisfaction.

4. Study 2

Study 2 extends the model in Study 1 to explore the mechanisms through which CD influences not only customer satisfaction and repurchase intention but also referral intention. These two behavioral intentions together reflect both future direct and potential indirect sales for firms (File et al., 1992; Babic Rosario et al., 2016). As depicted in Figure 1, Study 2 builds on the Appraisal framework (Lazarus, 1991) and integrates literature on crowdsourcing and E-LSQ to examine the impact of CD on customers' appraisal of on-time delivery and delivery costs, which subsequently impact customer satisfaction and behavioral intentions. Study 2 also identifies and tests the conditional boundary of the effect of CD. To overcome the context limitation of Study 1, Study 2 investigates retailers that employ 3rd party-owned CD platforms using a set of archival data constructed from multiple public data sources.
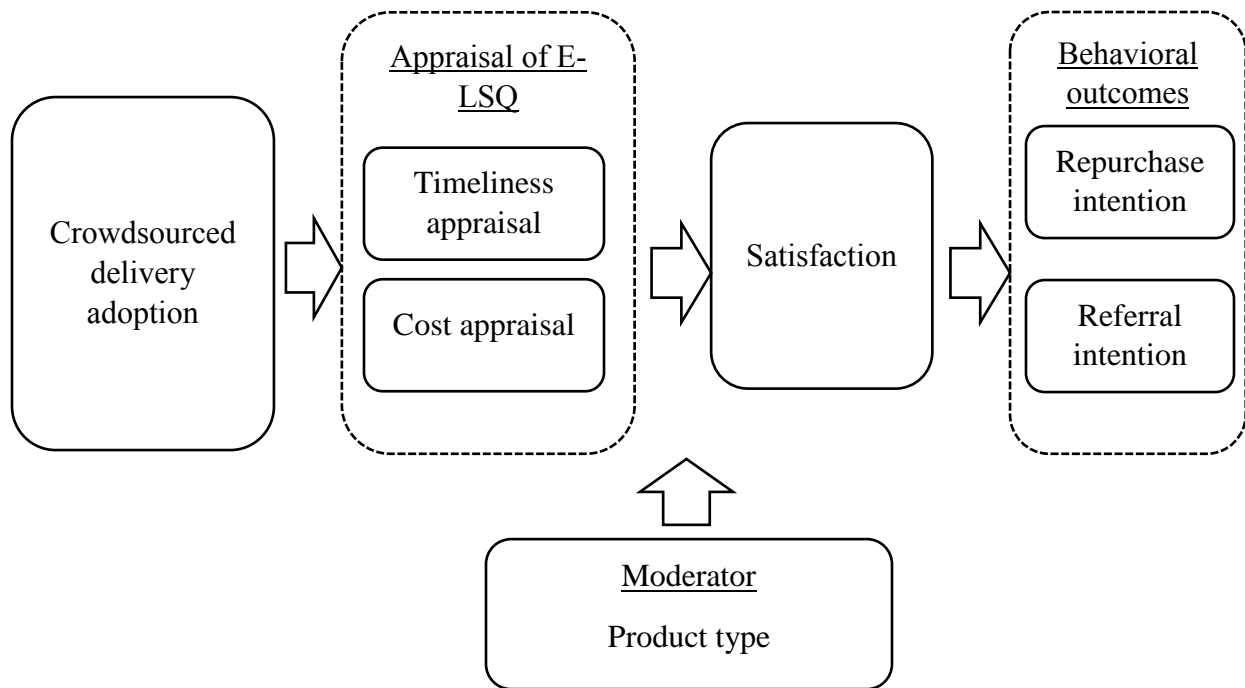

Figure 1. Study 2's conceptual model

4.1. E-logistics service quality (e-LSQ)

Logistics service quality (LSQ) is a foundational concept to measure how customers perceive the value provided through logistics services (Mentzer et al., 1999). LSQ is rooted in one of the most popular conceptualizations and measurements of service quality, Parasuraman et al. (1985; 1988)'s SERVQUAL, which composes of five broad dimensions: (1) reliability (the ability to perform the promised service dependably and accurate, (2) responsiveness (the willingness to help customers and to provide prompt service); (3) assurance (the knowledge and courtesy of employees and the ability to convey trust and confidence), (4) empathy (the provision of caring, individualized attention to customers), and (5) tangibles (the appearance of physical facilities, equipment, personnel, and communications materials). Service quality is considered an essential determinant of customer satisfaction (Yi and Zeithaml, 1990) and has been found to significantly impact, both directly and indirectly, customer loyalty (e.g., Caruana, 2002; Sivadas and Baker-Prewitt, 2000), sales (e.g., Olorunniwo et al., 2006), and firm profits (e.g., Hendricks and Singhal, 1997; Yee et al., 2010; Zeithaml, 2000).

However, dimensions of the SERVQUAL concept have been shown to be too broad and inconsistent across service industries (Bienstock, Mentzer, and Bird, 1997). The application of SERVQUAL into logistics services has initially lead to the development of the physical distribution service quality (PDSQ), which focuses on the transaction aspects of the order fulfillment process and is composed of three main dimensions: availability, timeliness, and quality (Lambert and Stock, 1993, Mentzer et al. 1989, Bienstock et al. 1997). Built on PDSQ, LSQ is a broader concept developed by Mentzer et al. (1999), consisting of nine dimensions: timeliness, availability (i.e. order accuracy), and order condition found in the PDSQ, as well as information quality, ordering procedures, order release quantities, order quality, order

discrepancy handling, and personnel contact quality. Another derivative of the LSQ concept is logistics service performance developed by Stank et al. (2003), which consists of two main dimensions: operational performance and relational performance. Operational performance evaluates reliability (i.e. the dependability, accuracy, and consistency of a service) and costs, while relational performance encompasses responsiveness, assurance, and empathy attributes (i.e. activities that enhance service firms' relationships with customers so that firms can understand and respond to customer needs and expectations) (Stank et al., 1999; Davis-Sramek et al., 2010).

A preponderance of research has provided strong evidence for the relationship between LSQ and firm performance (Leuschner et al., 2013). LSQ has also been shown to positively influence customer satisfaction (e.g., Daugherty et al., 1998; Mentzer et al., 2001; Bienstock et al., 2008; Soh et al., 2015), customer loyalty (Davis-Sramek et al., 2008, 2009; Juga et al., 2012), and future purchase behaviors (Davis-Sramek et al., 2010; Oflac et al., 2012). Findings related to the effect of each LSQ dimension, however, have been mixed. For example, relational performance was found to increase customer satisfaction in most cases (e.g. Stank et al., 2003; Davis-Sramek et al., 2008, 2009), but only had marginal effects in some (e.g. Stank et al. 1999). Most research also shows a significant relationship between the operational dimension and customer satisfaction (e.g. Davis-Sramek et al., 2008, 2009; Stank et al. 1999), except for Stank et al. (2003).

However, most LSQ literature has mainly focused on the B2B context, while the SERVQUAL literature, although applicable to B2C, does not incorporate physical distribution. To address these shortcomings, Parasuraman et al. (2005) developed the ES-QUAL scale for the online retail context, which includes efficiency, system availability, privacy, and order

fulfillment effectiveness. Recently, Rao et al. (2011) also developed an e-LSQ scale, which focuses on PDS quality and price, to tailor to the online retailing environment. In online retailing context, satisfaction with PDSQ and cost have been found to positively impact consumer satisfaction and consumer retention and referral behaviors (Rao et al., 2011; Griffis et al., 2012). In general, various attributes of physical distribution performance, including perceived costs, availability, timeliness, and reliability in order delivery, have been shown to be critical determinants of consumer satisfaction and consumer loyalty in online retailing (Keeney, 1999; Boyer and Hult, 2005; Rabinovich and Bailey 2004; Rabinovich et al., 2008; Agarz et al. 2005). While these elements capture customers' perception of operational LSQ in online retailing, it is uncertain whether they are perceived the same way in the CD context.

4.2. Hypothesis development

When customers engage in an exchange, they go through an appraisal process wherein their assessment of the exchange outcome will subsequently affect their emotional response and behaviors. This process is explained by the appraisal framework developed by Lazarus (1991), which consists of three primary stages: 1) appraisal, 2) emotional response, then 3) coping behaviors. The extent to which customers judge the perceived quality of the exchange in the appraisal stage leads to the customers' emotional response, i.e. feeling of pleasure or displeasure, which then leads to the development of intentions or behavior toward the change partners in the coping stage (Gotlieb et al., 1994).

Applying this framework to online retail exchanges, the appraisal stage often focuses on customers' judgment of the service performance and products provided by a retailer (Cronin and Taylor, 1992). In the emotional stage, customers' emotional response can be reflected in satisfaction, and coping responses are often operationalized as customers' behavioral intentions,

or referral behaviors (Zeithaml et al., 1996). The Appraisal framework has been adopted in previous e-LSQ literature. According to both e-LSQ and ES-QUAL literature, timeliness (i.e. on-time delivery), along with costs, availability, and condition, is a critical component of the overall service quality perception (Parasuraman et al., 2005; Rao et al., 2011). Customers are highly sensitive to these factors in the online retailing context because customers cannot be certain of the quality of these components until the order has been complete (Rabinovich et al., 2008).

CD can enhance on-time delivery for two reasons. First, CD capitalizes on the concept of economies of scales with the utilization of a vast network of independent drivers. The large scale of the crowdsourced network entails higher chance of finding available drivers, thus allows for faster order delivery. As a comparison, UPS and FedEx, two of the largest delivery carriers worldwide, operate a delivery fleet of 108,000 and 160,000 vehicles, respectively, while the CD network for Dada, the largest CD platform in China, has approximately 1.3 million active vehicles and delivery personnel. Second, using optimal routing algorithms, CD companies can effectively match the closest drivers to the customers, which also helps increase the time of delivery. In fact, merchants using UberRush, a CD service through Uber, have reported a reduced amount of time customer wait to receive orders (Lee et al., 2016).

Following this line of argument, I argue that customers' appraisal of on-time delivery performance is likely to be higher for retailers that use CD than for firms that do not utilize CD. Since timeliness is one critical element of delivery service quality and of customers' purchase experiences, higher appraisal of timeliness leads to higher appraisal of the service (Parasuraman et al., 2005; Rao et al., 2011). Integrating the appraisal framework logic, as customers appraise the service more positively, they are likely to display higher satisfaction as a positive emotional response, and subsequently higher repurchase and referral intentions. Therefore, I hypothesize:

Hypothesis 2 (H2). Customers' appraisal of on-time delivery will be higher for retailers that use crowdsourced delivery, which subsequently leads to higher customer satisfaction, higher repurchase intention, and higher referral intention, than for retailers that do not use crowdsourced delivery.

In addition, the perceived value of PDS or satisfaction with PDS cost is also an essential part of customer's evaluation of PDS service quality and their overall satisfaction (Griffis et al., 2012; Rao et al., 2011). Crowdsourcing literature proposes that crowdsourcing models can offer lower costs than traditional business models by taking advantage of "underutilized or idled" resources provided by the crowd network (Howe, 2008; Mladenow et al. 2015). Specifically, crowdsourced drivers utilize their own vehicles and their idle time while getting paid by the task. Therefore, CD companies can avoid fixed costs and idle time expenses, which in turn leads to higher efficiency for the companies and greater cost savings for the customers (Rouges and Montreuil, 2014). The lower the shipping charges, the better value customers perceive that they get for the delivery service, and the better customers appraise shipping charges. Since cost is one element of service evaluation, thus, according to the appraisal framework, customers will be more satisfied with the retailer and more likely to repurchase and refer in the future.

Hypothesis 3 (H3). Customers' appraisal of shipping charges will be higher for retailers that use crowdsourced delivery, which subsequently leads to higher customer satisfaction, higher repurchase intention, and higher referral intention, than for retailers that do not use crowdsourced delivery.

The appraisal framework also indicates that customer satisfaction is customers' emotional judgment of the extent to which the performance of the order fulfillment process meets customer expectations (Oliver, 1981, 1997). One way customer expectations of PDS vary is based on

product types (Thirumalai and Sinha, 2005). Specifically, according to a widely known product classification of Copeland (1924), products can be categorized into three groups primarily by shopping effort: convenience goods, shopping goods, and specialty goods. On the low end of shopping effort are convenience goods, which are purchased frequently, immediately and with a minimum effort and a low risk, for example, groceries, home and office supplies. On the high end of customer involvement effort are specialty goods, for which customers have certain specific requirements and spend the highest amount of time and money, for example, computers and electronics. In the middle of Copeland's (1924) product continuum are shopping goods, for which customer involvement in the purchase process, unit value, and the perceived risk of the purchase to customers are moderate, for example, apparel, shoes, and accessories. Thirumalai and Sinha (2005) found that customer satisfaction with the order fulfillment process for convenience good and for shopping goods are higher than for specialty goods. This can be explained by increasing customer expectations of order fulfillment moving from convenience goods to specialty goods. As mentioned earlier, convenience goods are often of low value, common, and less risky, therefore, customers place less value in the delivery process. On the other hand, specialty goods are purchased after considerable deliberation and are more valuable to customers. Consequently, customers tend to expect better delivery than for other products.

From this discussion, I argue that because customer expectations of PDS tend to be higher for specialty goods, it will be more challenging for firms to satisfy customers' delivery expectations for specialty goods than for shopping and convenience goods. As mentioned earlier, the use of CD is arguably thought to increase firms' delivery performance, therefore, firms that use CD will have a higher chance of satisfying customers' expectations for specialty goods than for shopping and convenience goods. Hence, the effect of CD adoption on customer satisfaction

and customer behaviors will be stronger for specialty goods than for shopping and convenience goods.

Hypothesis 4 (H4). Product type positively moderates the effect of crowdsourced delivery adoption on customer satisfaction, repurchase intention, and referral behavior such that the effect is stronger for specialty goods than for a) shopping goods, and b) for convenience goods.

4.3. Research design

4.3.1. Sample selection

Study 2 employs archival data of customer ratings on Bizrate.com to further investigate the mechanism through which crowdsourced delivery may influence customer outcomes. The Bizrate.com data is available for the year of 2016.

The selection of retailers in the sample is as follows: First, I identified retailers that use CD (i.e. the treatment group) and retailers that do not use (i.e. the control group) based on a number of sources. The main source is lists of customers from a number of CD platforms that provide CD services for retailers, including Deliv, Uber Eats, Postmates, Instacarts. A retailer's adoption of CD is further validated using other sources of information such as public news, company archives, and company public announcements. Second, due to data constraints, only companies that are available on Bizrate.com are included in the study. As a result, I identify six companies that used CD for their logistics operations in 2016 on Bizrate.com, including Aveda, Brookstone, Footlocker, Lampsplus, Nordstrom, and Things Remembered.

Following Hendricks and Singhal (2001), Study 2's methodology is based on one to one comparisons of comparisons of companies using CD to controls. The controls are chosen to be

similar in size and industry characteristics of the treatment group. To the best of my knowledge and based on the information I collect from corporate announcements and other news sources, the control firms have not used CD at the time of data collection. The controls also have to be available on Bizrate.com for data comparison. The matching process is based on three criteria: Bizrate department classification, Alexa overlap score, and Alexa popularity rank. The first criterion, Bizrate department classification, captures the similarity of product categories offered by the retailers. The second criterion, Alexa overlap score, measures the similarity of the retailer's websites based on shared visitors. The third criterion, Alexa popularity rank, provides an estimate of a website's popularity, which is calculated using a combination of average daily visitors to the site and page views on the website over the past 3 months. Each firm in the treatment group is matched to a control firm that satisfies the following conditions: 1) is on Bizrate.com; 2) has not used CD in 2016; 3) shared the same Bizrate department classification; and 4) is the closest in Alexa overlap score and popularity rank. As the results of the matching process, the control group of 6 firms includes Esteelauder.com, Buydig.com, Champs, Lighting New York, JCPenney, and Personalization Mall. The final sample includes 5,125 observations at the customer level with 1,970 observations in the control group and 3,149 in the treatment group.

4.3.2 Measures

Customer-based measures in the model are gathered using data from Bizrate.com, one of the most popular product comparison engines on the web. Bizrate routinely surveys verified customers of online retailers for their evaluation of the retailers' services. The survey results are published on Bizrate.com and are freely available to the public. Bizrate.com data are considered

a valid source for academic research purposes and have been used multiple times in operations management research (Thirumalai and Sinha, 2005; Rao et al., 2011).

Bizrate.com captures fifteen aspects of online retailers' services in two parts using a 10-point scale. The first part of the survey is delivered immediately after customers make a purchase. This part measures the level of customer satisfaction with website design, and easiness to find products, variety of shipping options, shipping charges, product price, product information, product selection, and check out process. The second part of the survey is emailed shortly after the scheduled delivery date, measuring customers' satisfaction with product availability, on-time delivery order tracking, product condition, returns process, and customer support. Following Rao et al. (2011), the customer satisfaction captures the overall experience with the purchase, repurchase intention reflects the likelihood of repurchase from the store, and referral intention measures the likelihood of recommending the store to others. The customers' PDS price perception is captured by the customers' satisfaction with shipping charges. Timeliness is measured by customers' level of satisfaction with on-time delivery. Product types are coded based on a coding scheme adopted from Thirumalai and Sinha (2005). Control variables in the model include, product information, product prices, order tracking/status information, product met expectations, product availability, shipping options, customer support, and firm effects. Table 2 presents the descriptive summary and the bivariate correlation matrix.

Table 2: Descriptive summary and Pearson's correlation matrix

Variables	Mean	SD	1	2	3	4	5	6	7	8	9	10	11
1. Satisfaction	8.53	2.51											
2. Repurchase	8.53	2.51	0.95										
3. Recommend	8.53	2.51	0.92	0.89									
4. Clear charges	9.17	1.63	0.22	0.22	0.22								
5. Price	8.69	1.72	0.22	0.22	0.22	0.44							
6. Shipping charges	8.23	2.55	0.20	0.20	0.20	0.50	0.39						
7. Shipping options	8.80	1.83	0.25	0.25	0.25	0.50	0.57	0.54					
8. On-time	8.84	2.34	0.70	0.70	0.70	0.19	0.18	0.18	0.20				
9. Track	8.78	2.36	0.65	0.65	0.65	0.19	0.17	0.19	0.23	0.77			
10. Product quality	8.73	2.44	0.74	0.74	0.74	0.16	0.18	0.15	0.19	0.51	0.51		
11. Customer support	8.46	2.59	0.80	0.80	0.80	0.26	0.23	0.22	0.30	0.70	0.66	0.63	
12. Product availability	8.80	2.30	0.66	0.66	0.66	0.19	0.18	0.20	0.23	0.60	0.57	0.62	0.65

Note: All correlations are statistically significant a t 0.05 level.

4.4. Analysis and results

Hypotheses are tested using Hayes Process. PROCESS is a regression based computational tool for path analysis-based moderation and mediation analysis as well as other conditional process models using a bootstrapping procedure (Hayes, 2013). The bootstrapping method has been recommended over the more traditional Baron and Kenny (1986) method for complex models with mediation and moderation effects due to its correction for non-normality, greater statistical power, and parallel testing of multiple mediation processes (Rungtusanatham et al., 2014; Zhao et al., 2010). With PROCESS, confidence intervals from 5,000 bootstrap samples are generated to assess mediation via an indirect effect of an independent variable on a dependent variable. If the confidence intervals do not contain a value of zero, significant mediation is evident (Hayes, 2013; Zhao et al., 2010).

For Hypothesis 2 and 3, the test for indirect effects involves Hayes' (2013) PROCESS model 6, which matched the layout of the conceptual model, using 95% bias-corrected confidence intervals and bootstrapping procedure of 5,000 samples. In support of H2, the results are significant for all outcome variables. Specifically, firms that use CD are associated with higher on-time delivery, which leads to higher satisfaction (b=0.23, se=0.05), higher repurchase intention (b=0.34, se=0.05), and higher referral intention (b=0.28, se=0.04). Similarly, the results are also positive and significant for the mediating effect of shipping charges, providing support for H3. Firms that use CD are shown to have higher satisfaction with shipping charges, which subsequently increased overall customer satisfaction (b=0.1, se=0.017), repurchase intention (b=0.2, se=0.018), and referral intention (b=0.17, se=0.017).

Hypothesis 4 assesses the moderation effect of product types on the linkage between CD adoption and customer-related outcomes. To test H4, I employ PROCESS model 10 using 95%

bias-corrected confidence intervals and bootstrapping procedure of 5,000 samples. The result indicates that while there is a significant difference between the effects of CD adoption on customer-related outcomes for convenience goods and for shopping goods, the direction of the coefficient is not positive as predicted (b=-1.92, se=0.59 for satisfaction; b=-1.84, se=0.53 for repurchase intention; and b=-1.85, se=0.6 for referral intention). Indeed, contrary to the hypothesis, the effect of CD adoption on customer-related outcomes is stronger for convenience goods than for shopping goods. Similar results are observed between convenience goods and specialty goods (b=-1.78, se=0.45 for satisfaction; b=-1.62, se=0.4 for repurchase intention; and b=-1.8, se=0.47 for referral intention). There is no significant difference between shopping good and specialty goods.

4.5. Study 2's discussion

Results of Study 2 corroborate the finding in Study 1, showing that the use of CD model can have a positive impact on not only customer satisfaction, but also their repurchase and referral intentions. While Study 1 indicates a positive effect of CD adoption on customer satisfaction when retailers own and control CD platforms, Study 2 substantiates the robustness of the finding by showing that the effect also holds for retailers who use third-party CD platforms.

Study 2 further suggests that customers are more satisfied with retailers that use CD and are more likely to repurchase and refer these retailers because these retailers are perceived to have higher on-time delivery performance and better delivery costs. While simulation result in Castillo et al. (2017)'s study suggests that a crowdsourced fleet may perform less consistently and have more late deliveries than a dedicated fleet, our empirical evidence showed otherwise. Lastly, contrary to the hypothesis, the use of CD is shown to have the strongest effect for convenience goods, not for specialty goods. Products such as grocery and food items are the

most likely to benefit from the adoption of CD model. This may suggest that for tight window deliveries (i.e., time-sensitive deliveries), customers may expect higher delivery service quality for convenience goods than for other purchases.

5. Study 3

While Study 1 and 2 empirically assess the potential effects of CD on customer-related outcomes, both studies rely on the current conceptualization of customers' perception of e-LSQ, which focuses solely on the operational aspects. As such, both the current ES-QUAL and e-LSQ do not fully capture the richness of order fulfillment provision previously established in B2B logistics literature (Rao et al., 2011). Specifically, both scales lack the relational components, which emphasize the willingness, competence, and courtesy of the service providers' employees (Stank et al., 2003). Most online retailing researchers understate the relational performance in B2C due to the perception that online B2C environment is not conducive to the interactional human elements (Rabinovich and Bailey, 2004; Xing and Grant 2006; Xing et al., 2010; Rao et al., 2011) because the physical barrier between buyers and sellers in online context is assumed to inhibit interpersonal interactions as well as interpersonal trust and customer service issues (Grewal et al., 2004; Rabinovich and Bailey, 2004). As a result, relational performance has not been considered in online retailing services, even though the positive link between relational performance and customer satisfaction and repurchase intentions have been well-documented in B2B context (Innis and LaLonde, 1994; Daugherty et al., 1998; Davis-Sramek et al., 2008).

As discussed earlier, the CD model differs from the traditional dedicated fleet model in several ways. For example, the individual identity of crowdsourced drivers is more pronounced and interactions between drivers and customers might be intensified (Carbone et al., 2017; Ta et al., 2018). These differences cast doubt upon the relevance of the current e-LSQ framework. In

light of this, Study 3 seeks additional insights into the CD phenomenon by exploring potential factors of customers' perception of e-LSQ in the CD context.

Due to the emerging nature of the CD model and the exploratory nature of the research question, a qualitative approach is deemed the most appropriate (Glaser and Strauss, 2009). Study 3 uses a newly emerged "netnography" method by utilizing a content analysis of customer reviews of CD services. The "netnography" approach is a qualitative research technique which "uses the information publicly available in online forums to identify and understand the needs and decision influences of relevant online consumer groups" (Kozinets, 2002; p.62). The qualitative data used for Study 3 comes from 424 customer reviews of Amazon Prime Now after Amazon's adoption of CD in September 2015. An analysis of customer reviews is particularly useful in exploring the rich aspects of customer perceived service quality (Yang et al., 2003).

The coding process follows the guideline provided by Yin (2009) and Tangpong (2011). The process consists of an initial coding and focused coding phase, which allows the connection of contextual rich descriptions to more abstract theoretical categories (Charmaz, 2014). All reviews are numbered, formatted and imported into NVivo 11, a software package designed for coding qualitative data (Wazienski, 2000). In the initial coding phase, each code is assigned to a smaller segment of data (i.e. sentence). This allows for the emergence of theoretical concepts and ideas from the data (Charmaz, 2014). Initial codes then are sorted, synthesized, and organized into more focused codes. Focused codes are developed based on relevant factors defined by previous LSQ studies. When some coding words could not be assigned to the extant factors, new dimensions are subsequently developed. To assess the trustworthiness of the qualitative data analysis results, the evaluation of the data analysis process and results is based on four criteria: credibility, transferability, dependability, and confirmability (Lincoln and Guba, 1986).

Following the guidelines of Lincoln and Guba (1986) and Kozinets (2002), various steps are taken to ensure high validity and reliability of the results. Table 3 summarizes the evaluation criteria and how they are implemented.

Table 3. Evaluation of trustworthiness in netnography research (Lincoln and Guba, 1986; Kozinets, 2002)

Trustworthiness criteria	Measures
Credibility (how well the data and processes of analysis address the intended focus)	Selecting appropriate subjects of study Using public data Using independent coder Showing representative quotations from the data
Dependability (ensuring consistency in the data)	Applying the same analysis procedure to all data Defining concepts a priori
Transferability (the extent to which the findings can be transferred to other settings)	Giving a clear description of the context , selection of participants, data collection, and process of analysis Comparing findings with literature and theory.
Confirmability (the degree of neutrality in the findings)	Using additional auditor to confirm interpretation Providing an audit trail Providing direct quotes

The results of the coding procedure are presented in Table 4 with definitions, frequencies, sub-codes, and exemplary quotes for each dimension. As illustrated in Figure 2, three main

dimensions associated with customers' perception of crowdsourced e-LSQ emerge. For all three dimensions, the most frequently mentioned is operational dimension. This is not surprising, as it is in line with existing literature on online retailing. However, the relative emphasis on other dimensions and the emergence of new sub-dimensions within the operational dimension lend distinctive insights into the CD context.

Operational dimension. This is the dimension that mainly constitutes the current e-LSQ conceptualization. Here, customers are concerned with aspects associated with the efficiency and the effectiveness of the CD services (Rao et al., 2011; Murfield et al., 2017). Operational factors consist of eight elements: timeliness, perceived cost, condition, availability, reliability, order accuracy, ordering procedure, and flexibility. Timeliness and costs appear to be the two dominant operational factors. Most customers are concerned, either impressed or dissatisfied, with the speed and costs of the CD service. This is expected because speed and costs of delivery are the two primary challenges in the context of two- and one-hour deliveries, examples of tight-window deliveries that typically use the crowdsourced model (Carbone et al., 2017; Castillo et al., 2017). Consistent with extant online retail literature (Xing et al. 2010; Murfield et al., 2017), order condition is also a frequent concern for customers. Ordering procedure, flexibility, and order accuracy also garner customers' attention. Even though Parasuraman et al. (2005) and Mentzer et al. (2001) included these factors in their e-SERQUAL and LSQ, later research in e-LSQ overlooked them. Ordering procedure and flexibility are particularly salient in this context because customers can only order through a mobile app and can select a range of delivery times. Both of these options are still novel concepts to online customers and at the same time typical practices in crowdsourced delivery (Carbone et al., 2017).

Relational dimension. Relational factors account for 30% of customers' concerns in the qualitative data. Relational dimension encompasses customer orientation or factors that enhance the closeness between customers and service provider personnel (Mentzer et al., 2001, Stank et al., 2003). Specifically, customers care about service providers' responsiveness (whether they are willing to help and provide service in a prompt fashion), assurance (whether they are knowledgeable and courteous), and empathy (whether they care about customers). These three relational factors have been previously introduced in the business-to-business LSQ and e-SERQUAL. They mainly focus on the face-to-face interactions between the customers and the service personnel during service delivery. The exclusion of these relational factors in e-LSQ is attributed to the lack of these interactions in the online retailing environment (Rao et al., 2011). The technology-enabled features in CD service, such as real-time tracking, drivers' ID and picture, and direct contact, however, allow customers to know the drivers' identity as soon as the orders are dispatched and track the drivers along their routes in real time. The "virtual interactions" with the delivery personnel before the delivery service encounters may enhance customers' feelings of closeness and interactions with the drivers even before the face-to-face encounters. This may explain why the relational factors become more relevant in the CD context. Additionally, some customers also appear to care about the drivers as another person being and being identified with the drivers, which is referred to as "identification". Identification can be manifested in behaviors such as customers' referring to the drivers by name, creating interpersonal connections with the drivers, and caring about the drivers. This factor may be pertinent to the crowdsourcing context due to the salience of the drivers' individual identity (Ta et al., 2018).

Social dimension. The qualitative data also reveal a new dimension, which refers to customers' concern about the impact of the CD service on the broader society. In this context, customers appear to be impressed with the innovativeness of the delivery service and how it will change the standard practice in online retailing. Customers also appear to be mindful of how this new delivery model can create jobs for the local community and at the same time cripple local businesses.
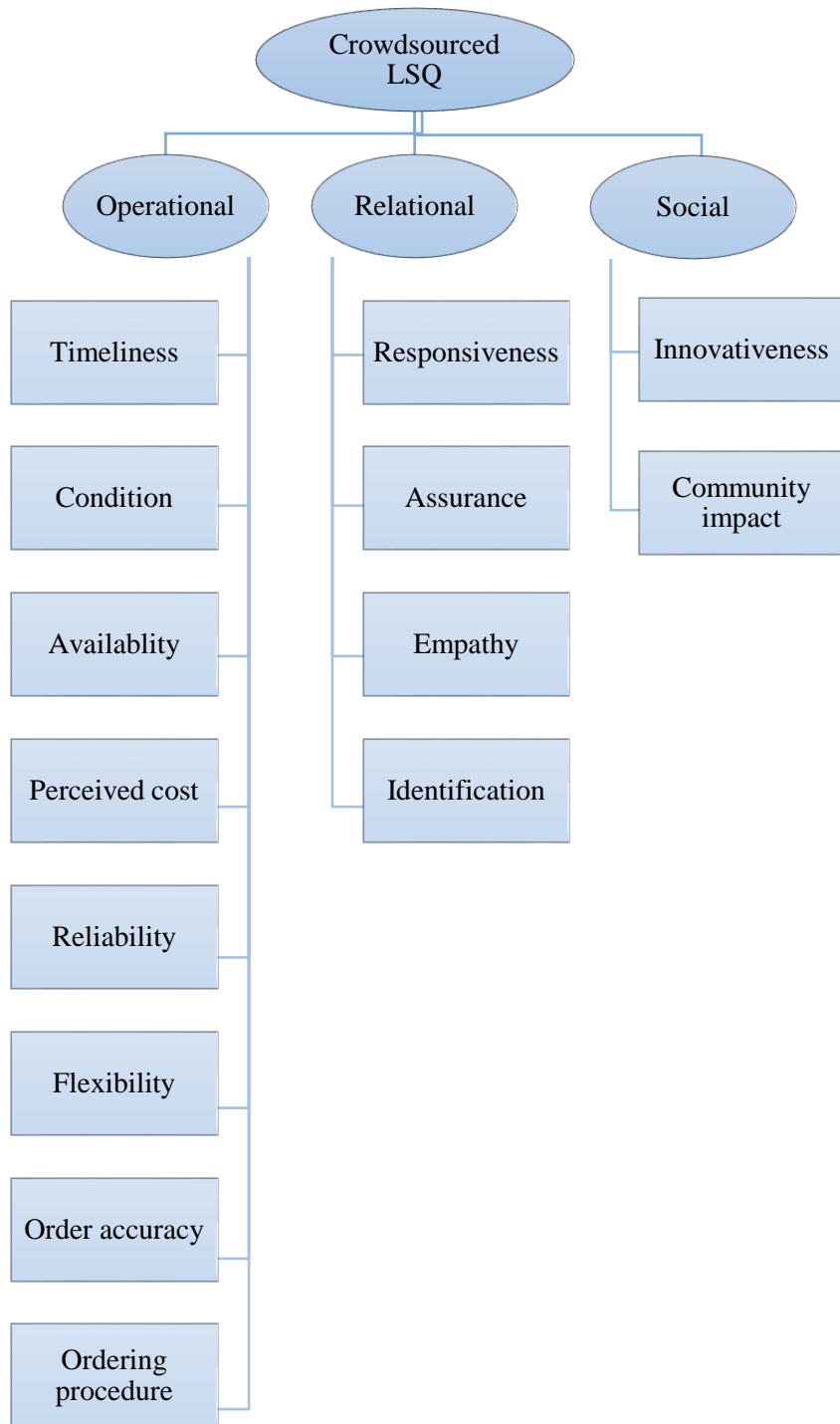
Figure 2. Emerging themes

Table 4a. Operational dimensions, description, and sample quotes

Dimension	Description	Sub-codes	Sample quotes
Operational (681- 66%)	Those activities performed by service providers that contribute to consistent quality, productivity, and efficiency (Stank et al., 2003; Rao et al., 2011)		
• Timeliness (272 - 27%)	whether orders arrive at the customer location when promised (Mentzer, 2001)	timely, fast delivery	"Normally my items are delivered by the first hour of the two hour time frame. Depending on where you're located you can have it within an hour. It beats Walmart pick up because of the delivery." "I was so surprised that it actually came in two hours." "Got a video game as a Christmas present, and it was delivered to my front door (2nd floor) in 2 hours :) AWESOME" "GREAT!! My order was delivered within two hours on Christmas Eve"
• Perceived cost (160 - 16%)	how much the delivery service costs and the price offered (Stank et al., 2003, Rao et al., 2011))	delivery charge, tip	"The first time I looked into ordering, I balked at the $5 tip. Then I was stranded with a sick child... suddenly $5 for home delivery sounded like a bargain!" "Daughter used it--I prefer to pick mine up on my own time or wait for next day delivery. Expensive!" "Sux!!! very limited delivery area. Too expensive!!!" "I went to check out and there was an auto-added $5 tip and a $4 estimated regulatory fee". I wouldn't mind if the items were priced higher in the app to support the fast delivery but the current implementation feels like bait & switch."" "Not to mention its only $5.00 to deliver. I'm never going to the store again. :)"

Note: Observed frequencies in parentheses

Table 4a. (Cont.)

Dimension	Description	Sub-codes	Sample quotes
• Availability (20 – 2%)	the ability to readily source inventory ordered by a consumer (Rabinovich and Bailey, 2004)	stock out, product availability	"2 items I purchased were out of stock (or my driver couldn't find them) and I wasn't given any other option for replacement or substitute or anything - they just canceled those items off my order & that was that." "I've had half an order delivered with no hey do you want this instead or would you like something instead. Just got a text telling me "No leeks you won't be charged" with no option to substitute" "Only challenge has been when things are out of stock - they text you for alternatives. Good in that they text you - bad in that you have to text back and be available for alternatives. I did order 2 lbs of tomatoes I needed once for a dinner party - and received 2 tomatoes - so emphasis on the quality control being needed. I emailed support and got a rebate pronto - but needed to drive to a grocery defeating the purpose." "Most of the items I've purchased have been food, such as caffeine-free diet Coke, Ozarka bottled water, etc. The only complaint I have with Amazon Prime Now is the selection of food products to choose from, which seems to be decreasing. Both that, or they're frequently out of stock…This inconsistency and poor selection is the reason I'm only giving it 3 stars."
• Condition (70- 7%)	the lack of damage to orders (Mentzer et al., 2001)	order condition, order packaging	"One of the eggs was broken. The milk container was leaking all over delivery bag. No doubt I myself wouldn't bring anything from store in such condition. I have no idea whose fault it is, warehouse people or delivery driver. Anyway, the quality of such service is not acceptable. I'll probably give it a try one more time. If anything happens again, then we are the history" "and frozen groceries were still frozen when they arrived" "The frozen items were thawed out and a couple wrong flavors were purchased. For example, I chose raspberry gelato but got chocolate chip." "Everything was ok except for one of the eggs broken. Next time I'll be inspecting my groceries upon receipt. Wish I could get my gratuity back." "My first couple of orders, everything was neatly packaged in one bag (the bags are pretty large) and I loved it! The last order however, I got about 4 or 5 different bags, when it all could have been easily packaged in one (three separate bags for each 18.5 oz bottle of Gold Peak green tea I ordered)"

Note: Observed frequencies in parentheses

Table 4a. (Cont.)

Dimension	Description	Sub-codes	Sample quotes
• Ordering procedure (80 – 8%)	the efficiency and effectiveness of the procedures followed by the supplier (Mentzer et al., 2001)	ordering process, order tracking, payment process, order cancellation, order changes	"Finally, I have several times completed and order and then realized I forgot something. I understand you don't want folks making changes after 30 minutes or something but there needs to be a way to immediately edit an order." "The process of ordering online is EASY" "will give you 5 Stars when you expand your selection, and allow me to save my grocery lists for easier reordering." "The glitch initially involved a problem with my form of payment and it caused me to need to re-create the entire order. When the payment issue popped up my order was automatically cancelled instead of being held until I could fix the payment problem. Since this occurred while I was at work I didn't notice it until 45 minutes later. When I started over to redo the order the time that had passed caused a 2-hour shift in the delivery window and that meant that my office would be closed during the new delivery window. I had to pay $7.99 additional to have the delivery within an hour so that I could receive it before leaving work. Although the payment issue was my problem I wish the order had been held instead of cancelled so that I didn't have to re-enter everything." "You even get an alert when they're almost to your house and you can track them to see where they are" "You can track the progress of your order with confidence."
• Order accuracy (28 – 3%)	how closely shipments match customers' orders upon arrival (Mentzer et al., 2001)	order accuracy, order inaccuracy	"The Amazon order will likely be 100% correct but the non-Amazon stuff will be a roll of the dice. Our Sprouts order had a lot of errors. 3rd party accuracy is out of Amazon's hands. But they will refund you if it is wrong." "Received the wrong item several times" Surreally, mind-bogglingly bad. I gave them more chances than I should have, due to ortho surgeries and lingering mobility impairment, but I finally gave up. I'm finding it impossible to believe so many things can go wrong purely through stupidity or inattention. I now believe they're consciously trolling us. Between 5/8 and 2/3 of any given order is just wrong. Examples: I ordered a number of organic items; they delivered regular. I ordered decaf coffee beans; they delivered regular. I ordered multiple plain, unsweetened dairy products, they delivered all sweetened vanilla. I ordered produce three-packs, they delivered a single item. I ordered mixed nuts, they delivered cashews. These are all commonly stocked items, and probably were not out of stock; in any case I was not contacted about substitution; I was just randomly brought whatever. After paying for something else entirely. I'm done. Never again." "I have thoroughly enjoyed using this service!! It is very convenient!!!! I have used this service over 10 times since January and every one of those orders were correct, on time, packaged with care" "…they have always got my order correct…"

Note: Observed frequencies in parentheses

Table 4a. (Cont.)

Dimension	Description	Sub-codes	Sample quotes
• Reliability (19 – 2%)	how consistent the quality of the service is (Stank et al., 2003)	delivery inconsistency, delivery failure	"The first time I ordered using Prime Now, it was great. Prompt delivery, and I had no problem with the tipping system...however, the second time I made an order (and got the message saying they were on their way) I looked at the tracking map and saw that the driver was going PAST my house and on to other areas. Tried calling the driver, and didn't get a response the first time. FINALLY got a message from him about 10-15 minutes later saying that my house was 3rd or 4th down his list! (which is astounding, considering the fact that my place is one of the closest to the dang distribution facility)It's been over an hour since I got the message that the driver was on his way, and I'm seeing that he's STILL making a gigantic ring around my house...Point is, it seems to be a mixed bag of good and bad, so be wary when you order." "Reliable delivery" "Well, the first delivery had a whole bag of moldy red Fuji apples and half a bag of rotten oranges. To make things better, Amazon offered me a $5 credit for the inconvenience. I used it toward a second order the next day. This time I ordered green apples after the mishap with the red ones. The 2 hour" order took 4 hours and the green apples are moldy! I think Prime now is a great service but I would not recommend ordering fresh produce. I think they may be having trouble storing the food at appropriate temperatures" "Limited selection and somewhat unreliable delivery service."
• Flexibility (32- 3%)	choices of ways and times to deliver and return items (Parasuraman et al., 2005)	delivery time options, return options	"You may even lose you delivery window, and if it's the last one of the day you can only get next day delivery" "GREAT!! My order was delivered within two hours on Christmas Eve" "and choose the time that worked best for me for delivery" "I like that you can choose the delivery time!"

Note: Observed frequencies in parentheses

Table 4b. Relational dimensions, description, and sample quotes

Dimension	Description	Sub-codes	Sample quotes
Relational (302 – 30%)	Those activities that enhance closeness to customers (Stank et al., 1999; Rao et al., 2011)		
• Responsiveness (96- 9%)	the willingness to help customers and provide prompt service (Parasuraman et al., 1988)	helpfulness, friendliness	"I don't mind tipping the drivers because they go all over the place and if I have several bags in the same delivery, they even help me to my door. I have used this service many times now and have not had a single issue, and they are always within the time Windows that I selected" "I've gotten drivers that were very friendly, and even in one instance where I didn't make it home in time for my delivery window, the driver very graciously turned around and came back to make sure that I received my items." "…the delivery guy was super nice, walked all the way up to my third floor apartment very important for me!" "Was a great experience and the girl who delivered my items was very nice." "Fast, friendly delivery!" "Driver was not friendly and complained about parking" "The delivery people are friendly and, in two cases, really funny."
• Assurance (110 – 11%)	the knowledge and courtesy of employees and the ability to convey trust and confidence (Parasuraman et al., 1988)	ability, courtesy, professionalism	"Only complaint was the driver kept circling the block and had to call me for directions. They don't get the same tracking map we do." "Never had a prob until today when two orders went undeliverable. It was the same driver I have had several times and I checked to have it left at door and they came while I was in dispose and marked it as such. The last time it seemed they got lost or ran somewhere else before coming to me" "…The driver arrived soon afterward and left the order on the front porch as I had directed " "Flawed service that needs work. I ran into the same issue several times. The delivery people don't know how to read or follow simple directions. They are incompetent and have no common courtesy etiquette. They are unable to read four simple words that say, leave package at door". That's driver 101 no? Amazon Prime Now needs to re-evaluate their training techniques because the current way doesn't work. Expect the drivers to be pounding on your door at all hours of the day or morning. They will do whatever they can to get into your place. They will alert your neighbors." "Many of the drivers do not speak English well - this is not a problem on its own. If they were trained in professionalism and basic delivery it would be fine. Today the girl needed 10 minutes to figure out how to work the keypad in front of her. She did not know how to access the delivery instructions in the app which have my gate code. I asked if she were new and she said no. If you are a delivery person in Houston you are well acquainted with gates. You should also know the app to get the customer's info."

Table 4b. (Cont.)

Dimension	Description	Sub-codes	Sample quotes
• Empathy (44 – 4%)	the provision of caring, individualized attention to customers (Parasuraman et al., 1988)	communication, care, individualized attention	"I have had excellent deliveries where people have waited for me to come to the door and acknowledged me." "…my driver texted me when they were on the way and when they arrived…" "The first time my Prime Now driver called me, and we arranged a place to meet. However, my second order (which I needed ASAP) was incomplete. The driver made 0 attempts to contact me, and I also tried placing a call but the call function does not work on the app it seems." "It still got here in under two hours and the driver handled everything with care but didn't read the instructions Please don't ring doorbell or knock on the door" after a "ding-dong and bang-bang-bang" my wife woke up from a needed nap." "The next morning in pouring down rain and thunder, but the driver showed up on time with a big smile on his face." "My delivery worker was nice and gave me ample warning on a particularly heavy bag.5 star for the service! Would recommend highly!"
• Identification (52 – 5%)	the attachment with the service providers at a personal level, interpersonal connections between customers and service providers	individual identity, care about drivers' well-being	"The drivers I've had were very professional and helpful. It is also nice to have the text message to alert me that the driver is on the way and know the driver's name" "I don't like the driver leaving a review and complaining about tips. That is rude" "…delivered with a smile by the driver named Nathan. Nice guy. Good attitude. Wish I could leave him individual feedback" "I received a text message my order was on its way, and I was able to track it (like Lyft/Uber) as Ross came closer to the hotel. My order was delivered by Ross on his bike!!! I took a picture of him. My friends were excited too- some of them never heard of Amazon Now. Thank you" When ordering from New Seasons, they did not have one of the fresh salads as I had ordered. They immediately called me and we worked out the details perfectly…They are using their gas, wear and tear, and time to shop and deliver. I benefit. It is worth the tip…" "…These delivery folks are working hard!" "Got a really friendly courier named Olakunle who seemed genuinely surprised that I pronounced his name correctly." "Kevin delivered my first order and was fast and very friendly" "The delivery person Tokara was really sweet" "My delivery driver Elizabeth was nice and charming to chat with." "…then I received my order from a nice lady in her mid 40's I mean early 30's ;-) in street clothes they're acting as personal shoppers as well but the Amazon orders are already picked & packed then just picked up at the prime now warehouse and delivered by the drivers."

Note: Observed frequencies in parentheses

Table 4c. Social dimensions, description, and sample quotes

Dimension	Description	Sub-codes	Sample quotes
Social (38 – 4%)	Those activities that contribute to a service provider's impacts on the broader society		
• Innovativeness (30 – 3%)	the newness of the logistics services		"This is the future and I'm totally hooked and plan on never leaving the house again." "The future has arrived!" "THIS IS STUFF TO YOUR DOOR IN 2 HOURS OR LESS PEOPLE!!! THIS IS AMAZING! Sure, not having a desktop version is a little frustrating, but compared to what this service actually is!? WELCOME TO THE FUTURE!!" "For REAL!! I am completely WoWeD and AMAZED with this service! You honestly need to try it, you will be WOWED as well. Keep-up the awesome innovations Amazon, ya'll are pure genius"
• Community impact (8 – 1%)	how the logistic service model impacts the local community	job creation, local business	"…And besides it's creating new jobs for people in the area and I always support that!" "I got a package at night on a Sunday! Kinda felt bad someone had to work at that time to make the delivery happen but it's great for emergencies and if someone is being paid well and is fine with working those hours then I'm ultimately fine with it." "I do feel a little bad buying things through Now rather than at stores in my neighborhood even the chains because their presence is important in the community. But given Now's limited selection there's still quite a bit I will buy locally including at our local independent Mexican butcher and produce store"

Note: Observed frequencies in parentheses

6. Discussion, limitations, and implications

This study provides empirical and theoretical foundations of LSQ in CD context. Across three studies, our key results are as follows. First, customers display significantly higher satisfaction and repurchase intention for retailers adopting CD. Second, the use of CD is related to higher satisfaction with delivery cost and with delivery timeliness, which subsequently links to higher satisfaction, repurchase intention. Third, the effects of CD adoption on customer's satisfaction and behavioral intentions are stronger for convenience goods than for shopping and specialty goods. Fourth, even though operational aspects account for a majority of customers' concerns, customers also care about relational and social facets when they evaluate CD service quality.

Our findings have several implications for both theory and practice. First, the findings contribute to the emerging area of crowdsourced logistics by providing the first empirical evidence of the benefits of CD model. While there are speculative arguments for potential benefits of CD such as lower cost, faster and scalable deliveries, previous simulation results showed that on-time delivery performance may decline if a firm uses a crowdsourced fleet in lieu of a traditional dedicated fleet (Castillo et al., 2017). The mixed outcomes of CD reflect the nascent nature of CD and the limited understanding of its impacts, which may hinder its development in both theory and practice. By demonstrating a positive association between the use of CD and customer-related outcomes, this research expands our knowledge of the CD model and the mechanisms through which CD affects customers. The study also can serve as a business case and provide support for supply chain managers to leverage the CD model to enhance customer satisfaction and generate future direct and indirect sales.

Second, we expand the model of CD by proposing product type as a moderator of CD's effect on customers' outcomes. This finding contravenes the previous notion that customers' expectation of LSQ is lower for convenience goods than for shopping and specialty goods. Our research, on the contrary, implies that for urgent purchases, i.e. tight-window deliveries, customers may expect higher LSQ for convenience goods such as groceries, food, office supplies. This finding thus suggests that retailers or companies will reap the most benefits of CD model if they start offering CD services for groceries and food products. This is an important implication for retailers or companies that look into offering same-day delivery services utilizing CD model to maximize returns on investment with constrained resources. Since this study uses a broad product classification, it may not provide concrete evidence of what truly differentiate the effects of those products. Future research, therefore, can further investigate specific product characteristics that the use of CD model may benefit the most. Future work could also triangulate the results by using a different product classification, for example, search vs. experience goods (Xiao & Benbasat, 2011).

Third, the qualitative findings extend the e-LSQ model in crowdsourcing context beyond the operational focus. The explorative findings defy conventional thinking that online retailing is not conducive to interactions between customers and service provider personnel, thus, undervalue the importance of relational factors (Rao et al., 2011). Our results show that enabled by technology, relational aspects between customers and logistics service provider are appreciated by customers not only during but also before the service counter. Companies that are offering and look into offering this type of service, therefore, might consider focusing on ways to enhance the relational side as a way to improve customer-related outcomes. Some approaches might be providing technological features that connect customers and drivers, and integrating

customer service components into training and performance ratings for crowdsourced drivers. One example of companies that make an extra effort in connecting customers and crowdsourced drivers is Zipment, which provides customers with a driver's social profile in addition to all other technological features mentioned above.

The emergence of the social dimension, albeit diminutive, also connotes the relevance of social impacts in customers' evaluation of logistics services. While the communication designed to promote consumers' purchase of goods or services that simultaneously contributes to a social cause, also referred to as cause-related marketing, has been increasingly common in practice and in the marketing literature (Fox and Kotler, 1980; Hyllegard et al., 2011), the communication of the social impacts of logistics services might be lacking. Also, one of the social dimension customers mention in this study is the innovativeness of the delivery model, which might not be long-lasting as the innovations are widely adopted (O'neill et al., 1998). Future research, therefore, could examine not only social factors of logistics services but also the longitudinal effect of those factors on customers' perceptions of service quality.

Furthermore, the emergence of identification factor and social dimension suggests that CD model may have some distinctive characteristics, particularly with regards to customers' perceptions of the drivers' role and identity. Our qualitative data reveal that customers may view crowdsourced drivers differently from the professional UPS or FedEx drivers, and that insight may also play a role in shaping customers' perceptions of the service. Additionally, customers start to take into consideration impacts of those new service models on the broader community and society when making purchases. Future research, therefore, could dive deeper into these distinctive characteristics of the CD model and how to incorporate these new attributes into the design of CD services to increase service performance and customer experiences.

More importantly, the qualitative findings extend the model in Study 1 and 2 by suggesting additional mechanisms through which the use of CD may affect customers' satisfaction and behavioral intentions toward the retailers. Whereas Study 2 provides an empirical evidence that increases of customer-related outcomes could be attributed to improvements of perceived on-time delivery and perceived costs associated with the crowdsourced delivery model, the theoretical explanations were only based on the operational factors proposed in the current e-LSQ framework and the findings were also limited by the data availability. The relevance of relational and social factors in customers' evaluation of service quality found in the Amazon Prime Now crowdsourced delivery context suggests that these factors might contribute to the additional gains in customer-related outcomes associated with the CD model. Future research, therefore, could empirically explore these new mechanisms to provide better understanding of the CD's effects.

Future research could also continue to expand upon limitations of this work. Specifically, even though our empirical data come from both Amazon Prime Now and Deliv services, which represent two types of CD platform arrangements, our qualitative data is restricted to the context of Amazon Prime Now service. The interpretation of the qualitative findings, therefore, needs to be taken in that context, which may limit the generalization of the findings. Future studies could explore other CD services beyond Amazon Prime Now where the retailers may not have direct control of the CD platforms. Also, despite the researcher's attempt to assure that no other events that might contribute to the changes in customers' ratings of Amazon Prime Now occurred during that same period, there might be other unobservable factors that Study 1 failed to capture due to the lack of data. The findings of the Study 1, thus, need to be interpreted in light of this limitation.

Future research can also look at how CD model works under different fulfillment strategies (point-to-point delivery vs. dynamic routing), geographical locations (urban areas with high population density vs. rural areas where distribution networks are not so developed). Another interesting angle is to look at the supply side. Given the voluntary nature of the crowdsourced networked and the on-demand nature of the service, future research can look at how to manage the risks and uncertainty associated with the supply. Furthermore, because CD is a system built upon underutilized or idled resources, its implications for sustainability might be another area to explore. Handling, storing, and transporting goods through a web of individuals could benefit local and global economies, cut greenhouse gas emissions, and may reduce the necessity for new investment in logistics infrastructure.

The retail landscape is undergoing immense transformation enabled by technological advances. The increasing trend of e-commerce adoption and increasing customer expectations will continue to fuel stronger demand for last mile delivery. CD has emerged as one advanced and innovative concept of home delivery, but successful utilization of CD only comes with understanding the economics, key benefits, challenges, and the technology required to harness CD, which I believe serves as a fruitful area for future research.

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III. Essay 2

The Impact of Motivation Message Framing on Crowdsourcing Performance

in Supply Chain Operations Tasks

1. Introduction

Changes in the business environment coupled with technological advancement (e.g. Web 2.0, mobile application) have enabled firms to tap into idled resources and capabilities beyond the firms' boundaries. The multitude of individuals in the marketplace, also referred to as the "crowd", can now participate in a wide range of business activities, from product development to product delivery (Kohler et al., 2011; Ta et al., 2015). This phenomenon of delegating work to the crowd of "ordinary" individuals in the marketplace, commonly termed as crowdsourcing (Howe, 2008), can be a viable low cost and high quality option for firms (Simula and Ahola, 2014). *A crowdsourcing firm* can implement crowdsourcing through either its own firm-hosted community or third-party providers (i.e. *crowdsourcing platforms*) who work with the firm to set up and administer portals to conduct crowdsourcing projects.

Crowdsourcing has been growing steadily in practice (Karamouzis et al., 2014). 85% of the top global brands have reported to used crowdsourcing in the last ten year with top names such as Procter & Gamble, Unilever, and Nestle (Yanig, 2015). While crowdsourcing has mostly been used for innovation and creative ideas in marketing (Pétavy, 2017), the application of crowdsourcing in supply chain management has recently flourished, primarily in last-mile delivery (Carbone et al., 2017) by top retailers such as Amazon and Walmart. Other supply chain areas, such as retail audit and supplier audit, are also increasingly being crowdsourced, albeit at a smaller scope (Ta et al., 2015).

The growth of crowdsourcing in supply chain operations has also given rise to crowdsourcing platforms such as Field Agent, Gigwalk, and WeGoLook, which rely on individuals in the marketplace to perform retail audit or supplier audit tasks. These tasks, which provide information about various aspects such as in-store display execution, on-shelf

availability, price checks, promotion efforts, as well as whether the suppliers comply with the buyer's requirements (Treasure, 1953), are traditionally done by firms' employees. Crowdsourcing taps into an open network of individuals in the marketplace, who are traditionally viewed as targeted consumers for firms (Prahalad and Ramaswamy, 2004). Unlike firms' employees and independent contractors, these crowdsourced agents are not legally bound to the firms (Krueger and Harris, 2015). Crowdsourced agents, thus, are more like "traditionally defined" consumers in the sense that they have autonomy and flexibility in participating in any crowdsourcing firm' offerings as well as ability to join different crowdsourcing platforms at the same time.

The success of a crowdsourcing projects, therefore, critically hinges on the participation and performance of crowdsourced agents (Zheng et al., 2011). In fact, nearly 90% crowdsourcing projects wither due to failures to attract participants (Dahlander and Piezunka, 2014). This is because crowdsourcing relies on the integration of micro contributions from a large enough number of participants (Zhao and Xia, 2016). The advantage of crowdsourcing, or the power of the "crowd", therefore, lies in its scalability, i.e. the ability to achieve a "critical mass" (Schenk and Guittard, 2011). Higher participation of crowdsourced actors increases not only the likelihood but also the speed at which a crowdsourced project can be completed (Zheng et al., 2014).

The performance of crowdsourced actors also dictates the quality of the crowdsourcing projects, particularly due to the nature of crowdsourced agents. Since crowdsourced participants are not professionally trained and may lack the accountability for the job, their performance may suffer instability and low quality (Aitamurto et al., 2011; Kannangara and Uguccioni, 2013). According to a study by Iren and Bilgen (2014), the cost of quality assurance associated with

crowdsourcing projects has been found to be significantly higher than other methods due to higher performance variability. Employing effective motivation strategies to foster not only participation but also performance quality in crowdsourcing, therefore, becomes a critical challenge for both crowdsourcing firms and crowdsourcing platforms (Antikainen et al., 2010). This is particularly important in operations tasks such as inventory audit as high-quality audit can yield substantial benefits for companies by maximizing the effectiveness of retail execution and supplier performance with subsequent impact on customer experience and firm profits (Raman et al., 2001; Chuang et al., 2016).

While the current crowdsourcing literature has provided some insights into the motivation of the crowds, previous work primarily focuses on motivation to participate, leaving the important question of how to enhance productivity and quality of crowdsourcing performance unanswered. In addition, prior literature mostly studies creative and abstract tasks such as idea contest, innovation, and product designs (Hossain and Kauranen, 2015). Hossain and Kauranen (2015), however, suggest that motivation of the crowds can vary based on the nature of a task. The crowd's motivation for operation tasks, which are typically more procedural and mechanical, therefore might differ from the motivation for creative tasks.

Using a field experiment setting, this study aims to address this gap in the literature by exploring ways to motivate the crowdsourced agents in order to enhance both participation and performance in crowdsourced supply chain operations activities. According to Self-determination theory (SDT) (Deci and Ryan, 1985, 2000), different types of motivation foster different behavioral outcomes. Further, Framing theory (Levin et al., 1998) suggests that the way incentives are described also exerts influence on human motivation and behaviors. The unique role that the crowdsourced agents play as an intermediary and their relationships with the

crowdsourcing platform, the crowdsourcing firm, and the consumer community could have a profound impact on their motivation to participate and perform in crowdsourcing work but has not been explored. Therefore, integrating SDT and Framing theory, this research examines the effects of different motivation messages on crowdsourced agents' participation in supply chain operations tasks as well as their performance quality. Furthermore, task complexity is also explored as a boundary condition for the effects of motivation messages on crowdsourcing outcomes.

This study makes several contributions to the current operations management literature. By demonstrating the positive effect of identification messages on crowdsourced agents' participation and performance outcomes, this study elucidates the role of the understudied identified motivation in SDT theory and the ambiguous nature of crowdsourced agents. Furthermore, the findings extend both SDT theory and framing theory by highlighting the interaction effects of identification messages and goal framing messages as well as the moderating effect of task complexity. Additionally, collective findings of this study provide insights into the nascent stream of research on crowdsourcing in operations management by exploring new mechanisms to enhance the success of crowdsourcing projects.

2. Theoretical background

2.1. Self-determination theory and motivation in crowdsourcing

The concept of motivation has been a central determinant of individual behaviors in organizations, which in turn impact organizational performance (Deci, 1971; Greene et al., 1976; Frey, 1992). As a macro-theory of human motivation, SDT (Deci and Ryan, 1985) concerns with the interrelations among different types of human motivation and the impact of social

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environments on motivation, affect, and human behaviors. SDT suggests that motivated behaviors vary in the degree to which they are self-determined, i.e. behaviors that are driven by internal forces within one's self such as joy, without external influence or interference (Ryan, 1982). The more internally driven the behaviors, the greater sense of freedom and volition people will feel when performing the behaviors. These behaviors are associated with positive emotional experiences, and generally tend to lead to better performance outcomes and higher satisfaction (Deci et al., 1994; Koestner and Losier, 2002; Ryan and Deci, 2000).

SDT categorizes three types of motivation: intrinsic, identified, and extrinsic motivation, ranging from the most to the least internally driven (Ryan and Deci, 2000). While intrinsic and extrinsic motivation has long been emphasized in the organizational literature (e.g., Hezberg, 1968; McGregor, 1960; Deci et al., 1994), identified motivation has received much less attention (Gagné and Deci, 2005) despite its importance in some contexts. According to SDT, a behavior can become more internally motivated if people realize the importance of performing the behavior even though people may not inherently enjoy the behavior itself. This is referred as identified motivation. An identification occurs when a person integrates a behavior with one's personal values and feel that performing the behavior is important to their self-identity, or to who they are (Ryan and Deci, 2000). SDT also postulates that the effect of different types of motivation may vary based on a variety of contextual factors, such as environment climate, nature of the tasks, and personal characteristics (Gagne and Deci, 2005).

Human motivation to participate in crowdsourcing creative tasks has been a central topic in the nascent crowdsourcing literature. In sum, the literature has identified a myriad of factors that motivate people in crowdsourcing work. The reasons can be intrinsic, for example, people participate in crowdsourced innovations because they wished to contribute to the society

(Zeitlyn, 2003), or because they found the tasks fun, enjoyable, or intellectually stimulating (Von Hippel and Von Krogh, 2003; Jeppesen and Frederiksen, 2006; Von Krogh et al., 2012; Ridings and Gefen, 2004; Wasko and Faraj, 2000; Lemeister et al., 2009). Most people were also found to participate in open innovations or idea contests for extrinsic reasons, namely for monetary rewards (Antikainen and Vaataja, 2008, Antikainan et al., 2010; Lemeister et al., 2009), firm recognition (Jeppesen and Fredeiksen, 2006); peer recognition (Hargadon and Bechky, 2006), or reputation (Bagozzi and Dholakia, 2002; Lakhani and Wolf 2005; Wasko and Faraj, 2005; Lemeister et al., 2009), or because they feel a sense of obligation to contribute from their external environment (Brant et al., 2005; Lakhani and Wolf, 2005).

Despite being one of important type of motivation proposed by SDT, identified motivation has received little attention, particularly in crowdsourcing work. Nevertheless, Auh et al. (2007) found that customers who strongly identify with a firm are more likely to involve in co-production with the firm in financial services. Furthermore, prior literature suggests that whereas intrinsic motivation was found to yield better performance in tasks that are deemed "interesting", identified motivation could increase performance and satisfaction in tasks that may be not inherently "interesting" but that are important and disciplinary (Koestner and Losier, 2002). Since the nature of supply chain operations tasks, which is different from idea contest or innovation competitions, typically requires discipline to follow a fixed set of instructions (Schenk and Guittard, 2011), identified motivation might be more conducive to this task environment.

Additionally, as aforementioned, ensuring a high quality of crowdsourcing projects is critical, especially in supply chain operations context. However, crowdsourcing projects are prone to quality failures either because crowdsourced individuals are more likely to make errors

or to cheat the system than professional ones (Iren and Bilgen, 2014). Understanding

crowdsourced agents' motivation to perform, thus, is important to enhance their performance.

The topic, nevertheless, has not been examined in the current literature (Zheng et al., 2011).

Moreover, crowdsourced agents play a multifaceted role as an individual consumer, an

"employee" of a crowdsourcing platform, and a service provider to a crowdsourcing firm

(Humphreys and Greyson, 2008; Harris and Krueger, 2015). Unlike traditional firm employees,

crowdsourced agents are not legally attached to any crowdsourcing platforms and can join

multiple platforms at the same time. In a crowdsourcing model in which a crowdsourcing

platform is involved, crowdsourced agents may not even be aware of the crowdsourcing firms

they perform the tasks for (Zheng et al, 2014). The nature of the supply chain operations tasks

and the distinctive role of crowdsourced agents, therefore, may provide new insights into the

motivation of crowdsourced agents in this context.

2.2. Framing theory

While SDT concerns the effect of types of motivation on human behaviors, the way

motivation messages are described can also influence people's attitudes and behaviors. This is

explained by the literature on message framing (Tversky and Kahneman, 1981; Levin et al.,

1998; Chong and Druckman, 2007). "The framing effects" broadly refer to occurrences when

alternative phrasing of the same basic issue produces changes of opinion and behaviors of

message recipients (Zaller, 1992). The major premise of framing theory is that an issue can be

viewed from a variety of perspectives and that decision makers respond differently to different

but objectively equivalent descriptions of the same issue (Levin et al., 1998; Chong and

Druckman, 2007).

Although there are other types of framing, the current literature has mainly focused on three types: risky choice, attribute, and goal framing (Levin et al., 1998). While previous studies have consistently supported hypothesized effects of risky choice framing and attribute framing, the evidence for goal framing effect has been lacking (Levin et al., 2002). Goal-framing effects occur when a persuasive message has different appeal depending on whether it emphasizes *the positive consequences of performing an act or the negative consequences of not performing the act*. Similar to risky choice framing, it is expected that negative goal framing is more persuasive because people tend to be loss averse, i.e. they are more motivated to avoid a loss than to achieve a gain of the same magnitude (Levin et al., 1998).

In operations and supply chain management literature, risky choice framing effect has been supported in decisions such as supply chain contract selection (Katok and Wu, 2009), pricing contract (Ho and Zhang, 2008), supply chain payment (Kremer and Van Wassenhove, 2014), and inventory ordering (Schweitzer and Cahon, 2000; Tokar et al., 2016). Notably, Hossain and List (2012) have shown that framing worker bonus incentives in terms of losses can lead to higher worker productivity than posing the bonuses as gains. Bendoly (2013) also found that penalty-focused feedback increases the extent to which decision makers adhere to decision guidelines and experience greater levels of stress than benefit-framed feedback in resource allocation decisions. In general, research on framing effects, particularly goal framing, has been sparse and confined to a limited set of settings while framing effects have been suggested to depend to a great extent on contextual nuances (Levin et al., 1998).

3. Hypothesis development

Drawing on the underpinnings of SDT and Framing theory and the crowdsourcing literature, this research examines different motivation messages as a mechanism to enhance

crowdsourcing performance outcomes such as participation, quality, and satisfaction with the task in supply chain operations tasks. *Figure 1* captures the overall theoretical model, in which the effects of three factors, including identification messages, goal framing messages and task complexity, as well as their interactions on the crowdsourcing tasks' outcomes are investigated.
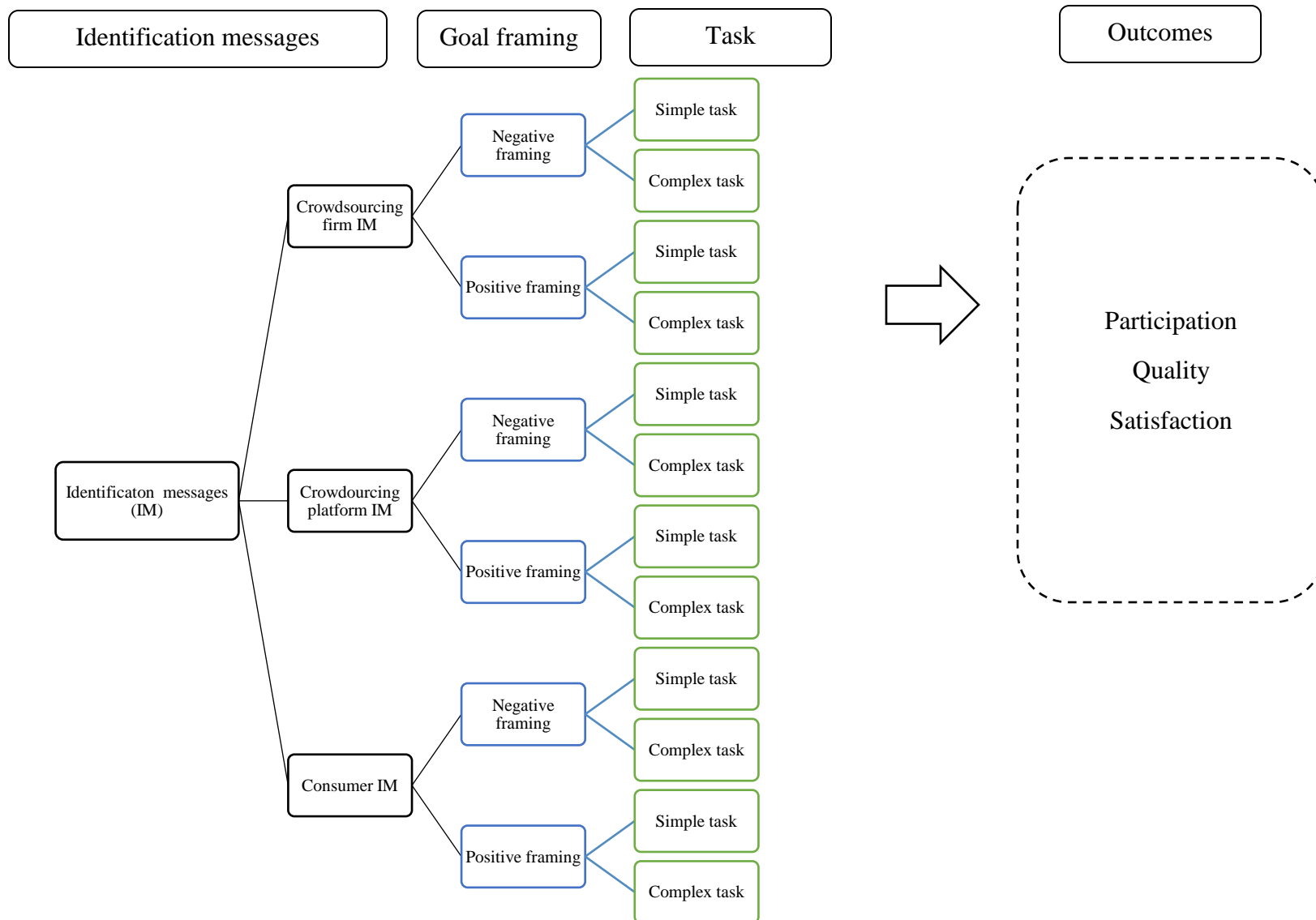
Figure 1. Theoretical model

Even though the literature on framing theory has mainly focused on the comparison between negative and positive presentations of a message, framing effect in its broadest sense refers to the effect of different emphases of the same message (Chong and Druckman, 2007). Specifically, this study examines the effect of presenting motivation messages differently to induce identified motivation for crowdsourced agents. As previously discussed, crowdsourced agents assume a multifaceted role: as an individual consumer on the marketplace, as a member of a crowdsourcing platform, and as a service provider for a crowdsourcing firm. This multi-sided role, as such, composes part of their identity. SDT suggests that the stronger the identification, the more motivated people are in performing a behavior (Ryan and Deci, 2000). Identification has been found to facilitate people's motivation in accord with a group's goals and engagement in the behaviors endorsed by that group (Ellemers et al., 2004; Kelman, 1958). Framing that emphasizes each part of this role can increase crowdsourced agents' identified motivation, and therefore, may impact crowdsourced agents' behaviors.

Since crowdsourced agents are independent workers who can participate in different platforms for different firms, they have weak attachments to a crowdsourcing platform or a crowdsourcing firm (Krueger and Harris, 2011). The consumer identity, however, is an invariable component of crowdsourced agents' overall identity, hence, may be the strongest identity out of the three (Cook, 2013). In fact, Lakhani and Wolf (2005) found that community identification is a strong determinant of contribution made to open source software projects as contributors cited a strong sense of self-identification with the community. In another crowdsourcing research, Rogstadius et al. (2011) showed that people were more accurate when they thought they were helping other people than they were helping a specific company. As such, enhancing identified motivation with the consumer community may have the strongest effects on

crowdsourced agents' behaviors. Therefore, a message emphasizing identification with the consumer community is expected to induce greater identified motivation for crowdsourced agents than a message emphasizing identification with a crowdsourcing platform or with a crowdsourcing firm, thus, leading to higher behavioral outcomes and satisfaction with the task.

Hypothesis 1 (H1). Task participation (H1a), task quality (H1b), and task satisfaction (H1c) will be higher for consumer community identification messages (CIM) than for crowdsourcing platform identification messages (CPIM), and for crowdsourcing firm identification messages (CFIM).

Framing theory suggests that the manner in which motivation messages are described also can influence the way people interpret and understand the meaning, and thus affecting people's subsequent attitudes and actions (Chong and Druckman, 2007; Levin et al., 1998; Thaler, 1980). Goal framing affects the persuasiveness of a message by stressing either the positive consequences of performing an act (i.e. positive framing) or the negative outcomes of not performing (i.e. negative framing) (Levin et al., 1998). Negative goal framing is thought to trigger the "loss aversion" effect, in which people are more likely to take risks due to stronger fear to avoid potential losses than to achieve potential gains (Tversky and Kahneman, 1981; Levin et al., 1998). Indeed, Tokar et al. (2016) found that decision makers in inventory control scenarios exhibit higher behavioral intentions upon reading a negative framing message. Following this logic, I argue that framing the outcome in a negative fashion (i.e. as a potential loss) will be more effective in motivating crowdsourced agents to participate, to perform better, and to be more satisfied than framing the outcome as a potential gain.

Hypothesis 2 (H2). Task participation (H2a), task quality (H2b), and task satisfaction (H2c) will be higher for negative framing messages than positive framing messages.

Previous studies suggest that negative framing is more effective under a high level of message involvement, i.e. when people are strongly involved with an issue (Maheswaran and Meyers-Levy, 1990). This is because when people are strongly concerned with the issue, they are more likely to scrutinize the message diligently. In contrast, when people are little involved, message persuasiveness is more likely to be determined by simple inferences derived from peripheral cues (Jain and Maheswaran, 2000). In such low involvement context, people were found to be more persuaded when extraneous cues are positive rather than negative (Maheswaran and Meyers-Levy, 1990). Since identification messages affect the level of identified motivation people feel with the task, which in turn is likely to affect their effort to process the task messages (Deci et al., 1994), identification messages are likely to affect the goal framing effect. Specifically, in the presence of consumer identification messages, people's perceived involvement with the task is likely to be higher than in the presence of crowdsourcing firm identification messages or crowdsourcing platform identification messages. Negative framing, therefore, is likely to be more effective than positive framing in the presence of consumer identification messages than in the presence of the other two.

Hypothesis 3 (H3). Identification messages will strengthen the effect of negative framing on a) task participation, b) task quality, and c) satisfaction with the task such that the effect of negative framing will be stronger in the presence of CIM than in the presence of CPIM or CFIM.

SDT also postulates that the effect of different types of motivation may vary based on a variety of contextual factors, such as nature of the task (Gagne and Deci, 2005). Behavioral

operations research on framing also observed and speculated that the effects of framing on inventory performances may depend on the complexity of the task environment (Tokar et al., 2016). Research on task characteristics has identified five task dimensions, including task complexity, task identity, task significance, task autonomy, and feedback (Hackman and Oldham, 1975). However, previous research has suggested that these five job characteristics may be best regarded as comprising a single task-complexity construct (Dunham, 1976; Roberts and Glick, 1981; Pierce et al., 1989). In line with existing literature, this study adopts this conceptualization of task complexity, which captures the extent to which a task is multifaceted and difficult to perform (Humphrey et al., 2007).

Complex tasks involve the use of a greater skill variety and a higher skill level, thus, they tend to require more efforts and cognitive resources from task executors (Klemz and Gruca, 2003; Shalley et al., 2009). Complex tasks, as such, leave little remaining resources to process other activities, or in other words, low level of processing opportunity. When people are involved in the message and motivated to process the message, however, their cognitive elaboration does not significantly differ (Webster et al., 1996). People in such situation could exert similar level of cognitive processing regardless of different levels of processing opportunity (Wright, 1974; Shiv et al., 2004). People under conditions high processing motivation are more attentive to the message claim, and thus, are more prone to negative framing (Shiv et al., 2004). Because consumer identification messages are argued to associate with higher level of identified motivation, it is therefore hypothesized that in the presence of consumer identification messages, negative framing is likely to be more effective irrespective of task complexity.

Hypothesis 4a (H4a). Negative framing is more effective than positive framing when consumer identification messages are present, regardless of task complexity.

In contrast, when people are less motivated and less engaged in the task message, the level of cognitive elaboration will differ across different levels of processing opportunity (Wright, 1974; Shiv et al., 2004). In such cases, for complex tasks, which connote low levels of processing opportunity, people are less likely to scrutinize the message claims. Instead, they rely more on claim-related heuristics, which favor negative framing (Chaiken et al., 1996). Because the presence of crowdsourcing platform identification messages is hypothesized to associate with lower levels of motivation, it is then expected that negative framing is more effective than positive framing for complex tasks. On the contrary, for simple tasks, which entail low cognitive requirements and high levels of processing opportunity, heuristics related to the valence of the message frame are more accessible (Shiv et al., 2004). In other words, people are more prone to the valence of the message frame. Since these heuristics favor positive framing (Wright, 1974; Roskos-Ewoldsen and Fazio, 1992), positive framing is likely to be more effective than negative framing for simple tasks when processing motivation is low, i.e. in the presence of CPIM.

Hypothesis 4b (H4b). Negative framing is more effective than positive framing when crowdsourcing firm identification messages are present for complex tasks.

Hypothesis 4c (H4c). Positive framing is more effective than negative framing when crowdsourcing firm identification messages are present for simple tasks.

4. Methodology

4.1. Experimental design and protocol

This research employs field experiment method to empirically examine the proposed theoretical model. A field experiment is the application of the experimental method in natural settings. Field experiments allow the design and implementation of creative treatments to identify causal relationships, at the same time have great potential to reveal actionable insights for managers (Chatterji et al., 2016). Experimental stimuli are carefully developed through pretesting to ensure that the manipulations work as intended (Perdue and Summers, 1986). The stimuli are developed based on previous literature. Specifically, goal framing messages are adapted from Levin et al. (1998). Identification messages are adapted from Ren et al., (2007) and Auh et al. (2007).

Participants for the experiments are crowdsourced agents recruited through a crowdsourcing platform. The platform uses mobile app technology to crowdsource the retail audit jobs to willing participants based on GPS locations. In this experiment, participants take part in a retail audit task created by the researcher. The task requires agents to complete a series of actions to check the on-shelf inventory level for a specific product, a cereal box, at a big US-based retailer's stores. The task is designed to mimic real retail audit tasks that other companies previously posted on the crowdsourcing platform.

When the task is posted on the crowdsourcing platform, the agents receive a notification in the mobile app informing them of the task. The agents can also read the task description before deciding to accept the task. Once the task is accepted or reserved, the agents have two hours to complete the task. The experimental manipulation, presented in Appendix 1, is delivered

in the push notification sent to the agents' mobile app and in the task description. Once an agent completes the task and submits it, the quality team at the crowdsourcing platform reviews the quality of the submission and determines whether to accept or reject the submission. Participants get paid $6 for an accepted task regardless of task complexity. The payment amount is recommended by the crowdsourcing platform to be in line with similar tasks on the platform.

The experiment is a 3x2x2 between subject experimental design. Three variables: identification messages (consumer identification, crowdsourcing platform identification, crowdsourcing firm identification) x goal framing (positive, negative) x task complexity (low, high) are manipulated. Participants are randomly assigned to 12 treatments. A power analysis conducted in G-Power 3.1 suggests an estimated sample size of 318. The final sample size for data analysis is 350. Table 1 presents the sample size of each treatment cell. Participants' demographic characteristics are summarized in Table 2. Participants come from 37 states in the US with the highest proportion from California (10.9%). The average agent completes 134 jobs and earns a total $592 in one's lifetime on the crowdsourcing platform. For this specific task, the average time for the agents to reserve the task was 8.97 days, and to actually complete the task was 1.9 hour. In the end, 84.6% of the submissions were accepted (see Table 3 for acceptance rates for each treatment).

Table 1. Treatment sample size

	Simple task (TC=0)		Complex task (TC=1)	
	Positive framing (GF=0)	Negative framing (GF=1)	Positive framing (GF=0)	Negative framing (GF=1)
Crowdsourcing firm identification messages (IM=0)	30	31	28	28
Crowdsourcing platform identification message (IM=1)	30	30	28	28
Consumer identification message (IM=2)	30	30	29	28

Table 2. Sample characteristics (N=350)

Demographics	Percentage	Demographics	Percentage
Race		Education	
Caucasian	13.7%	*High school (or equivalent)*	7.1%
African American	7.1%	*2-year college*	13.7%
Latino	24.6%	*4-year college*	38%
Asian	38%	*Post graduate degree*	15.7%
Other	16.6%	*Others*	25.5%
Gender		Annual household income	
Female	27.1%	*Less than $35,000*	11.1%
Male	72.9%	*$35,000-$39,999*	7.1%
Age		*$40,000-$49,999*	8.9%
18–34	18.9%	*$50,000-$64,999*	19.4%
35–54	69.4%	*$65,000-$74,999*	12.3%
over 55	11.7%	*More than $75,000*	41.1%

Table 3. Acceptance rates across treatments

	Simple task		Complex task	
	Positive GF	Negative GF	Positive GF	Negative GF
CFIM	19 (5.4%)	23 (6.6%)	10 (2.9%)	20 (5.7%)
CPIM	24 (6.8%)	29 (8.3%)	18 (5.1%)	26 (7.4%)
CIM	28 (8%)	36 (10%)	28 (8%)	35 (10%)

4.2. Measures

After completing the task, participants are asked several questions. All measures use a 5-point scale ranging from (1=Completely disagree) to (5=Completely agree). The outcome variables of interests are task participation, task quality, and post-task satisfaction. *Task participation* is captured by two separate variables: reservation time and completion time. Reservation time and completion time, i.e. the time it takes for a crowdsourced agent to accept and complete the task, arguably reflect the extent to which a message attracts a participant's attention and induces the participant to partake in the task. One could argue, the short reservation and completion time, the higher the participation level of the agents. Reservation time is measured as the difference between the time the task is launched in the system and the time a crowdsourced agent accepts, while completion time measures the difference between the time a crowdsourced agent accepts the task and the time the agent completes the task. *Task quality* captures how well the participants perform the task and is measured by a binary variable, denoted as 1 if a submission is accepted by the quality team of the crowdsourcing platform and 0 otherwise. Lastly, *post-task satisfaction* captures participants' pleasurable or positive emotional

state resulting from the task experience (Tsiros et al., 2004), which is measured as a Likert-scale survey question delivered to participants after the task is completed.

Manipulation check variables in the post-task survey include perceived task complexity (Gupta et al., 2013), goal framing (White et al., 2011), and identification message framing (Morgeson and Humphrey, 2006). Based on prior literature on SDT and framing theory, several control variables are also incorporated in the model, namely task intrinsic motivation (Ryan and Cornell, 1989), attitude toward the retailer (Mathwick and Rigdon, 2004), task self-efficacy (Meuter et al., 2005), knowledge about the product (Shiv et al., 2004), and perceived fairness of the payment (Hardesty et al., 2002). Demographic information about participants is also obtained by linking participants' ID with their profiles on the crowdsourcing platform. These variables include state of residence, number of jobs completed, number of jobs denied, total earnings, gender, age, ethnicity, education, and household income.

A pre-test is conducted using 33 students to ensure the manipulations have intended effect. All manipulation checks were significantly different across treatments ($F(1,32)=8.9$, $p<005$ for task complexity, $F(1,32)=7.5$, $p<0.05$ for goal framing, and $F(2,31)=6.3$, $p<0.05$ for identification messages).

5. Analysis and results

5.1. Measurement model

Measure reliability was assessed via Cronbach's alpha and composite reliability for each factor. Each was well above the threshold of 0.7 (Nunnally and Bernstein, 1994). Additional psychometric properties of all model factors were assessed using confirmatory factor analysis (CFA) in AMOS 23. The CFA results indicate good model fit with RMSEA = 0.05; SRMR =

0.057; CFI = 0.96; TLI = 0.95; IFI = 0.95 (Kline, 2005)[1]. The average variance extracted (AVE)

for each factor exceeds the recommended threshold of 0.5 (Fornell and Larcker, 1981), and all

factor loadings are greater than 0.5 and significant at the $p < 0.001$ level. Additionally, the shared

variances between all possible construct pairs are lower than the AVE for the individual

constructs (Fornell and Larcker, 1981). In sum, the scales for all measures exhibit both

convergence and discriminant validity. Table 4 presents all the measurement items for all

constructs together with their mean, standard deviation, and standard loadings, while Table 5

summarizes the scale validation.

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[1] RMSEA = root mean square error of approximation. CFI = confirmatory fit index. TLI = Tucker–Lewis index. IFI= incremental fit index. SRMR = standardized root mean residual.

Table 4. Measurement model

Item/Construct	Sample
__Post-task satisfaction__ (adapted from Tsiros, Mittal, and Ross, 2004)	M=3.3, SD=0.87
1. I am satisfied with this job.	0.81*
2. I am pleased with this job.	0.78*
3. I am happy with my performance in this job.	0.77*
__Post-task intrinsic motivation__ (adapted from Ryan and Cornell 1989)	M=3.13, SD=0.66
1. I think this task is fun.	0.99*
2. This task is interesting to me.	0.86*
3. I think I enjoy this task.	0.99*
__Fairness of payment__ (adapted from Hardesty, Carlson, and Bearden, 2002)	M=3.87, SD=0.65
1. The payment for this task represents a fair price.	0.68*
2. The payment for this task seems fair to me.	0.88*
__Task self-efficacy__ (adapted from Meuter et al., 2005)	M=3.94, SD=0.84
1. I am fully capable of completing this task.	0.99*
2. I am confident in my ability to do this task.	0.89*
3. Completing this task is well within the scope of my abilities.	0.95*
__Product knowledge__ (adapted from Chang, 2004)	M=3.46, SD=0.49
1. I know a lot about cereal products.	0.92*
2. I would consider myself an expert in terms of my knowledge of cereal products.	0.96*
3. I usually pay a lot of attention to information about cereal products.	0.97*
4. I know more about cereal products than my friends do.	0.97*
__Attitude toward the retailer__ (adapted from Mathwick and Rigdon, 2004)	M=2.98, SD=01.35
1. I have a favorable attitude toward [the retailer].	0.97*
2. I believe [the retailer] is a good company.	0.98*
3. I say positive things about [the retailer] to other people.	0.96*
Manipulation check	
__Crowdsourcing firm identification message__ (adapted from Morgeson and Humphrey, 2006)	M=2.68, SD=1.46
1. I think this task is important to [crowdsourcing firm Y].	0.99*
2. The results of my works are likely to significantly affect [crowdsourcing firm Y].	0.99*
__Crowdsourcing platform identification message__ (adapted from Morgeson and Humphrey, 2006)	M=2.78, SD=1.35
1. I think this task is important to [crowdsourcing platform X].	0.98*
2. The results of my works are likely to significantly affect [crowdsourcing platform X].	0.99*
__Consumer identification message__ (adapted from Morgeson and Humphrey, 2006)	M=2.92, SD=1.24
1. I think this task is important to other cereal shoppers.	0.90*
2. The results of my works are likely to significantly affect other cereal shoppers.	0.89*
__Goal framing__ (adapted from White et al , 2011)	M=3.02, SD=1.54
1. The message stresses the monetary gain of completing the task.	0.91*
2. The message stresses the potential monetary loss of not completing the task. (reverse-coded)	0.98*
__Perceived task complexity__ (adapted from Gupta et al., 2013)	M=2.76, SD=1.37
1. I found this to be a complex task.	0.89*
2. This task was mentally demanding.	0.88*
3. I found this to be a challenging task.	0.91*

Notes: The confirmatory factor analyses used a MLM estimator. Standardized loadings are reported for each item. M = Mean. SD = Standard Deviation. *$p < .05$.

Table 5. Reliability, convergent and discriminant validity of the measurement model

	α	CR	AVE	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1. Task motivation	0.95	0.97	0.90	**0.95**										
2. Self-efficacy	0.96	0.96	0.89	-0.04	**0.95**									
3. Firm identification framing	0.99	0.99	0.99	0.07	0.10	**0.99**								
4. Satisfaction	0.83	0.83	0.70	-0.14	-0.06	-0.82	**0.84**							
5. Attitude toward the retailer	0.98	0.98	0.95	0.02	-0.03	0.03	-0.01	**0.97**						
6. Platform identification framing	0.99	0.99	0.98	-0.03	0.01	-0.58	0.40	-0.07	**0.99**					
7. Consumer identification framing	0.89	0.89	0.81	-0.04	-0.02	-0.49	0.54	0.02	-0.18	**0.90**				
8. Product knowledge	0.98	0.98	0.92	-0.03	-0.02	0.08	-0.09	0.02	-0.02	-0.04	**0.96**			
9. Task complexity	0.92	0.92	0.80	0.08	0.00	0.01	-0.03	0.03	-0.02	-0.01	-0.05	**0.90**		
10. Goal framing	0.95	0.95	0.90	0.03	0.01	-0.16	0.34	0.02	0.04	0.01	-0.04	0.03	**0.95**	
11. Fairness of payment	0.76	0.77	0.64	0.01	-0.01	-0.18	0.21	0.00	-0.03	0.25	-0.04	-0.03	0.08	**0.80**

Note: α = Cronbach's alpha. CR = composite reliability (ρ). AVE = average variance extracted.   The bold diagonal line represents squared roots of AVE.

5.2. Treatment checks

Following Bachrach and Bendoly (2011), manipulation check and confound check are conducted and the results are summarized in Table 6. Manipulation check verifies whether participants across conditions interpret the nature of the manipulation as intended (Bachrach and Bendoly, 2011; Perdue and Summers, 1986). Three MANOVA with crowdsourcing firm identification message (CFIM), crowdsourcing platform identification message (CPIM), and consumer identification message (CIM) as dependent variables are performed. The results show that CIM is significantly higher in the treatment with the consumer identification message (M=4.4, SE=0.057), CPIM higher in the treatment with the crowdsourcing platform identification message (M=4.42, SE=0.5), and CFIM higher in the treatment with the crowdsourcing firm identification message (M=4.56, SE=0.045) than in other treatments. The results indicate that identification messages are perceived as intended. Similarly, the ANOVA results suggest that the message is perceived positively in positive framing condition (M=4.49,

SD=0.5) and negatively in negative framing condition (M=4.55, SD=0.5). The manipulation is also shown to be effective for task complexity as the task is perceived to be more complex (M=4.1, SD=0.5) for the complex condition than for simple condition (M=1.5, SD=0.3). At the same time, there are no significant differences in "goal framing" and "perceived task complexity" among "consumer", "crowdsourcing firm", and "crowdsourcing platform identification message" treatments. As suggested in Table 4, the results also indicate no significant differences in "CIM", "CFIM", and "CPIM" between negative and positive framing treatments, as well as between simple and complex task treatments. As in Bendoly and Swink (2007), these results assure concerns regarding manipulation confound effects.

Furthermore, I also check for the Hawthorne effects (Adair, 1984) to assess if treatments may have changed the participants' goals or motivations, which could subsequently affect observed differences between treatment groups. To alleviate concern in this regard, I follow Bendoly et al. (2014) and test whether post-task intrinsic motivation does not differ significantly across treatments. The ANOVA result shows no significant difference ($F(11, 338)=1.18$, $p=0.3$), indicating little concern of potential Hawthorne effects.

Table 6. Manipulation check and confounding check results

Treatments	CFIM	CPIM	CIM	Goal framing	Task complexity
Identification messages	F(2,347)= 103***	F(2,347)=89***	F(2,347)=54***	F(2,347)=0.06	F(2,347)=0.02
Goal framing	F(1,348)=0.67	F(1,348)=0.83	F(1,348)=0.06	F(1,348)= 64***	F(1,348)=0.082
Task complexity	F(1,348)=0.12	F(1,348)=0.39	F(1,348)=0.04	F(1,348)=0.38	F(1,348)=38***

Note: ***significant at 0.001 level (2-tailed), otherwise not significant.

5.3. Hypothesis testing

The hypotheses are tested using MANOVA for task participation and satisfaction as dependent variables and logistics regression for task quality as a binary outcome variable. Control variables in the model include task self-efficacy, intrinsic motivation, product knowledge, fairness of payment, attitude toward Walmart, age, ethnicity, education, number of jobs completed, and household income. The results were summarized in Table 7. Figure 2 graphs the 3-way interactions.

Hypothesis 1 predicts the main effect of identification messages. Significant differences are found for all dependent variables ($F(2, 314)= 35.55$, $p<0.001$ for reservation time, $F(2,314)=23.5$, $p<0.001$ for completion time, $F(2,314)= 65.8$, $p<0.001$ for satisfaction, and Wald $\chi^2 =16.5$, $p<0.001$ for quality). Reservation time and completion time are longer in the presence of crowdsourcing firm identification messages (M=12.02, SE=0.054; M=2.28, SE=0.027 respectively) than crowdsourcing platform identification messages (M= 9.25, SE=0.053; M= 2.2, SE=0.027), and consumer identification messages (M=5.64, SE=0.54; M=1.5, SE=0.27). Similarly, post-task satisfaction is the highest for CIM (M=3.82, SE=0.037) compared to CPIM (M=3.7, SE=0.037) and CFIM (M=2.39, SE=0.037). The likelihood of a submission to be accepted is also higher for CIM (b=1.97, SE=0.68) and for CPIM (b=1.3, SE=0.64) than for CFIM. *Hypotheses 1a, 1b, 1c, thus, are all supported.*

Hypothesis 2 tests the main effect of goal framing. The results show that negative framing is associated with significantly shorter reservation time (ΔM=-1.98, SE=0.06, p<0.001), higher post-task satisfaction (ΔM=0.51, SE=0.043, p<0.001), and higher task quality (b=3, SE=0.59, p<0.001) than positive framing. However, there is no significant difference in

completion time. *Hypothesis 2b and 2c, therefore, are fully supported while 2a is partially supported.*

Hypothesis 3 assesses the interaction effect of goal framing and identification messages. The interaction terms are significant for reservation time ($F_{(2,314)}=40.3$, $p<0.001$) and for satisfaction ($F_{(2,314)}=58.3$, $p<0.001$), but not for completion time or task quality. *Hypothesis 3a, thus, is partially supported, while H3c is fully supported*, indicating that the effect of negative framing on task reservation time and satisfaction is stronger when a CIM is present. *H3b, however, is not.*

Lastly, hypothesis 4 predicts the three-way interactions of goal framing, identification messages, and task complexity. Similar to H3, the three-way interaction terms are also significant for reservation time ($F_{(2,314)}=8.1$, $p<0.001$) and satisfaction ($F_{(2,314)}=4.6$, $p=0.018$), but not for completion time or task quality. According to the results, when a CIM is present, negative framing is more associated with higher satisfaction ($\Delta M= 1.35$, $SE=0.07$, $p<0.001$), and shorter reservation time ($\Delta M= -1.74$, $SE=0.1$, $p<0.001$) than positive framing, regardless of task complexity. *This provides partial support for Hypothesis 4a.* When a CFIM is present, however, negative framing is more effective in increasing satisfaction ($\Delta M= 0.583$, $SE=0.1$, $p<0.001$) and reducing reservation time ($\Delta M= -0.2.275$, $SE=0.15$, $p<0.001$) only for complex tasks. For simple tasks and in the presence of a CFIM message, positive framing is more effective to reduce reservation time ($\Delta M= -3.3$, $SE=0.14$, $p<0.001$), but has no differential effects on completion time, post-task satisfaction, or task quality. *Hypotheses 4b and 4c, thus, are also partially supported.*

Table 7. Summary of results

Variables	Model 1			Model 2
	MANOVA			**Logistics regression**
	Reservation time	Completion time	Satisfaction	Task quality
Identification message (IM)	F(2,314)=35.55***	F(2,314)=23.5***	F(2,314)=65.8***	Wald χ2 = 16.5***
Goal framing (GF)	F(1,314)=33.5***	ns	F(1,314)=14.1***	b=3, SE=0.59***
IM x GF	F(2,314)=40.3***	ns	F(2,314)=58.3***	ns
Task complexity (TC)	ns	F(1,314)=5*	ns	ns
IM x GF x TC	F(2,314)=8.1***	ns	F(2,314)=4.6*	ns
Control variables				
Intrinsic motivation	F(1, 314)=5.5*	F(1, 314)=5*	F(1, 314)=7.5*	b=3.2***, SE=0.5
Task self-efficacy	F(1,314)=4.3*	F(1,314)=4.8*	ns	b=2.5**, SE=0.6
Fairness of payment	ns	ns	ns	ns
Product knowledge	F(1,314)=3.8*	F(1, 314)=4.1*	ns	ns
Attitude toward the retailer	ns	ns	ns	ns
Jobs completed	ns	ns	ns	ns
Age	ns	ns	ns	ns
Gender	ns	ns	ns	ns
Ethnicity	ns	ns	ns	ns
Income	ns	ns	ns	ns
Education	ns	ns	ns	ns

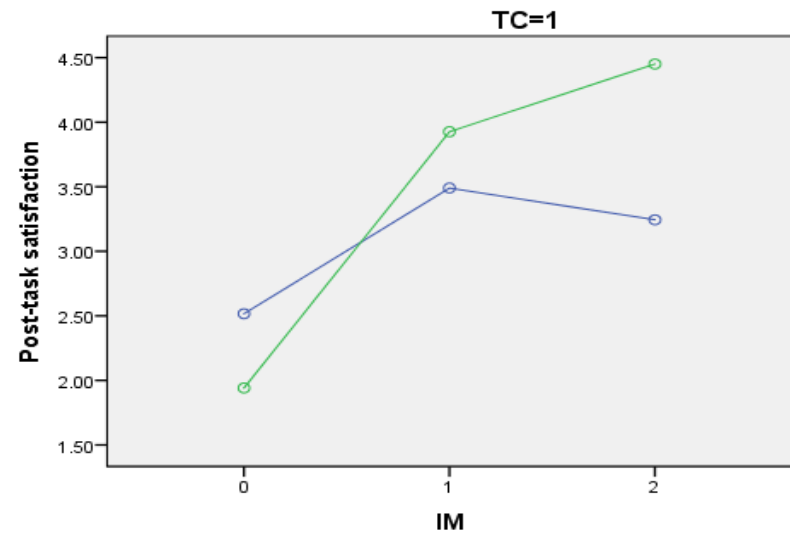* Significant at p<0.05, ** significant at p<0.01, ***significant at p<0.001, ns = "not significant" at p<0.05.
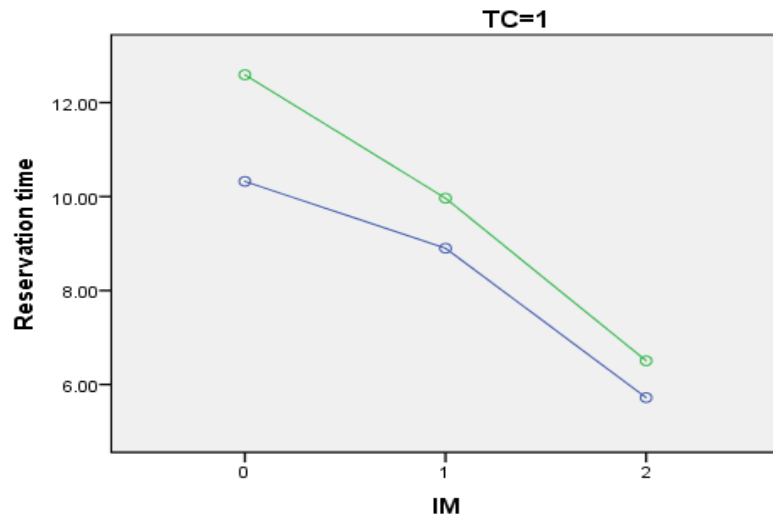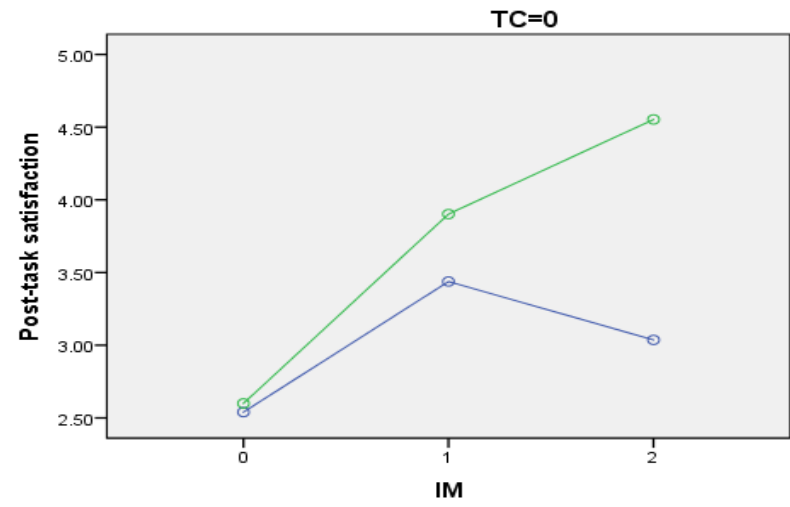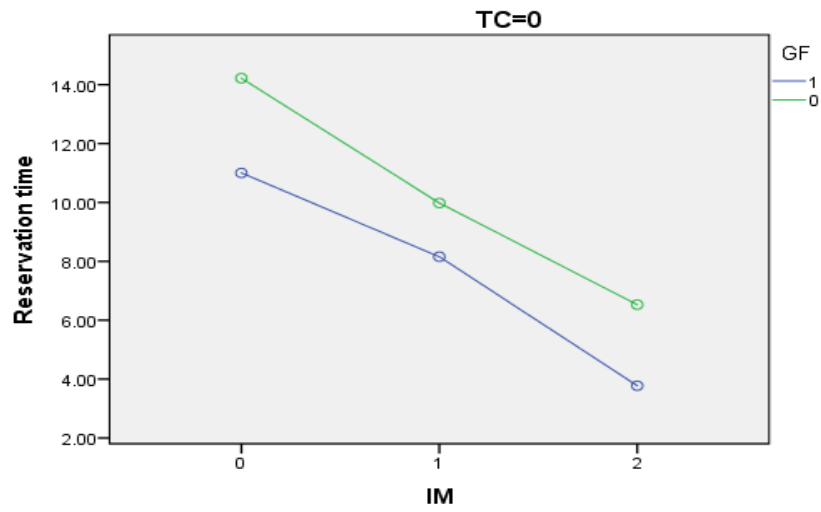
Figure 2. Graphs of 3-way interactions among identification messages (IM), goal framing (GF), and task complexity (TC)

6. Discussion and implications

This study begins to examine the effects of motivation messages and framing to improve crowdsourcing participation and performance in supply chain operations. A key result is that identification messages could significantly impact crowdsourced agents' participation, quality, and post-task satisfaction. Particularly, consumer identification messages have the strongest effects on crowdsourced agent's behaviors and perception compared to crowdsourcing platform and crowdsourcing firm identification messages. One possible explanation for this effect is that crowdsourced agents might have a stronger sense of belonging and connection with the broader consumer community than with the specific crowdsourcing platform or crowdsourcing firm. Therefore, when a message highlights that linkage, it triggers stronger motivation to work toward an outcome that benefits the crowdsourced agents' subject of identification.

This finding contributes to the emergent literature on crowdsourcing by illuminating the nature of crowdsourced agents. Specifically, current debates exist in the literature regarding the relationships between the crowdsourced agents and the firms (Felstiner, 2011; Ford et al., 2015). There are arguments that consumers-agents are neither employees of the firms nor independent contractors (Krueger and Harris, 2015). They are independent individuals in the marketplace that are not legally bound to any firms. However, their actions have important implications for the operational performance of the firms, thus, understanding this new type of "employment" relationship is critical to motivate their performance in this new context. The result of this study may provide some evidence to support the aforementioned argument, suggesting that crowdsourced agents might feel more connected to the consumer community than to a specific crowdsourcing firm or platform.

The findings also support the effect of goal framing. Consistent with framing theory, negative framing is found to be more effective than positive framing. Participants in the negative framing take shorter time to accept the task and achieve better performance. In addition, negative framing also leads to higher post-task satisfaction, which has been shown to increase willingness to commit to new challenges, or subsequent participation (Locke and Latham, 2002). Given the mixed results of goal framing in operations management literature (Tokar et al., 2016) and the lack of studies on the effect of framing on perceptions and attitudes in lieu of behavioral outcomes, this study provides additional insight in this regard.

Furthermore, this research also contributes to the current literature on SDT and message framing by investigating the interaction effects of identification messages and goal framing as well as presenting task complexity as a potential boundary condition of the effects of goal framing and identification messages. Specifically, the effect of negative framing on reservation time, satisfaction, and task quality is stronger in the presence of consumer identification messages. This result suggests an additive nature of extrinsic motivation and identified motivation given the right presentation of the message. The implication of this finding, therefore, might serve as an avenue for future research given the continuing discussion in SDT literature regarding whether different types of motivation enhance or undermine each other (Cerasoli et al., 2014).

Additionally, negative framing might be more effective when consumer identification messages are present, yet positive framing can lead to higher satisfaction for simple tasks in the presence of crowdsourcing firm identification messages. This finding can be explained by the interplay between processing motivation and processing opportunity. Shiv et al. (2004) found that when processing motivation is low and processing opportunity is high, frame-related

heuristics are more accessible and favor positive framing. As such, the result of this study suggests that task complexity constrains human processing opportunity, and crowdsourced agents' processing motivation decreases as they are presented with crowdsourcing firm identification messages in lieu of consumer identification messages.

Collectively, this study provides insights into the crowdsourcing and co-creation literature by exploring new mechanisms to motivate crowdsourced agents. While extant literature in crowdsourcing and co-creation have explored various motivations of why people participate in such activities, current studies only focus on either extrinsic factors such as rewards, or intrinsic factor such as enjoyment, creativity (Antikainen et al., 2010). The unique role that the crowdsourced agents play as an intermediary and their relationships with both the firms and the consumer community, as well as the impact of these factors on crowdsourced agents' behaviors have not been explored. Yet, as our results show, these factors can have significant effects on crowdsourced agents' participation, satisfaction, and performance level.

Managers of both crowdsourcing platforms and crowdsourcing firms can leverage the insights from this study to design and structure the messages sent to crowdsourced agents to enhance the success of crowdsourcing projects. The most effective combination is a message that emphasizes the consequence of the work on the broader community and the potential monetary loss. This type of messages can reduce reservation time and completion time and at the same time increase task performance and satisfaction, which ultimately lead to the success of crowdsourcing projects. These results are found to be robust with regard to demographic variables such as gender, age, ethnicity, education, household income, or working experience, suggesting that they can be applied widely to the crowd. In addition, some operational tasks may be too simple and insignificant to the broader community. In those cases, messages that are

framed positively and underscore the importance of the task to the crowdsourcing firm might achieve better outcomes.

This research also relates to a broader body of behavioral operations and supply chain management and add its unique insights into behaviors of a new set of actors, crowdsourced agents, in a new crowdsourcing operational context. Plus, the use of field experiment is a contribution to the behavioral operations literature dominated by lab studies (Tokar et al., 2016). This study, as such, responds to the call by DeHoratius and Rabinovich (2011) for more field and action research in the realm of operations and SCM to rigorously address managerial-relevant research questions in a rich natural setting. Future research in this realm may also consider the use of crowdsourced agents as participants to alleviate some difficulties and challenges in carrying out field experiments in operations research.

There are several limitations to the research, which may serve as additional opportunities for future research. Specifically, while field experiment method may help enhance realism and external validity compared to lab studies, it may lack the total control of laboratory experiments. In addition, the measure of completion time does not take into account other factors such as time to travel to the store, which is beyond the control of the participants. Future replications in different settings and different methods can help increase the robustness of these findings. Future research could also examine whether or not these framing effects persist over time. Furthermore, while this study answers the question of "how" and "when" the framing effects occur, it does not explicitly address the question "why" and test the mechanisms through which these effects occur. Future research, therefore, could shed more light on this matter.

Moreover, even though most demographic variables are found not significant, literature has suggested certain individual characteristics such as conscientiousness (Chen et al., 2001),

prosocial values (Grant, 2008), or construal level (White et al., 2011) can affect cognitive

processing or moderate the effect of task significance on performance (Grant, 2008). Future

research, therefore, could explore these factor as additional moderators or controls. Interested

researchers could also build on this work and expand into the emerging area of crowdsourcing

behaviors in operations and supply chain management.

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Appendix 1. Experimental stimuli

Task: Inventory audit

Agent instructions:

Crowdsourcing firm IM: **Complete this task and you will help Nutritius, a private company dedicated,] to improving shopping experiences for food products!**

Crowdsourcing platform IM: **Complete this task and you will help [crowdsourcing platform X] improve data quality about shopping experiences for food products for their client!**

Consumer IM: **Complete this task and you will help improve shopping experiences for food products for consumers like you!**

Positive framing: **Hurry! Participate now and earn $6.**

Negative framing: **Hurry! If you don't participate now, you'll lose a chance of earning $6.**

Task description:

Please visit a Walmart store near you and head to the Cereal aisle in the Food Department.

You are looking for the Grate Value Cinnamon Crunch Cereal 20.25 oz.

Simple task: **This task requires 3 steps to complete**. We'll have you take a photo, assess on-shelf stock, and answer several questions.

Complex task: **This task requires 6 steps to complete**. We'll have you take a photo, check the price, scan barcode, assess on-shelf stock, count inventory, and answer several questions.

Time allowed: 2 hours

IV. Essay 3

The Impacts of B2C Collaboration on Retail Supply Chain Triads

1. Introduction

Recent technological advances such as Web 2.0, mobile apps, social media, have given new ways for manufacturers to connect directly with their consumers and bypass the middlemen (Garcia, 2017). Enabled by technology, modern consumers are increasingly engaged with the manufacturers not only at the point of purchase but also throughout the various activities along the supply chains (Ta et al., 2015). For example, consumers submit new ideas (e.g. Coca Cola, P&G), develop new products (e.g. Threadless.com), deliver products (e.g. Instacart, Postmates, Deliv), and check on-shelf inventory for firms (e.g. Field Agent, WeGoLook) (Ta et al., 2015; Carbone et al., 2017). Variations of this phenomenon have been captured under different concepts in the current literature, including crowdsourcing (Howe, 2006), consumer engagement (Vivek et al., 2012), consumer participation (Dabholkar, 1990), co-creation (Lusch & Vargo, 2006), and more broadly as business- to-consumer (B2C) collaboration (Ta et al., 2015).

In B2C collaboration, the mass of individuals in the marketplace, hereby referred to as "consumer crowd", who have traditionally been defined broadly as "consumers", is producing exchange value for companies by connecting with and participating in organizations' offerings and activities (Prahalad & Ramaswamy 2000; Ramirez, 1999; Vargo & Lusch, 2004). Various forms of B2C collaboration have been utilized by a majority of top global brands such as Procter & Gamble, Unilever, and Nestle in the past decade (Petavy, 2017). Overall, the market for crowdsourced professional services has gained over $1 billion in revenues in 2016 and is predicted to grow more than 60 percent year over year (Grewal-Carr & Bates, 2016).

The growing popularity of direct consumer engagement and collaboration with manufacturers, however, may have consequences for retailers. B2C collaboration activities between manufacturers and consumers establish and nurture direct relationships between the two

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parties, which could increase consumers' attachment and loyalty to the manufacturers (Auh et al., 2007). This heightened connections between the consumers and the manufacturers could encourage consumers to bypass retailers, especially if the manufacturers can sell direct to consumers through their own channels, such as in the cases Coach, Nike, or P&G. In fact, a recent survey found that 55% of consumers want to buy directly from manufacturers versus from multi-brand retailers (Sterling, 2017). In that sense, the retailers may perceive the manufacturer-consumer collaboration as a threat to their business. B2C collaboration by the manufacturers, therefore, may stifle the relationships between the manufacturers and the retailers. Indeed, more than half manufacturers say the reason they hesitate to go directly to consumers is to avoid angering their retail partners, who could respond by sharing less information and seeking retaliation (Callard, 2014). The detrimental effect of the manufacturers' B2C collaboration on the relationships with the retailers may be even more pronounced for higher levels of engagement between the manufacturers and the consumers, such as in the case of Nike, which reported strained relationships with its retailers after its aggressive push for direct-to-consumers (Hopwood, 2016).

Even when the manufacturers lack their own channel and rely solely on the retailers for selling to consumers, the direct engagement between the manufacturers and the consumers at any point during the value chain could pose as a risk to the retailers, particularly a risk of losing privileged access to consumer data. By engaging in B2C collaboration, the manufacturers could gain valuable insights from their direct interactions with the consumers and gain back control over valuable consumer data from the retailers. Even utilizing the consumers in operational tasks such as inventory audit could provide manufacturers with insights into consumer perceptions of product on-shelf display, product availability, as well as retailers' in-store execution (Turley &

Chebat, 2002). Access to consumer insights is an invaluable asset to consumer-goods manufacturers, which has been in possession of the retailers as they control the direct links to consumers (Peterson et al., 1997). The loss of informational advantage as a result of the manufacturers' B2C collaboration actions, therefore, may still upset the retailers even though it may not directly threaten the retailers' sales.

The consequential effects of B2C collaboration by the manufacturers on the retailers might be explained by the dynamics of a supply chain triad. The introduction of consumers as actors into a manufacturer's collaboration network creates a new link between the manufacturer and the consumers. According to Balance theory (Cartwright & Harary, 1956), the formation of this new link is likely to affect the relationship dynamics within the existing triad consisting of the manufacturer, the retailer, and the consumer crowd. These relationships, in turn, may have potential effects on the performance of all actors in the triad such as service quality improvement, delivery performance, and interest and capability alignment (Wu et al., 2010; Finne & Holmstrom, 2013). These triadic dynamics resulting from a manufacturer's B2C collaboration activities, however, remain little understood in the current literature.

This study aims to address this gap in this nascent stream of research by addressing two research questions: 1) What are the effects of different levels of B2C collaboration by a manufacturer on the retailer's collaborative behaviors with other actors in the supply chain triad?; and 2) Do these effects differ when the existing relationship between the manufacturer and the retailer is positive vs. negative, or cooperative vs. coopetitive? To explore these research questions, this research draws on Balance theory and the literature on B2C collaboration and supply chain relationships. The theoretical model is tested using a scenario-based experimental method.

By doing so, the study provides a holistic understanding of the impact of B2C collaboration on different echelons in the supply chain. While current crowdsourcing and co-creation literature may suggest potential benefits of B2C collaboration for the consumer crowd and the focal firm (Bendapudi & Leone, 2003), there exist no insights into how B2C collaboration might impact the focal firm's supply chain partners. In addition, the study also contributes to the supply chain triad literature by exploring relationship dynamics in a new supply chain crowdsourcing triad, which may be different from the buyer-supplier-supplier triad commonly seen in the extant supply chain literature (Wynstra et al., 2015).

Furthermore, the study also explores the moderating role of the nature and magnitude of the existing relationship between the manufacturer and the retailer. The findings extend Balance theory by proposing that the triadic dynamics speculated by the theory depends on not only the relationship magnitude but also the nature of the partnership between the actors in the triad. The insights also help to advance manufacturers' knowledge of how to leverage their current relationships with the retailers in order to achieve the desired B2C collaboration outcomes.

2. Theoretical background

2.1. Balance theory and supply chain triads

Research on supply chain triads, which concern the possible linkages among any subset of three actors in the supply chain (Wasserman & Faust, 1994), has emerged in the past decades to explore the interrelationships at this smallest level that represents a network (Bastl et al., 2013). A commonly used theory in triad research is Balance theory (Cartwright & Harary, 1956), one of a very few theories that address triads explicitly (Choi & Wu, 2009). Originate from

behavioral psychology, Balance theory has been applied to both interpersonal and inter-organizational relationships (Davis, 1963; Alessio, 1990; Gimeno, 1999; Madhavan et al., 2004).

Balance theory describes and predicts the formation of relationships among groups of individuals or entities. Relations within actors in the group are characterized based on sentiment or liking into as negative valence or positive valence (Heider, 1958). In an inter-firm setting, a positive relationship indicates a cooperative exchange between two firms predicated on mutual trust and commitment (Choi & Wu, 2009, Morgan & Hunt, 1994). Conversely, a negative relationship implies an adversarial exchange that arises from inequity and distrust between two firms (Choi and Wu, 2009; Johnston et al., 2004; Griffith et al., 2006).

The central premise of the theory is that actors in any social group will tend to strive to achieve balance in their relations (Cartwright & Harary, 1956; Heider, 1958). A balanced state depicts a situation in which the relations among the entities fit together harmoniously; there is no stress toward change (Heider, 1985). Relationships in a group are considered balanced if the product of all the relationships in the group is positive. In other words, as illustrated in Figure 1, a relationship triad is balanced if each of the three dyadic linkages is positive (*balance state 1*), or if two are negative and one is positive (*balance state 2*) (Heider, 1958). An example of balance state 1 is a manufacturer's, such as Toyota, cultivating a trusting and sharing culture with and between its two suppliers (Choi & Wu, 2009). Alternatively, in balance state 2, a manufacturer has an adversarial relationship with both suppliers whereas the suppliers form a cooperative coalition with each other against the manufacturer (Choi & Wu, 2009).
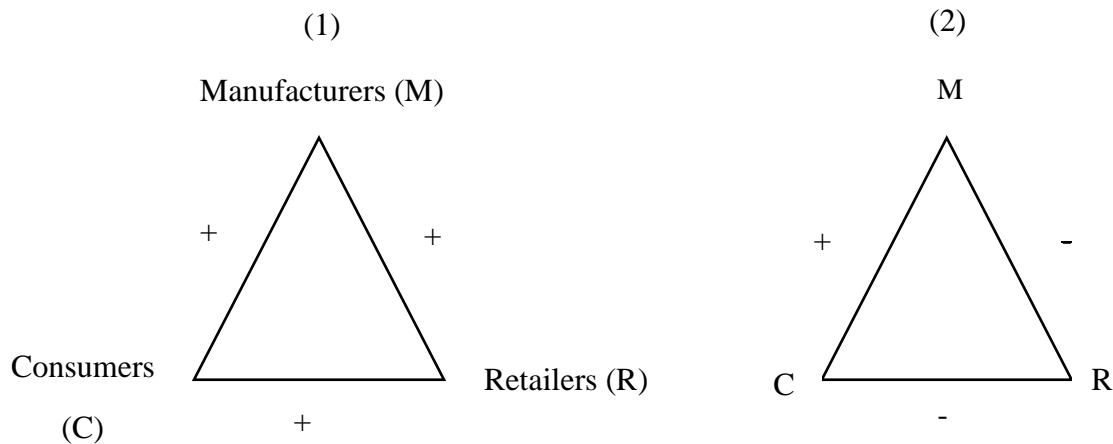
Figure 1. Two states of a balanced triad

If the relationship arrangement within the triad engenders an imbalance (in the form of 'tension' or 'strain'), actors within the triad would engage in behaviors to move their triad toward a balanced state (Heider, 1958; Cartwright & Harary, 1956; Newcomb, 1961). For example, if a manufacturer has positive relationships with each of the two suppliers, but the suppliers dislike each other, then the following behaviors could occur to correct the imbalance: 1) two suppliers collaborate with each other, 2) each supplier turns adversarial toward the manufacturer as they realize that the manufacturer has benefited from their competition, or 3) one of the suppliers withdraw from the relationships with the other two actors altogether.

Overall, past research on supply chain triads has suggested that relationships between any two actors in a triad are likely to influence the other remaining relationships (Havila et al., 2004; Choi & Wu, 2009). Notably, Li and Choi (2009) allude to the negative implication for the buyer (i.e., the middleman) in the outsourcing service triad when the supplier comes into direct contact with the customer. Specifically, the authors propose that as the supplier forms a direct linkage with the customer, the buyer is likely to gradually lose their "bridge" position as well as the information and control benefits inherent in the position to the supplier.

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Furthermore, the relationship dynamics within the triad might have significant effects on the performance and the structure of firms in the triad (Wu & Choi, 2005; Wu et al., 2010; Dubois & Fredriksson, 2008). The relationships between the actors are major determinants of the service capabilities not only for each actor but also for the whole supply chain (Finne & Holmstrom, 2013). Particularly, according to a case study by Finne and Holmstrom (2013), triadic cooperation between a supplier, a manufacturer, and a customer helps improve the value to the customer by providing service quality and aligns the interest and capabilities of the supplier and the intermediary. The relationship between the supplier and the customer is particularly important for service provision when the customer relationship is controlled by the manufacturer (Finne & Holmstrom, 2013). Service performance, however, is not an outcome of a single collaborative relationship but is a combination of multiple configurations of relationship dimensions and exogenous factors (Karatzas et al., 2016). Triad structure has also been found to play a significant role in effective outsourcing, contract design, and performance (Zhang et al., 2015). Yet, research on triads thus far is mostly exploratory in nature, lacking empirical evidence (Wynstra et al., 2015).

2.2. B2C collaboration and the emergence of consumers as an actor in SC triads

The rise of a new generation of empowered and active consumers, enabled by recent technology, has changed the "traditional role" of consumers from passive resources to active collaborators in the firm's network (Kohler et al., 2011; Nambisan, 2002). This involvement of the consumer crowd in firms' supply chain activities is defined broadly as B2C collaboration (Ta et al., 2015). Different types of B2C collaboration with varying degrees of collaboration between consumers and firms have been captured in different literature. Consumer co-creation, mostly in marketing, emphasizes a joint effort of the consumers and the focal firm in developing new

products or services (Prahalad &Ramaswamy, 2000; 2004), involving joint input and a frequent two-way interaction between consumers and companies (Cook, 2013; Etgar, 2008; Prahalad & Ramaswamy, 2004). Crowdsourcing, on the other hand, often refers to one-way interaction whereby the crowd submits information or solutions to a specific task delegated by the firms (Aitamurto et al., 2011).

In general, the current literature has offered some empirical evidence for the benefits of co-creation. Overall, successful co-created services and products provide higher level of customization, superior economic benefits accruing from, namely, greater control, increased goal achievement, reduced financial and performance risks, and enhanced relational benefits for consumers and for firms (e.g. Chan et al,. 2010; Claycomb et al., 2001; Xie et al., 2008; Hsieh & Chang, 2016). Prior research has also suggested that crowdsourcing can be a viable mechanism to attain better solutions at lower cost and faster pace than traditional methods (e.g. Afuah & Tucci, 2012; Aitamurto et al., 2011; Hossain & Kauranen, 2015). Research in B2C collaboration, however, is rudimentary and has only focused on consumers and firms as two main actors of interest, thus, lacking the holistic understanding of supply chain implications.

One exception is the conceptual framework by Siguaw et al. (2014), which suggested potential impact of consumer co-creation by the manufacturers' on intermediaries. Specifically, the author proposed that as manufacturers utilize consumer contributions, affiliated intermediaries will report having less informational power, providing less value to the channel, greater benefit-based and cost-based dependence, heightened efforts to create channel value, an enhanced reputation, and greater sales. These potential impacts of B2C collaboration on different supply chain echelons, however, require further exploration and empirical support.

This research addresses this gap in the current literature by applying Balance theory in the B2C collaboration context. As depicted in Figure 2, the research model tests the impact of B2C collaboration on the relationship dynamics within a manufacturer-consumers-retailer triad. Specifically, the research proposes that B2C collaboration by the manufacturer positively influences the retailer's future collaboration with consumers but negatively affects the retailer's information sharing with the manufacturer. The effects are contingent on the nature of partnership and relationship magnitude between the manufacturer and the retailer (M-R).
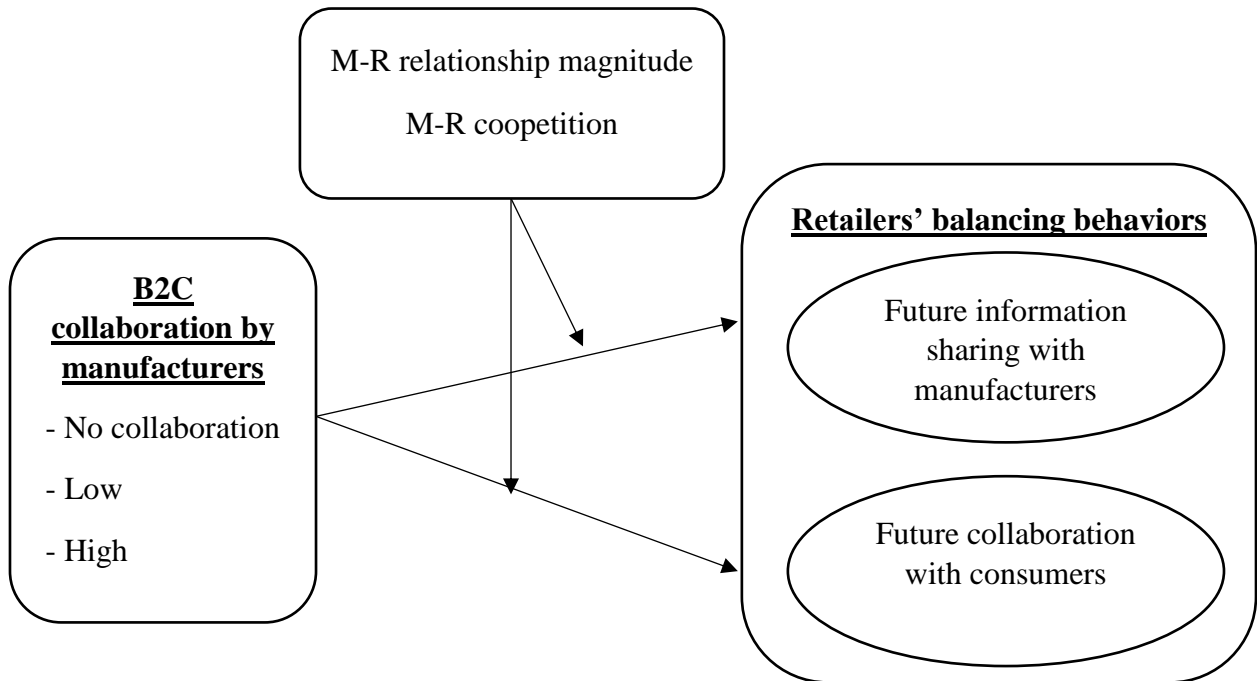
3. Hypothesis development

Figure 2. The theoretical model

As Balance theory suggests, an unbalanced triad tends to move toward a balanced state to avoid tension and achieve harmony (Cartwright & Harary, 1956; Heider, 1958). Therefore, actors within a triad will take necessary actions to achieve balance (Heider, 1958). When a manufacturer engages in B2C collaboration, a positive linkage between the consumer crowd and

the manufacturer is created. However, the same action could be perceived as negative by the retailer. This is because the consumers are often considered a powerful actor in a supply chain as they provide wealth to firms through their purchase behaviors (Lengnick-Hall, 1996). As manufacturers involve consumers as a new collaborative actor into their network, the existing power balance between the manufacturer and the retailer may be disrupted (Emerson, 1962). The retailer may perceive that the manufacturer gains power advantage at the loss of the retailer's and regard the manufacturer's B2C collaboration action as a violation of the retailer's trust and interest (Callard, 2017). This B2C collaboration by the manufacturer, as such, increases the negative sentiment between the manufacturer and the retailer. Given the positive M-C relation, this action will increase the degree of imbalance perceived by the retailer. According to Balance theory, the retailer then will engage in a balancing act by either converting the relationship with the manufacturer to a positive one (1), or turning the relation with the consumers into a negative one (2). In committing action (1), the retailer is likely to engage in more collaborative behaviors with the manufacturer, such as by sharing more information with the manufacturer. In committing action (2), the retailer is likely to refrain from collaborative behaviors with the consumers.

Hypothesis 1 (H1). B2C collaboration behaviors by the manufacturers will positively influence the retailers' future information sharing with the manufacturers.

Hypothesis 2 (H2). B2C collaboration behaviors by the manufacturers will negatively influence the retailers' future collaboration with consumers.

Also, according to Balance theory, the current state of two existing relationships within the triad affects the nature of the new relationship formed between two actors (Choi & Wu, 2009). An existing relationship between the manufacturer and the retailer will influence the

extent to which the B2C collaboration by the manufacturer increase or decrease the positive sentiment of the M-R linkage. If a positive relationship already exists between the manufacturer and the retailer, it is likely to act as a buffer and lessens the retailer's negative perception of the manufacturer's B2C collaboration action, therefore, increasing the positive sentiment of the M-R linkage. The more positive M-R relation and M-C relation exist in the triad, the more likely it is to trigger a new positive relationship between the retailer and the consumers to attain a balanced state with three positive linkages (*balanced state 1 in Figure 1*). The negative effect of the B2C collaboration action on the retailer's future collaboration with the consumers, thus, will be weakened. Conversely, if the existing M-R relationship is negative, the B2C collaboration action by the manufacturer will impair the M-R linkage further and is likely to negatively affect the M-C relationship to move the triad toward a balanced state with one positive and two negative relationships (*balanced state 2 in Figure 1*). In other words, a negative M-R relationship will strengthen the negative effect of B2C collaboration by the manufacturer on the retailer's future collaboration with the consumers.

Hypothesis 3a (H3a). The effect of B2C collaboration by the manufacturers on the retailers' future collaboration with consumers will be weaker if positive relationships exist between the manufacturers and the retailers.

Similarly, since an existing positive relationship between the manufacturer and the retailer signifies a high level of trust and collaborative intention (Heider, 1958; Choi & Wu, 2009), this existing level of trust could act as a buffer and alleviate the retailer' feeling of betrayal (Maloni & Benton, 2000). Thus, the retailer in a positive M-R relationship will perceive the manufacturer's B2C collaboration as less negative. Because the relationship triad becomes less imbalanced to the retailer, the retailer will be less motivated to fortify the positive

relationship with the manufacturer to achieve balance. Alternatively, an existing negative M-R relationship exacerbates the negative sentiment perceived by the retailer, and thus the perceived imbalance. The retailer in an existing negative M-R relationship, as such, will be more motivated to achieve balance by engaging in collaborative behaviors with the manufacturer.

Hypothesis 3b (H3b). The effect of B2C collaboration by the manufacturers on the retailers' future information sharing with the manufacturers will be weaker if positive relationships exist between the manufacturers and the retailers.

Most supply chain relationship literature focuses on cooperative relationships between supply chain partners, which assumes mutual beneficial outcomes for both partners (Cai &Yang, 2008). However, supply chain partnerships much often involve the simultaneous pursuit of cooperation and competition between firms, referred to as coopetition (Bengtsson & Kock, 2000; Wu, Choi, & Rungtusanatham, 2010). For example, Walmart sells its private cereal brand, along with brands of manufacturers such as Kellogg's and General Mills, who also sells through their own e-commerce channels. Whereas cooperation emphasizes mutual benefits and collective interests, competition underscores opportunistic behavior and private interests (Khanna, Gulati, & Nohria, 1998; Park & Zhou, 2005). Coopetition, as such, could engender tension and aggravate the relationships as the parties involved have to simultaneously juggle the conflicting interests (Fang, Chang, and Peng, 2011; Gnywali et al., 2016).

A retailer in a coopetitive relationship, thus, is more likely to perceive the B2C collaboration action by the manufacturer as a threat and a withdrawal of interest on the manufacturer's side. Following this line of argument, compared with an existing collaborative relationship between the manufacturer and the retailer, a coopetitive relationship is likely to aggravate the negative sentiment of the B2C collaboration action by the manufacturer. The

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retailer in a coopetitive M-R relationship is more likely to perceive an imbalance and more motivated to engage in balancing acts. A coopetitive M-R relationship, as such, will strengthen the negative effect of B2C collaboration by the manufacturer on the retailer's future collaboration with consumers as well as its positive effect on the retailer's future information sharing with the manufacturer.

Hypothesis 4a (H4a). The effect of B2C collaboration by manufacturers on retailers' future collaboration with consumers will be stronger if highly coopetitive relationships exist between the manufacturers and the retailers.

Hypothesis 4b (H4b). The effect of B2C collaboration by manufacturers on retailers' future information sharing with the manufacturers will be stronger if highly coopetitive relationships exist between the manufacturers and the retailers.

4. Methodology

4.1. Experiment design

A scenario-based experimental method is used to test the proposed hypotheses. This is a well-established method in various disciplines, including operations and supply chain management (Rungtusanatham et al., 2011). By imitating realistic situations, scenario-based experiments can efficiently delve into the perceptions and behaviors of decision makers with a great degree of control and precision (Thomas, 2011). As with experiment methods, scenario-based experiment allows a better understanding of how various factors influence the behavioral outcomes by teasing out the causal effect of each factor (Bendoly et al., 2006). Importantly, scenario-based experiment is appropriate for emergent topics such as crowdsourcing, whose

limited use in practice might render other methods, namely surveys or archival data, unattainable (Rungtusanatham et al., 2011).

The experiment is a 3x2x2 full factorial design. The three factors manipulated are B2C collaboration, M-R relationship magnitude, and M-R coopetition. Specifically, there are three levels of B2C collaboration (no, low, high), two levels of M-R relationship magnitude (negative, positive), and two levels of M-R coopetition (low, high). The combination of all levels of three factors results in twelve treatment conditions.

4.2. Sample and procedure

In order to ensure the reliability of scenario-based experiments, participants must understand and respond to experimental treatment conditions (Rungtusanatham et al., 2011). Since the context of this study involves a manufacturer-retailer relationship with a certain degree of nuances, working business professionals, specifically in retailing, manufacturing, and logistics, were selected to ascertain that participants have the ability or experience to understand the supply chain phenomenon particularly with regard to the retailer-manufacturer-consumer relationships (Thomas, 2011). As such, participants in the sample were working professionals with an average age of 37 and 8 years of full-time work experience graduated from an MBA program at a Southern public university. The sample characteristics are summarized in Table 1. The total sample size is 284 with 22 to 26 participants for each of the twelve treatment conditions.

After a brief introduction, participants were randomly assigned into one of the twelve treatments. Participants were asked to read a scenario that depicts a manufacturer-supplier relationship and how the manufacturer involved the consumers in an inventory audit task. After

reading the scenario, participants responded to a series of questions asking how they think the retailer would react to the scenario. This so-called "projective technique" allows participants to reflect on how the retailer (not "they") would (rather than should) respond, thus minimizing the bias from the participants' individual positions (Fisher, 1993; Murfield et al, 2017). The participants took 12 minutes on average to finish the experiment.

The experiment stimuli, presented in Appendix 1, were sent to participants via Qualtrics web-based survey platform. Careful development of the experimental scenarios follows the guidelines of Rungtusanatham et al. (2011). Pretesting was conducted with 40 undergraduate students to ensure the realism and validity of the scenario as well as the effectiveness of the manipulation. All the manipulations were found to have intended effects.

Table 1. Sample characteristics (N=284)

Demographics	Percentage	Demographics	Percentage
Race		Industry	
Caucasian	74.9%	*Retail*	41.0%
African American	7.5%	*Logistics*	21.0%
Latino	6.0%	*Manufacturing*	16.0%
Asian	7.0%	*Others*	22.0%
Other	4.6%	Annual household income	
Gender		*Less than $75,000*	8.0%
Female	35.0%	*$75,001-$150,000*	40.5%
Male	65.0%	*More than $150,000*	51.5%
Age		Working experience	
18–34	24.0%	*Less than 5 years*	20.6%
35–54	73.0%	*5-10 years*	62.5%
over 55	3.0%	*More than 10 years*	16.9%
Crowdsourcing experience	69.8%		

4.3. Measures

Existing scales are adapted for the measurement of the dependent variables and independent variables manipulation checks. Participants responded to each item using a 7-point Likert scale (Strongly disagree – Strongly agree). The final measures are shown in Appendix 2. Two dependent variables are future information sharing with the manufacturer and future collaboration with consumers, which captures the retailer's intention to share information with the manufacturer and to collaborate with the consumers in the future. Three manipulation check variables include B2C collaboration, M-R relationship magnitude, and M-R perceived coopetition. B2C collaboration refers to the degree to which a firm involves individuals in the marketplace in the firm's supply chain activities (Ta et al., 2015). Relationship magnitude, defined as the extent of the relationship closeness between the manufacturer and the retailer, is a second-order construct consisting of trust, commitment, and dependence (Golicic & Mentzer, 2006). Lastly, perceived coopetition measures the degree to which firms compete and cooperate at the same time (Boucken et al., 2016).

Prior research has shown that individuals differ in their tendency to trust or distrust others, which may be influenced by cultural background, gender, and previous experiences (Mayer et al., 1995). This trust propensity subsequently affects people's trust and collaborative behaviors (Johnston et al., 2004; Colquitt et al., 2007). Therefore, several demographic variables are collected as controls in the model, including gender, age, ethnicity, household income, industry, working experience, and crowdsourcing experience. Because scenario-based experiment only mimics the real-world situation, realism check is necessary to ensure that participants understand and respond to the tasks (Louviere et al., 2000). Two-item realism check,

thus, is also included to measure the degree to which the scenario is perceived as realistic by the participants (Thomas et al., 2011).

5. Analysis and results

5.1. Measurement model

Scale purification is conducted using confirmatory factor analysis (CFA) on AMOS 24.0 software. The results (see Table 2) show good model fit with $\chi^2= 422.3$, df=172, p<0.001; CFI=0.965, TLI=0.95, NFI=0.94, RMSEA = 0.057, SRMR = 0.06. Each factor shows an acceptable level of reliability as Cronbach's α and composite reliability Rho are above the recommended value of 0.7 (Nunnally and Bernstein, 1994; Bagozzi et al., 1998). All factor loadings are greater than 0.5 and significant at the p<0.001 level, suggesting good unidimensionality and convergence validity for each factor. The shared variances between all possible construct pair are lower than the AVE for the individual constructs, suggesting sufficient discriminant validity (Fornell and Larcker, 1981).

Table 2. Reliability, convergent and discriminant validity of the measurement model

	M	SD	α	CR	AVE	(1)	(2)	(3)	(4)	(5)	(6)
1. Realism	5.31	1.28	0.76	0.78	0.65	**0.81**					
2. Perceived coopetition	4.23	1.9	0.91	0.92	0.78	0.05	**0.88**				
3. B2C collaboration	4.39	1.26	0.77	0.77	0.53	0.25	0.27	**0.72**			
4. Information sharing	4.70	1.28	0.90	0.90	0.75	0.19	-0.15	0.29	**0.87**		
5. Future collaboration with consumers	4.74	1.31	0.91	0.91	0.77	0.01	-0.08	0.35	0.54	**0.88**	
6. Relationship magnitude	4.13	1.28	0.88	0.75	0.63	0.03	-0.06	0.06	0.57	0.28	**0.79**

Note: M= mean. SD= standard deviation. α = Cronbach's alpha. CR = composite reliability. AVE = average variance extracted. The bold diagonal line represents squared roots of AVE.

5.2. Treatment checks

As recommended by Bachrach and Bendoly (2011), three treatment checks are conducted. Manipulation check items are included in each questionnaire to test the success of experimental manipulations. The MANOVA results (see Table 3) show significant difference between each level of B2C collaboration ($M_{no} = 3.6$, $M_{low} = 4.7$, $M_{high} = 5.33$, $p<0.001$), between negative and positive M-R relationships ($M_{negative} = 3.3$, $M_{positive} = 5$, $p<0.001$), and between cooperative and coopetitive M-R relationships ($M_{cooperative} = 2.96$, $M_{coopetitive} = 5.4$, $p<0.001$).

Confounding checks are also conducted to ensure that one manipulation does not have unintended effects on others. As in Bendoly and Swink (2007), MANOVA tests are performed to verify whether the manipulation of B2C collaboration differs between negative and positive relationships as well as between cooperative and coopetitive relationships. The results (see Table 4) shows no significant differences. Similarly, no significant differences are found in "B2C collaboration" and "perceived coopetition" responses between negative and positive relationship treatments, as well as no significant differences in "B2C collaboration" and "relationship magnitude" responses between cooperative and coopetitive relationship treatments. All four interaction terms between treatments are also not significant across treatments.

Following Bendoly and Swink (2007) and Tokar et al. (2014), Hawthorne checks against extraneous perceptual effects of the treatments are conducted using supplemental items (see Appendix 2). The supplemental items include three items that are not relevant to this study but direct at three potential goals that the participants could conceivably have assumed for the retailer in the scenario. No significant differences in ratings between conditions on any of these three questions are detected. As a result, serious concerns regarding the Hawthorne effect can be dismissed. Additionally, realism checks indicate that the scenarios were considered realistic with

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an average score of 5.3 of 7, supporting the reliability of the scenario-based experiment

(Louviere et al., 2000; Murfield et al., 2017).

Table 3. Manipulation checks and confounding checks

Treatments	Manipulation check variables		
	Perceived coopetition	Relationship magnitude	B2C collaboration
B2C collaboration (*b2c*):	F(2, 272)=1.9	F(2,272)=0.04	F(2,272)=39.3***
- High vs. low			ΔM=0.63*, SE=0.21
- Low vs. no			ΔM=1.1***, SE=0.16
M-R relationship (*pastrel*)	F(1,272)=1.45	F(1,272)= 23.2***	F(1,272)=0.22
Coopetition *(coop)*	F(1,272)=21.87***	F(1,272)=3.1	F(1,272)=1.53
b2c*pastrel	F(2,272)=0.3	F(2,272)=0.38	F(2,272)=0.22
b2c*coop	F(2,272)=2.6	F(2,272)=0.59	F(2,272)=2.1
pastrel*coop	F(1,272)=2.55	F(1,272)=0.17	F(1,272)=0.08
b2c*pastrel*coop	F(2,272)=0.87	F(2,272)=2.4	F(2,272)=1.7

5.3. Hypothesis testing

Four hypotheses are tested using a multivariate analysis of covariance (MANCOVA)

with information sharing and intention to collaborate with consumers as two dependent

variables. Three factors are levels of B2C collaboration, relationship magnitude, and perceived

coopetition. Covariates in the model include gender, age, ethnicity, household income, industry,

and working experience. The overall omnibus results are summarized in Table 4.

A significant main effect of B2C collaboration is founded for both outcome variables (Wilk's Lambda = 0.82, $F_{(4, 524)}$= 13.4, p<0.001). Univariate tests show that higher levels of B2C collaboration by the manufacturer are associated with higher levels of the retailer's future information sharing with the manufacturer (ΔM= 0.5, SE=0.14, p<0.001 between no B2C collaboration and low B2C collaboration; ΔM=0.31, SE=0.14, p=0.029 between low and high B2C collaboration). *H1, therefore, is supported.*

In contrast, univariate tests show that the retailer's future collaboration with consumers is significantly higher for higher levels of B2C collaboration by the manufacturer (ΔM= 0.51, SE=0.14, p<0.001 between no B2C collaboration and low B2C collaboration; ΔM=0.37, SE=0.14, p=0.009 between low and high B2C collaboration). Despite the significant result, the direction of the effect is opposite of what was hypothesized. *H2, thus, is not supported.*

The lack of significant omnibus result suggests non-significant interaction effects between B2C collaboration and relationship magnitude (*b2c*pastrel*) on the retailer's future collaboration with consumers and information sharing with the manufacturer. *Both H3a and H3b, thus, are not supported.* Nevertheless, the post-hoc test shows a significant interaction effect when comparing high B2C collaboration treatment to no B2C collaboration treatment (b=-1.02, SE=0.4, t=-2.52, p=0.01). This finding indicates that the effect of B2C collaboration by the manufacturer on the retailer's future collaboration with consumers is weaker if the existing M-R relationship is positive.

Whereas the interaction term between B2C collaboration and coopetition (*b2c*coop*) is not significant for the retailer's future information sharing, it is significant for the retailer's future collaboration with consumers. Specifically, the retailer's future collaboration with consumers is higher for higher levels of B2C collaboration when a coopetitive M-R partnership

exists (low B2C collation vs. no B2C collaboration: b=1.15, SE=0.39, p=0.0036; high B2C collaboration vs. no B2C collaboration: b=1.33, SE=0.4, p=0.0012). *The results, thus, support H4a, but does not support H4b.*

In addition, the three-way interaction term (*b2c*partrel*coop*) is also significant for the retailer's future collaboration with consumers. Post-hoc tests reveal that the interaction term between B2C collaboration and relationship magnitude is significant for a coopetitive M-R relationship ($F_{(2,261)}=3.34$, p=0.037), and not significant for a cooperative M-R relationship.

Table 4. Hypothesis testing results

Independent variables	Dependent variables	
	Future information sharing with the manufacturer	Future collaboration with consumers
B2C collaboration (*b2c*)	F(2, 261)=16.59***	F(2,261)=20.89***
M-R relationship (*pastrel*)	F(1,261)=48.5***	F(1,261)= 33.3***
Coopetitive vs. Cooperative (*coop*)	F(1,261)=23.8***	F(1,261)=19.8***
b2c*pastrel	ns	ns
b2c*coop	ns	F(2,261)=3.9*
pastrel*coop	ns	ns
b2c*pastrel*coop	ns	F(2,261)=3.75*
Control variables		
Gender	ns	F(1,261)= 4.64*
Industry: Manufacturing	ns	F(1,261)=6.8**
Ethnicity, income, working experience, age, crowdsourcing experience	ns	ns

6. Discussion and implications

This study aims to examine the effects of B2C collaboration activities by the manufacturers on the retailers' collaborative behaviors with the consumers and with the manufacturers. One key finding is that the level of B2C collaboration by the manufacturers is positively related to the retailers' future collaboration with the consumers. Whereas this finding contradicts Balance theory, it could be explained by the logic of power dependence theory. Specifically, as the level of consumer engagement by the manufacturers in operational activities increases, the retailers might feel at a power disadvantage, and therefore, are more likely to engage in collaboration with consumers to achieve the power balance (Emerson, 1962).

The level of B2C collaboration by the manufacturers also positively influences the retailers' future information sharing with the manufacturers. This finding supports the logic of balance theory even though it repudiates the norm of reciprocity well-established in the inter-organization literature, which expects that retailers will less likely to share information with the manufacturers, the more the manufacturers directly get involved with consumers. The finding also seems to resonate with a current survey stating that more than half of manufacturers who sell directly to consumers on their own-e-commerce sites reported a positive effect on relationships with other sale channels, and only 9% reported a negative effect (Callard, 2018). Another possible explanation for this effect is that the retailers might realize they could benefit from the manufacturers' B2C collaboration. This might be particularly true in this context. Involving consumers in supply chain activities provides the manufacturers with insights from the consumers, who are the ultimate target of the retail supply chain (Ganesan et al., 2009). These consumer insights, thus, could be advantageous for the retailers as well. Therefore, the retailers

would be more likely to share information with the manufacturers with the expectation that the manufacturers will also share more information in return.

Another notable finding is that the omnibus interaction effects between B2C collaboration by the manufacturers and M-R relationship magnitude on the retailer's future collaboration with consumer and future information sharing are not significant. This finding thus does not provide support for Balance theory. One explanation for this result is that the involvement of consumers in supply chain operations in this context might not be viewed as substantial enough by the retailers to affect an existing relationship between the manufacturers and the retailers. This notion seems to be supported by the fact that the effect of B2C collaboration by the manufacturers on the retailers' future collaboration with consumers is found weaker if the existing M-R relationships are positive only when compared between no B2C collaboration and high B2C collaboration.

While Balance theory has been discussed in supply chain relationship literature, there is a dearth of empirical support for this theory (Choi & Wu, 2009). By challenging the claims of the theory, this research suggests that either the theory might not hold in this context or there might be potential factors that previous research on Balance theory has not considered. Another alternative explanation is that the balance of sentiments proposed by Balance theory might not be the only force in process. The retailers, instead, might strive to keep the power balance in the triad and thus feel more pressure to collaborate with the consumers if they are in adversarial relationships with the manufacturers.

Particularly, this study suggests another factor might interfere with the state of balance proposed by Balance theory. According to this research, B2C collaboration activities by the manufacturers are more likely to increase the retailers' future collaboration with consumers

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given positive M-R relationships when the M-R relationships are coopetitive in nature than when the relationships are purely cooperative. In other words, Balance theory seems to only hold true for coopetitive relationships. As such, while Balance theory has solely focused on sentiment valence as the determinant of relational changes within a triad, this research suggests that the coopetitive nature of a relationship might be a boundary condition. This finding appears to support the aforementioned argument that there is a brewing interplay between the power dynamics and sentiment dynamics and that the attempt to achieve power balance seems to prevail in this case.

Building upon these findings, future research could explore the interrelations between power and sentiment in triadic relationships in more details. Future studies might also reexamine the state of balance proposed by Balance theory, which is solely based on sentiment valence (Heider, 1958). Actors in a triad might indeed tend to reach a balanced state, but in terms of power, not sentiment valence. Also, the nature of the relationships, not just the valence, could have an influence on the triadic dynamics as well. Lastly, future research could explore other potential boundary factors of Balance theory beyond a few factors suggested in this case.

Collectively, this study contributes to the emerging literature on consumer engagement and crowdsourcing in supply chain management by investigating the impact of B2C collaboration on other supply chain partners. While the consumer crowd and the crowdsourcing firm have been the recurrent subjects of study in the crowdsourcing and co-creation literature (Bendapudi & Leone, 2003; Zhao & Zhu, 2014), there is little understanding of how the involvement of consumers in supply chain activities might have a "chain effect" given the interconnectedness and interdependence among supply chain partners (Siguaw et al., 2014). By showing that B2C collaboration by the manufacturers, contrary to the conventional thinking

suggested by power dependence theory, does not impair, but enhances their existing relationship with the retailers, this study provides a holistic understanding of the impact of B2C collaboration on various supply chain echelons.

While manufacturers' directly and closely engaging and collaborating with consumers have increasingly become commonplace and provided manufacturers with competitive advantages in this market-driven environment (Brodie et al., 2013), numerous manufacturers are still hesitating due to fear of retailers' retaliation (Siguaw et al, 2014). The findings of this study could help encourage firms, particularly manufacturers, to readily engage with consumers without a necessary fear of agonizing the retailers. Other supply chain members, in fact, are not always negatively impacted by consumer engagement. When manufacturers collaborate with consumers to enhance their supply chain processes, their supply chain partners are more likely to share information with them and to emulate and co-create value with the consumers. Even when the manufacturers and the retailers simultaneously cooperate and compete, there are no negative effects of the manufacturers' B2C collaboration on the retailer's collaborative behaviors, such as information sharing with the manufacturers. The manufacturers' B2C collaboration, particularly in supply chain activities, might even foster the retailer's collaborative behaviors if they are in coopetitive relationships.

In addition, the study contributes to the understudied supply chain triad literature by examining the power and relationship dynamics within the manufacturer-consumers-retailer triad. By bringing the consumer crowd into a firm's collaboration network, the consumers become a newly emerging active and powerful actor in the service triad (Ta et al., 2015). As the consumer crowd may possess characteristics that are different from a traditional supplier or service provider, the power and relationship dynamics in this triad might differ from the

interfirm buyer-supplier-supplier triad commonly seen in supply chain literature. This could

serve as an interesting avenue for future research.

Nevertheless, the findings should be interpreted in light of the limitations of this study.

While scenario-based experiment allows for precision and control, it may lack generalizability

and is still artificial in nature. Also, even though the study implies future balancing behaviors of

the retailers, actual behaviors are not observed. Future research, thus, could triangulate the

results using other methods and replicate the study in other settings to ensure the robustness of

the findings. Furthermore, future research could delve into examining "why" the effects occur.

For example, the study did not measure how the retailers actually view the manufacturers' B2C

collaboration. It is an assumption that it would be viewed negatively, but the results suggest

otherwise. Future research could provide more explicit evidence of this. It would be interesting

for future studies to examine the manufacturer-consumer-retailer dynamics when there are

consequences of B2C collaboration activities involved. Additionally, while this study focuses on

the retailer's point of view, other supply chain members, as well as the consumer crowd, are

likely to have different perspectives regarding their relationships with other actors in the triad or

even in the network. For instance, the involvement in supply chain activities with the

manufacturers might improve consumers' attachment to the manufacturers, and thereby loyalty

and purchase behaviors, while impair their connections with the retailers. These impacts,

however, might be reversed if the B2C collaboration experience is not a pleasant one to the

consumers. Future research, as such, could study from the consumers' viewpoint and how B2C

collaboration activities might impact the consumers' attitude and behaviors toward the supply

chain partners of the focal firm. Overall, this research is a first empirical effort in understanding

the "chain" effects of B2C collaboration in supply chain management. The emerging nature of

the phenomenon renders it a fruitful area for future inquiries.

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Appendix 1. Examples of experimental vignettes

Instructions prior to reading scenarios:

You are an executive of Retailer A. Imagine that NAC is a manufacturer that supplies consumer products to Retailer A. The business relationship between NAC and Retailer A is described in the scenario. Assume all scenario descriptions are accurate and trustworthy. After reading the scenario, please answer each question based on how you think Retailer A actually WOULD respond.

Scenario:

NAC is a manufacturer of consumer products. NAC supplies their products to Retailer A. NAC relies on a periodic retail audit report to ensure that retailers are complying with pre-established agreements and that NAC products are fully stocked and correctly displayed on-shelf for consumers to purchase. Providing consumers with a high service level is very important to stay competitive in this industry.

Low coopetition: In addition to selling their products through Retailer A, NAC also sells directly to consumers through their own stores and their online channel. Thus, NAC also competes with Retailer A.

High coopetition: NAC does not have their own retail stores. Their products are only sold at other retail channels such as at Retailer A.

No B2C: Periodically, NAC uses a group of employees to collect data about product on-shelf availability, inventory levels, stock-outs, and general shelf appearance. Based on the audit report generated by their employees, NAC evaluates how well their products perform at Retailer A's

stores and how well Retailer A complies with previous agreements. NAC then requests Retailer A to make improvements accordingly.

Crowdsourcing: Periodically, NAC recruits a random group of consumers through a mobile platform to go into stores and collect data about product on-shelf availability, inventory levels, stock-outs, and general shelf appearance. Based on the audit report generated by the consumers, NAC evaluates how well their products perform at Retailer A's stores and how well Retailer A complies with previous agreements. NAC then requests Retailer A to make improvements accordingly.

Co-creation: Periodically, NAC recruits a random group of consumers through a mobile platform to go into stores and collect data about product on-shelf availability, inventory levels, stock-outs, and general shelf appearance. Based on the audit report generated by the consumers, NAC evaluates how well their products perform at Retailer A's stores and how well Retailer A complies with previous agreements. NAC then requests Retailer A to make improvements accordingly. NAC also frequently asks consumers about the way the company should display products on the shelves (e.g. quantity, variety, facings). Consumer input then is incorporated into NAC's recommendations to Retailer A.

Negative focal firm-supplier relationship: Retailer A has an arm's length (i.e., not very close) relationship with NAC. Neither party is strongly committed to the relationship. Retailer A benefits from working with NAC but often finds it difficult to do business with them. The relationship is a little unstable and strained. On frequent occasions, NAC does not follow through on their verbal commitments. When problems arise, NAC does not proactively contact Retailer A and often tries to resolve the situations in their own best interest.

Positive focal firm-supplier relationship: Retailer A has a close relationship with NAC. Both parties are strongly committed to the relationship. NAC has been working with Retailer A for multiple years. Retailer A benefits from working with NAC and finds it easy to do business with them. NAC generally follows through on their verbal commitments. If NAC has a problem, they tend to proactively contact Retailer A to discuss the issues and offer options to resolve the problems in a mutually beneficially manner.

Appendix 2. Measurement items

Instruction: Consider how Retailer A would respond to NAC in the above scenario situation. Please base your answers on how you think Retailer A would work with and respond to NAC. Please indicate the extent to which you agree or disagree with the following statements (5-point Likert scales ranging from Strongly Disagree (1) to Strongly Agree (5).

Dependent variables

1. Intention to collaborate with consumers (Vivek, 2009): To what extent would Retailer A work with consumers in their audits?

- Retailer A intends to work more with consumers in the auditing process.

- Retailer A plans to involve consumers more in their auditing activities.

- Retailer A wants to engage with consumers more in their store audits.

2. Information sharing (Thomas et al., 2011): Thinking of the relationship between Retailer A and NAC, how would retailer A work with NAC?

- Retailer A would share information with NAC about changes that may affect them.

- Retailer A would share information that might be helpful to NAC.

- Retailer A would share information with NAC frequently and informally, and not only according to a pre-specified agreement.

Manipulation checks

3. Relationship magnitude (Golicic and Mentzer, 2006)

➤ Trust: In our relationship, NAC . . .

- has high integrity.

- can be counted on to do what is right.

- is sincere in their promises.

- treats my firm fairly and justly.

- is a firm my firm trusts completely

➢ Commitment

- The relationship NAC has with Retailer A is something NAC is very committed to.

- The relationship NAC has with Retailer A is something NAC intends to maintain indefinitely.

- The relationship NAC has with Retailer A deserves NAC's maximum effort to maintain.

- The relationship NAC has with the retailer is something NAC cares a great deal about long-term.

➢ Dependence

- Retailer A could not easily replace NAC.

- Retailer A is dependent upon NAC.

- Retailer A believes NAC is crucial to their success.

4. Customer Participation (Chan 2010) (Auh et al. 2007; Bendapudi and Leone 2003; Dabholkar 1990; Ennew and Binks 1999; Hsieh, Yen, and Chin 2004)

- Consumers provide suggestions to NAC for improving the auditing outcome.

- Consumers have a high level of participation in the auditing process.

- Consumers are very much involved in deciding how the NAC products should be stocked at Retailer A.

5. Realism check (Dabholkar 1994)

- The situation described in the scenario was realistic.

- I can imagine two companies in the described situation.

6. Perceived coopetition (Bouncken, 2016)

- Retailer A and NAC are in a competition with each other for direct selling to consumers.

- NAC is both a partner and a competitor of Retailer A in direct selling to consumers.

- Retailer A and NAC both sell directly to consumers.

7. Supplemental items (Hawthorne checks, Tokar et al., 2014)

- Efficient management of costs is important for retailers.

- Providing a high level of customer service is important to retailers.

- Increasing sales is important for retailers and manufacturers.

V. Conclusion

This dissertation examines and provides a holistic understanding of the impacts of crowdsourcing model for successful retail supply chain management. By considering three different echelons in the supply chain (customers, focal firm, and retailer) in different supply chain activities (order delivery, and inventory audit) and employing different methodological approaches, each essay makes distinctive contributions to the literature. However, collectively, this dissertation contributes to the understanding of crowdsourcing model and B2C collaboration in supply chain management in several ways.

Overall, this dissertation provides evidence that across the supply chain and across processes B2C collaboration, and crowdsourcing in particular, have positive benefits for various supply chain members. Specifically, the end-customers seem to enjoy better on-time delivery and lower delivery charges owing to the adoption of crowdsourced delivery, and thus are more satisfied with the purchase experience and with the retailers. The crowdsourcing firms, or the retailers in the context of Essay 1, could financially benefit from higher customer's repurchase and recommendation as a result of crowdsourced delivery adoption. Last but not least, the involvement of the consumer crowd in supply chain operational activities does not negatively impact other supply chain partners. Instead, B2C collaboration enhances the relationship between the crowdsourcing firms, or the manufacturers in the context of Essay 3, and the retail partners and promote more information sharing from the retailers.

This dissertation also indicates that to ensure the success of crowdsourcing projects, crowdsourcing firms and platforms need to overcome the challenges of motivating the crowd to participate and perform. One way for companies to increase participation and quality of crowdsourcing work is to frame the task messages in a negative way and emphasize the connections between the crowdsourced agents and the consumer community. This finding also

contributes to the emergent literature on crowdsourcing by illuminating the nature of crowdsourced agents, suggesting that crowdsourced agents might feel more connected to the consumer community than to a specific crowdsourcing firm or platform.

Furthermore, this dissertation contributes to the theoretical underpinnings of several theories, including e-LSQ, framing and self-determination theory, and balance theory. Particularly, Essay 1's findings extend e-LSQ framework by proposing product type as a moderator of CD's effect on customers' outcomes. The finding suggests that retailers or companies will reap the most benefits of CD model if they start offering CD services for groceries and food products. Future research, therefore, can further investigate specific product characteristics that the use of CD model may benefit the most. In addition, Essay 1's findings also expand the e-LSQ model in crowdsourcing context beyond the operational focus. The explorative findings defy conventional thinking that online retailing is not conducive to interactions between customers and service provider personnel, thus, undervaluing the importance of relational factors (Rao et al., 2011). Our results show that enabled by technology, relational aspects between customers and logistics service provider are appreciated by customers not only during but also before the service counter. The emergence of the social dimension, albeit diminutive, also connotes the relevance of social impacts in customers' evaluation of logistics services. Future research, therefore, could examine not only social factors of logistics services but also the longitudinal effect of those factors on customers' perceptions of service quality. Future research, therefore, could dive deeper into these distinctive characteristics of the CD model and how to incorporate these new attributes into the design of CD services to increase service performance and customer experiences.

In addition, Essay 2's findings also contribute to the current literature on SDT and message framing by investigating the interaction effects of identification messages and goal framing as well as presenting task complexity as a potential boundary condition of the effects of goal framing and identification messages. Specifically, the effects of negative framing on reservation time, satisfaction, and task quality are stronger in the presence of consumer identification messages. This result suggests an additive nature of extrinsic motivation and identified motivation, given the right presentation of the message.

Future research can also look at how crowdsourcing model works under different fulfillment strategies (point-to-point delivery vs. dynamic routing), geographical locations (urban areas with high population density vs. rural areas where distribution networks are not so developed). Another interesting angle is to look at the supply side. Given the voluntary nature of the crowdsourced networked and the on-demand nature of the service, future research can look at how to manage the risks and uncertainty associated with the supply. Furthermore, because crowdsourcing is built upon underutilized or idled resources, its implications for sustainability might be another area to explore. Handling, storing, and transporting goods through a web of individuals could benefit local and global economies, cut greenhouse gas emissions, and may reduce the necessity for new investment in logistics infrastructure.

Future research, as such, could study from the consumers' viewpoint and how B2C collaboration activities might impact the consumers' attitude and behaviors toward the supply chain partners of the focal firm. Overall, this research is a first empirical effort in understanding the "chain" effects of B2C collaboration in supply chain management. Additionally, the dissertation contributes to the understudied supply chain triad literature by examining the power and relationship dynamics within the manufacturer-consumers-retailer triad. By bringing the

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consumer crowd into a firm's collaboration network, the consumers become a newly emerging active and powerful actor in the service triad (Ta et al., 2015). As the consumer crowd may possess characteristics that are different from a traditional supplier or service provider, the power and relationship dynamics in this triad might differ from the interfirm buyer-supplier-supplier triad commonly seen in supply chain literature. This could serve as an interesting avenue for future research.

VI. Appendix

UNIVERSITY OF ARKANSAS

September 18, 2017

MEMORANDUM

TO: Ha Ta
                Adriana Rossiter Hofer

FROM: Ro Windwalker
                IRB Coordinator

RE: New Protocol Approval

IRB Protocol #:   17-09-078

Protocol Title: *Inventory Task Designs*

Review Type: ☒ EXEMPT

Approval Date: 09/18/2017

Your protocol has been approved by the IRB. We will no longer be requiring continuing reviews for exempt protocols.

If you wish to make any modifications in the approved protocol that may affect the level of risk to your participants, you must seek approval prior to implementing those changes. All modifications should be requested in writing (email is acceptable) and must provide sufficient detail to assess the impact of the change.

If you have questions or need any assistance from the IRB, please contact me at 109 MLKG Building, 5-2208, or irb@uark.edu.

To:	Ha Hai Ta
	BELL 4188
From:	Douglas James Adams, Chair
	IRB Committee
Date:	02/22/2018
Action:	**Exemption Granted**
Action Date:	02/22/2018
Protocol #:	1801094409
Study Title:	The impact of B2C collaboration in supply chain triads

The above-referenced protocol has been determined to be exempt.

If you wish to make any modifications in the approved protocol that may affect the level of risk to your participants, you must seek approval prior to implementing those changes. All modifications must provide sufficient detail to assess the impact of the change.

If you have any questions or need any assistance from the IRB, please contact the IRB Coordinator at 109 MLKG Building, 5-2208, or irb@uark.edu.

cc: Adriana Rossiter Hofer, Investigator