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Omni-Channel Supply Chain Management: Assessing the Impact of Retail Service Operations in the Retail Supply Chain

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Omni-Channel Supply Chain Management: Assessing the Impact of Retail Service Operations in
the Retail Supply Chain

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy in Supply Chain Management

by

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Abstract

The traditional retail environment, which is characterized by a clear division between brick-and-mortar and non-brick-and-mortar retail channels, has been recently disrupted by developments in e-commerce and mobile technologies. The result has been the emergence of omni-channel retailing. Within the reality of this new retail environment, it has been proposed that retailers should develop the necessary capabilities to fulfill consumer demand from anywhere – the store, the distribution center, or via drop-shipping from a supplier – which leads to the emergence of new operational complexities and challenges in the retail supply chain. In light of the growing popularity of these new fulfillment capabilities, it is important to not only consider the financial returns they provide to retailers, but also the potential impacts on the upstream supply chain. Moreover, omni-channel operations will allow retailers to offer new fulfillment services to consumers, such as cross-channel returns or in-store pick-ups, ultimately resulting in new supply chain service outputs in the consumer market. Thus, the aim of this dissertation is to investigate and obtain a holistic understanding of the importance and impacts of omni-channel fulfillment operations for successful retail supply chain management. This will be done by considering three different echelons in the supply chain, (retailer, supplier, and consumer), and investigating how emerging strategies in omni-channel fulfillment impact all three.

Using the theoretical underpinning of ambidexterity, Essay 1 investigates how retailers manage their investments and developments pertaining to existing and new fulfillment operations, and how that may lead to improvements in a retailer's operational and financial performance. To address this research question a structured content analysis in combination with secondary financial data was conducted. To explore how retail omni-channel fulfillment

operations impact upstream supply chain members a qualitative research approach was executed in Essay 2 using the case study methodology. Essay 3 employs a series of experimental studies to explore how retail omni-channel fulfillment operations can be used to recover from a stockout. Using equity theory, this essay investigates how, in the case of a stockout, different attributes of omni-channel service operations may impact consumer satisfaction and their evaluation of a retailer's physical distribution service quality (PDSQ).

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I. Introduction

The traditional retail environment, characterized by a clear division between brick-and-mortar and non-brick-and-mortar retailers, experienced a recent shift by the emergence of e-commerce and mobile technologies (Brynjolfsson, Hu, and Rahman 2013; Rigby 2011). In this new retail environment, the clear division between physical and digital retail channels has been slowly diminishing. Now, a new integrated omni-channel retail environment (Brynjolfsson et al. 2013) with multiple touch-points (Wallace et al. 2004) and innovative services, such as in-store pick up (Vishwanath and Mulvin 2001) and the ability to return online purchases at a physical store is emerging (Bendoly et al. 2005). However, retailers offering consumers with these innovative fulfillment services spanning multiple channels are likely to also face difficulties and challenges in managing and executing their retail supply chain operations in an efficient and effective manner. While some retailers, such as Nordstrom, Apple, or Walmart for instance, excel with their omni-channel fulfillment operations, the reality is that the majority of retailers struggle with the realization and management of their omni-channel fulfillment operations (Forrester Research, Inc. 2014).

Omni-channel fulfillment operations are those *activities that span from consumers placing orders from multiple touch points (i.e. store, website, mobile device) to retailers fulfilling those orders from multiple touch points (i.e. store, DC, or manufacturer), ultimately resulting in customer satisfaction* (Pyke et al. 2001; Strang 2013). Research suggests that retailers with effective omni-channel retail service operations management are able to gain a competitive advantage (Burke 2002; Weinberg et al. 2007). However, the majority of the research on retail operations focuses on investigating operations within a single channel, neglecting the emerging operational complexity of omni-channel retailing (Agatz et al. 2008).

Thus, important and interesting research questions pertaining to omni-channel fulfillment operations are still unanswered and warrant further exploration.

Apple, for example, became a leading omni-channel retailer by taking advantage of its already established fulfillment operations of its brick-and-mortar and online channel through integrating the respective channel operations to develop and establish new fulfillment operations opportunities. This anecdotal evidence of Apple advocates the importance of adopting new fulfillment operations for retailers to be successful within the new reality of omni-channel retailing. It is proposed that retailers developing the necessary capabilities to fulfill consumer demand from anywhere – the store, the distribution center, or via drop-shipping from a supplier (Strang 2013) – is leading to the emergence of new operational complexities and challenges in the retail supply chain. While these new fulfillment operations enable retailers to offer new services to consumers, such as cross-channel returns or in-store pick-ups (Vishwanath and Mulvin 2001), they might also have significant impacts on the upstream supply chain as well. However, current research falls short in terms of considering the potential impacts of omni-channel fulfillment operations on different echelons in the supply chain.

Thus, the aim of this dissertation is to investigate and obtain a more holistic understanding of the importance and impacts of omni-channel fulfillment operations for successful retail supply chain management by considering three different echelons in the supply chain. Three individual studies implementing various methodological approaches were conducted that considered the potential impacts of omni-channel fulfillment operations at the supplier, the retailer, and the consumer level. Figure 1 illustrates the relationship between the three essays. The following research questions are addressed in this dissertation:

- (1) How do retail omni-channel fulfillment operations impact retail firm performance?
- (2) How do retail omni-channel fulfillment operations impact the upstream supply chain?
- (3) How do retail omni-channel fulfillment operations impact consumer service perceptions?

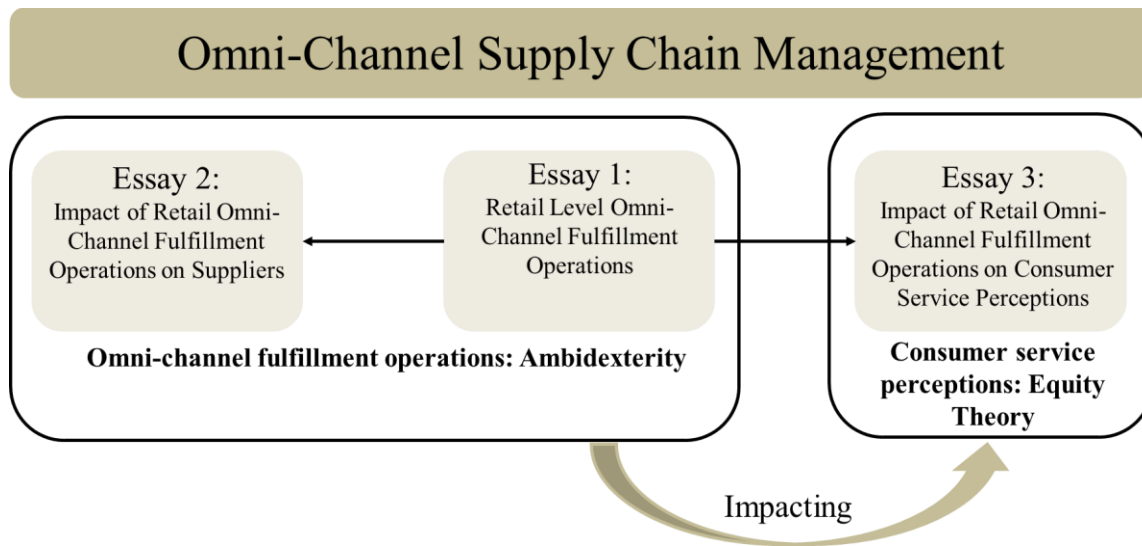


Figure 1: Dissertation Overview

Foundational Literature Review

Retail Supply Chain Management

Retail supply chain management research spans across a wide range of specific research areas, but predominantly focuses on investigating the potential impacts of operational improvements on retail supply chain performance (Mentzer et al. 2000). Over the last decade more retail research emerged focusing on the strategic importance of the retailer (Randall et al. 2011) and even consumers in retail supply chain management (e.g. Rao et al. 2014; Rao et al.

2011). Extant literature can be broadly categorized into three areas that address: forecasting, inventory management and the bullwhip effect, and retail operations.

Forecasting

Literature exploring forecasting in supply chain management can be segmented into three literature streams. The first stream focuses on how forecasting accuracy can be improved (e.g. Williams and Waller 2010; Williams and Waller 2011). For example, research in this stream suggests that suppliers may be able to improve their forecast accuracy by using Point-of-Sale data rather than using a retailer's order history to develop forecasts (Williams and Waller 2010; Williams and Waller 2011). The second stream explores how forecasting impacts operational performance (e.g. Aviv 2007). For instance, it is suggested that suppliers and buyers can achieve significant supply chain performance improvements when implementing a collaborative forecasting approach in comparison to each echelon developing an individual forecast (e.g. Aviv 2001; Cachon and Lariviere 2001). The third stream of research integrates the importance of managerial decision making into forecasting accuracy (Carbone and Gorr 1985; Kremer et al. 2011). This body of work suggests that human judgment is an important factor that should be considered when developing forecasts. For example, Kremer et al. (2011) showed that managers are likely to overreact to forecast errors in stable environments leading to poorer forecasting performance.

Inventory Management and Bullwhip Effect

Another body of literature within the area of retail supply chain management considers inventory management and the bullwhip effect. The bullwhip effect is the amplified variability in demand as one moves upstream in the supply chain (Lee et al. 1997). Within that literature,

research primarily focuses on exploring the impact of inaccurate inventory records (e.g. DeHoratius and Raman 2008; Kull et al. 2013) and the operational and behavioral causes of the bullwhip effect (e.g. Lee et al. 1997; Croson and Donohue 2006). In general, research has shown that inventory record inaccuracy leads to poor retail performance. Specifically, within a multi-channel retail setting, daily inventory record inaccuracy has been shown to increase inventory levels, while simultaneously decreasing service levels (Kull et al. 2013). Similarly, Nachtmann et al. (2010) found evidence for lower service levels stemming from inaccurate inventory records.

Pertaining to the bullwhip effect, early research was specifically interested in exploring the operational causes that lead to the bullwhip effect (e.g. Sterman 1989; Lee et al. 1997). In addition to operational causes, behavioral causes, such as decision biases, have been of interest to retail supply chain management research. For example, Croson and Donohue (2006) found that managers constantly underweight the supply line (i.e. failure to account for past orders) inducing the bullwhip effect even after controlling for operational causes. However, some researchers failed to find evidence that the bullwhip effect exists in retail supply chains (Cachon et al. 2007).

Retail Operations

A last major topic in retail supply chain management considers retail operations and specifically focuses on on-shelf availability (OSA) (e.g. DeHoratius and Raman 2008; Waller et al. 2010; Ehrental and Stölzle 2013). Within this research domain two streams can be identified. The first stream emphasizes the causes of poor OSA (e.g. Ehrental and Stölzle 2013; Ettouzani et al. 2012) whereas the second stream focuses on consumer responses to out-of-stocks (Zinn and Liu 2001; Zinn and Liu 2008; Peinkofer et al. 2015). This research

suggests that poor OSA is primarily the result of operational inefficiencies within the supply chain (Corsten and Gruen 2003). Furthermore, while poor OSA leads to significant financial losses for retailers and suppliers, it also impacts consumers. The literature suggests that stockouts lead to consumer dissatisfaction and lowers repurchase intentions (Pizzi and Scarpi 2013; Kim and Lennon 2011).

Fulfillment Operations

Research pertaining to omni-channel fulfillment operations is still in its infancy and the majority of the available papers are either analytical in nature or adopt simulation techniques. This body of literature primarily focuses on investigating the linkages between fulfillment operations and the potential cost trade-offs firms may face when implementing omni-channel fulfillment operations (e.g. Bretthauer et al. 2010; Alptekinoğlu and Tang 2005). While these important contributions should not be overlooked, the current focus of the extant research effectively ignores the impact that omni-channel fulfillment operations may have on supply chain members. Thus, it might be necessary to gain a holistic understanding of the potential impacts, changes, and challenges by considering different echelons of the supply chain.

Within the realm of omni-channel retailing, operating and integrating multiple channels adds to a supply chain's complexity but also provides members of a supply chain with new service opportunities and synergies (Verhoef et al. 2012). This is particularly relevant within the context of fulfillment operations. For example, some companies now offer consumers the ability to order products online and pick them up in the store, or request they be delivered to their home or place of employment. Given this change in the consumer environment, retailers will need to develop the capabilities required to fulfill consumer orders that are received and

satisfied simply from anywhere - whether it is from the store, the warehouse, or directly the supplier (Strang 2013).

One common theme found across the fulfillment literature pertains to the different strategies that multi-channel retailers use. Typically, retailers adding an additional retail channel can either select to establish a separate fulfillment network or they can leverage their already existing network (Bendoly 2004). In the latter case, retailers could use their stores to also fulfill online demand. However, research shows that retailers should carefully evaluate based on various factors, such as that the percentage of online sales (Bretthauer et al. 2010) for example, which stores to dedicate for simultaneous in store and online demand fulfillment since not all stores may be appropriate for online fulfillment operations (e.g. Bretthauer et al. 2010; Bendoly 2004; Mahar et al. 2014). Another possible option for retailers is to fulfill online demand using a distribution center. Insofar as distribution cost might differ for each of these options, Alptekinoğlu and Tang (2005) develop a model and demonstrate that it is typically more beneficial to fulfill online demand from the store when the distribution costs for both options similar.

A second stream of research pertaining to fulfillment operations focuses on the impact of drop-shipping in online retailing. Drop-shipping is a fulfillment strategy where online orders are directly fulfilled by suppliers rather than drawing inventory from a retailer's physical store or a distribution center (Cheong et al. 2015). One major challenge associated with this fulfillment option has to do with the potential discrepancies in inventory information between retailers and drop-shippers. Inventory record inaccuracies are a major driver of retail operation inefficiencies (Kull et al. 2013; DeHoratius and Raman 2008). However, research shows that

these challenges can be mitigated by commitment-penalty contracts (Gan et al. 2010) or by accounting for potential inventory errors (Cheong et al. 2015).

Theoretical Background

Essays one and two focus on the firm level; hence, an organizational theory is a suitable lens to inform these essays. Insofar as it is important for suppliers and retailers to refine their current fulfillment operations while simultaneously developing new fulfillment operations to adapt to the changing environment, the theoretical underpinnings of ambidexterity is deemed appropriate for these two studies. Essay three focuses on consumers more specifically and thus warrants a consumer level theory. Since equity theory has been widely used to study consumer behavior and perceptions in the context of service recovery (e.g. Roggeveen et al. 2012), equity theory is suitable to explore how omni-channel fulfillment operations impact consumer service perceptions.

Ambidexterity

Rothaermel and Alexandre (2009, 759) define ambidexterity as “an individual’s ability to use both hands with equal ease”. Applied to organizational management research, the ambidexterity concept has received interest from management scholars over the last decade (O’Reilly and Tushman 2013) and have given rise to a new research paradigm in the organizational theory literature (Raisch and Birkinshaw 2008). Research suggests that specifically within dynamic environments successful firms are understood to be ambidextrous (Junni et al. 2013) when they are capable of meeting current demand while at the same time being able to adapt to environmental (and subsequent demand) changes (Duncan 1976; Gibson and Birkinshaw 2004; Tushman and O’Reilly 1996).

The concept of ambidexterity has been examined across various disciplines and contexts, such as organizational learning (e.g. March 1991; Katila and Ahuja 2002), innovation (e.g. Tushman and O'Reilly 1996; He and Wong 2004), and most recently, operations management (e.g. Blome et al. 2013; Kristal et al. 2010). Ambidexterity originated in the organizational learning literature (March 1991) and implies that in order to be successful, firms should meet current business demands (exploitation) while simultaneously adapting to environmental changes (exploration) (Duncan 1976; Gibson and Birkinshaw 2004; Tushman and O'Reilly 1996). According to March (1991, 71) exploitation is defined as a firm's activities that are characterized by, for example, refinement, efficiency, implementation, and execution, whereas exploration is understood as a firm's activities that include risk taking, experimentation, flexibility, discovery, and innovation to name a few.

While earlier research proposes that it is impossible for firms to achieve a simultaneous balance between exploitation and exploration (Hannan and Freeman 1977), March (1991) argues the contrary. March claims that it is of explicit necessity to a company's survival that a balance between exploitation and exploration is maintained. Focusing on only one activity, either exploitation or exploration, may actually be to a company's disadvantage. Literature suggests that companies solely focusing on exploitation may find themselves in a competency trap since these companies are unlikely to have the necessary capabilities in place to respond to environmental changes (Levitt and March 1988). Similarly, companies solely focusing on exploration may find themselves in a reiterative circle of search without any long-lasting outcomes (Levinthal and March 1993). Therefore the organizational research focus shifted from considering trade-offs between competing organizational activities, to adopting the

paradoxical view of aligning competing organizational activities simultaneously, thus giving rise to the concept of ambidexterity in management research (O'Reilly and Tushman 2013).

Operations and supply chain scholars recognize ambidexterity as a potential solution to overcome the trade-offs between operational efficiency and adaptability (e.g. Kristal et al. 2010; Patel et al. 2012). Within the limited number of research manuscripts addressing ambidexterity three themes can be distinguished. First, some scholars use ambidexterity within the broader context of supply chain management (Kristal et al. 2010; Chandrasekaran et al. 2012). For example, Kristal et al. (2010) showed that firms having an ambidextrous supply chain strategy is helpful in developing supply chain capabilities and competencies leading to increased firm performance. A second theme considers ambidexterity at an operational level. Research suggest that operational ambidexterity is specifically important for companies operating under high uncertainty (Patel et al. 2012). While the first two themes consider ambidexterity within an individual firm, the third theme investigates the potential impact of ambidexterity when spanning firm boundaries. Research especially focused on how ambidextrous governance relates to firm performance (Blome et al. 2013; Chiu 2014). Findings suggest that within supply chain management, contractual and relational partnerships should be viewed as complementary rather than trade-offs (Blome et al. 2013).

Equity Theory

Equity theory (Adams 1965) is an appropriate theoretical lens to study retail phenomena involving retailers and consumers. Equity theory states that in an exchange relationship, one party will experience a feeling of injustice if their ratio of outcomes to inputs is perceivably lower than their exchange partner's ratio of outcomes to inputs. For example, if a retailer and its consumers are in an exchange relationship and the retailer is unable to provide

the consumers with the products they desire, consumers are likely to experience inequity and dissatisfaction (Oliver 1980) since they expected to be able to buy the product. However, equity can be restored by altering either the consumer's inputs or outputs. For example, a retailer may offer customers a similar product (to the one they are out of), which in turn may increase the consumer's output, thereby mitigating the feeling of injustice leading to consumer satisfaction (Roggeveen et al. 2012) and a positive attitude (Oliver 1980).

While equity theory originally only considered the dimension of distributive justice, more recently it has been conceptualized by three dimensions: distributive, procedural, and interactional justice. Distributive justice refers to an individual's perception that the outcome of a process was fair (Adams 1965; Tax et al. 1998). Procedural justice refers to an individual's perception of whether the process and policies that led to the outcome of process are were fair (Lind and Tyler 1988; Blodgett et al. 1997), and interactional justice refers to an individual's perception of whether the interpersonal treatment during the process was fair (Tax et al. 1998).

Service recovery literature specifically draws on equity theory and conceptualizes equity as consisting of the three aforementioned dimensions. Extant research has shown that all three justice dimensions are important when attempting to restore consumer satisfaction after a service failure has occurred (e.g. Roggeveen et al. 2012). Additionally, supply chain management researchers have used equity theory to investigate supply chain failures (Rao et al. 2011; Griffis et al. 2012). Therefore, the use of equity theory to study how omni-channel fulfillment operations impact consumer service perceptions is appropriate.

Structure of the Dissertation

Three individual essays with different methodological approaches were conducted to address the research questions outlined in the introduction. Essay one addresses the impact of omni-channel fulfillment operations at the retailer level using secondary data. Essay two investigates the impact of omni-channel fulfillment operations on upstream supply chain members. For this study a qualitative approach is used. Lastly, essay three focuses on the impact of omni-channel fulfillment operations at the consumer level by implementing a series of experimental studies.

Essay One

Using the theoretical underpinning of ambidexterity, this essay explores how retailers manage and prioritize their investments and developments pertaining to exploratory and exploitative fulfillment operations and how those may lead to improvements in a retailer's operational and financial performance. To address how omni-channel fulfillment operations are related to retail firm performance, a combination of secondary data of the retail industry are used. Using secondary data overcomes several shortcomings of other methods, for example survey methods, which are associated with common method and key informant bias (Roth 2007; Gattiker and Parente 2007).

Data was collected from various secondary data sources. First, Compustat data was used to collect firm-level financial measures for publicly traded retailers. Second, press releases from the Lexis-Nexis database were used to collect data pertaining to a retailer's announcement of fulfillment operations. This approach is in line with prior research

implementing a similar research approach (e.g. Hofer et al. 2012; Uotila et al. 2009; Tate et al. 2010).

The search within Lexis-Nexis is limited to the archives of the *Business Wire and PR Newswire* and all press releases referring to a retailer's omni-channel fulfillment operations will be included in our analysis. Once all press releases were collected, the archival texts were analyzed using ATLAS.Ti to extract data to create our independent variables. Structural content analysis is an appropriate tool for quantitative content analysis (Tangpong 2011) and has been used in prior supply chain and operations research (e.g. Hofer et al. 2012). This approach is in line with previous research using press releases and structural content analyses to construct the independent variables of interest (Uotila et al. 2009).

Essay Two

A qualitative approach is suitable for exploration and theory building (Charmaz 2006). To explore how a retailer's omni-channel fulfillment operations impact upstream supply chain members a qualitative research approach is employed using a case study design (Yin 2009). By starting the research process with examining the potential impacts of omni-channel fulfillment operations on upstream supply chain members in depth, a solid understanding of the underlying assumptions and processes is achieved. Two case studies consisting of in-depth interviews and on-site visits were conducted. The emerging findings were triangulated with data from online news articles. This study explores the new role of suppliers within omni-channel retailing and how suppliers achieve operational ambidexterity. Interviews were professionally transcribed and analyzed using initial and focused coding procedures following Charmaz (2006). Adopting a qualitative research approach resulted in a solid theoretical model deeply grounded in the data (Charmaz 2006).

Essay Three

The aim of this essay is to explore how omni-channel fulfillment operations can be used to recover from a stockout. This essay investigates how, in the case of a stockout, different attributes (e.g. convenience and speed) of omni-channel fulfillment operations may impact consumer satisfaction and their evaluation of a retailer's physical distribution service quality (PDSQ). Using equity theory, a conceptual framework was developed and a series of experimental studies conducted to address the aforementioned research question.

Experimental methods are used to isolate the causal effect of the independent variables on the dependent variable(s) of interest (Tokar 2010) and to test for potential mediators and moderators (Knemeyer and Naylor 2011). To ensure that only the variables of interest are manipulated and to rule out potential confounds, this method involves the careful development of experimental manipulations through extensive pretesting (Perdue and Summers 1986; Knemeyer and Naylor 2011).

The first study manipulated two attributes related to omni-channel fulfillment: *convenience*, which refers to where a product is shipped to (i.e. the store or the consumer's home) and *speed*, which accounts for when a product will be delivered (i.e. next day or in 9 days). Building on the first study, the second study specifically investigated the underlying theoretical mechanism, which may lead to restoration of positive consumer perceptions after a stockout occurred. Study 3 introduced purchase criticality as an important contextual factor to investigate whether the relationships found in study 1 and study 2 hold in different consumer's shopping context. Research on consumer responses to out-of-stocks has shown that it is important to consider whether a consumer feels he or she truly "needs" a product or not, since this contextual factor might alternate the expected relationships (Zinn and Liu 2001).

Following prior experimental work in the supply chain management field (e.g. Esper et al. 2003), the series of experiments is based on a hypothetical shopping scenario where only the variables of interest vary between treatment groups. Careful development of the experimental shopping scenario, following the guidelines of Rungtusanatham et al. (2011), ensured the validity of the shopping scenario. Similarly, extensive pretesting ensured the validity of the experimental manipulations (Perdue and Summers 1986).

The hypothetical shopping scenario asked participants to imagine themselves in a particular shopping situation and asked them to answer a short survey, wherein the responses served as the dependent variables of interest. For the pretest, a student sample was used. Students are an acceptable sample for experimental research in supply chain management research (Thomas 2011), insofar as students are also consumers (Kardes 1996). The final data were collected via Amazon Mechanical Turk (MTurk), a national online consumer panel. MTurk has been deemed an acceptable source to recruit participants for experimental research (Knemeyer and Naylor 2011; Goodman et al. 2013).

Contributions and Implications

The current fulfillment operations literature primarily employs analytical models to investigate the impact of various fulfillment strategies on cost trade-offs. Consequently, the extant literature provides only limited insights into the impact of fulfillment operations and neglects the potential effects on other important retail supply chain performance measures. This dissertation overcomes these limitations by exploring the impact of omni-channel fulfillment operations on three different echelons in the supply chain. Thus, this dissertation provides a holistic view of how omni-channel fulfillment operations affect retail operations and supply chain management, more generally.

Contributions and Implications of Essay One

Essay one of this dissertation highlights the strategic importance of omni-channel fulfillment operations for retailers' performance outcomes. Specifically, this research shows that retailers in the general merchandise and apparel segment achieve significant financial performance improvements due to operational ambidexterity. By focusing on the importance of developing ambidexterity in terms of fulfillment operations to achieve superior operational and financial performance outcomes, this dissertation explicates the impacts of omni-channel fulfillment operations, beyond just a retailer's cost structure. This is of particular interest, insofar as some companies fail to report any performance enhancements despite conducting omni-channel fulfillment operations (PwC 2015). Consequently, this research is able to explain why some companies experience superior performance outcomes due to omni-channel fulfillment operations and why others do not. Such insights might enable managers to evaluate their own companies and equip them with better understanding as to why their companies might not reach expected performance outcomes. It also highlights the importance for managers to develop ambidextrous fulfillment operations to succeed in the changing and volatile retail environment.

Moreover, by considering the impact of additional factors on the ambidexterity-performance relationship, this research explores boundary conditions and thus, also contributes to the theoretical understandings of ambidexterity. Considering resource endowment as a potential moderator, this research shows that large as well as small retailers might benefit from developing ambidextrous fulfillment operations. Managerially, the results inform managers on whether, operational ambidexterity would be is a viable strategy to implement in order to achieve improved performance outcomes.

This research also contributes to the limited body of work on operational ambidexterity. Ambidexterity is an important concept, which overcomes trade-offs that managers might experience in the operations management field. Thus, this research provides further evidence of the positive relationship between operational ambidexterity and a firm's operational and financial performance. In particular, this research uses longitudinal data providing further insights into the impact of operational ambidexterity over time to overcome the limitations of the current research, which relies heavily on cross-sectional data (e.g. Patel et al. 2012).

Furthermore, by constructing an innovative data set and using a structured content analysis, this research specifically follows recent calls for more innovative research approaches (Boyer and Swink 2008) and the usage of content analyses for operations management research in particular (Tangpong 2011). Accordingly, essay one contributes to the general operations management literature by illustrating the suitability of this methodological approach for this discipline.

Contributions and Implications of Essay Two

Essay two of this dissertation explores how suppliers become operationally ambidextrous. Specifically, considering drop-shipping as a new fulfillment option, suppliers might experience a disruption in their already established fulfillment operations, insofar as they now might also fulfill individual end-consumer orders. This research focuses on suppliers' operational ambidexterity by providing a detailed description of how suppliers actually achieve operational ambidexterity within the context of drop-shipping. It is suggested that within the context of drop-shipping, there is a cyclical nature of exploitation and exploration. This is especially important considering that the literature lacks a clear understanding on how companies can achieve ambidexterity (e.g Adler et al. 1999; Siggelkow and Levinthal 2003).

Thus, this research advances the theoretical understandings of operational ambidexterity. This research also provides managers with insights on how to become operationally ambidextrous. Supply chain managers can use the findings of this study to benchmark them against their own company to investigate the factors needing adjustment in order to improve their operational ambidexterity.

In addition, this research shifts the focus of drop-shipping research from a strategic perspective (the retailer) to a more tactical perspective (the supplier). In response, this research provides insight into the operational challenges (customizing, complying, and coordinating) and drivers (reacting, accepting, and penetrating) suppliers are facing within the current context of omni-channel retailing.

Contributions and Implications of Essay Three

Essay three spans the research areas of operations and marketing by investigating how omni-channel fulfillment operations can impact consumer perceptions. This research specifically contributes to the growing literature stream associated with consumer issues in supply chain management, which advocates the importance of operations management to create end-consumer value (Flint and Mentzer 2006). Specifically, this research highlights the importance of fulfillment operations for service recovery within an omni-channel retail environment. This research is important considering that in an omni-channel retail environment fulfillment operations may play a new and important role in recovering from out-of-stocks and could help retailers “save the sale.”

Additionally, this research contributes to the literature that investigates how consumers respond to out-of-stocks. Historically, this body of work has exclusively focused on exploring

consumer responses to out-of-stocks in a single channel setting (e.g. Zinn and Liu 2008; Pizzi and Scarpi 2013). However, with the emergence of omni-channel retailing, consumers have new options, in terms of their behavioral responses, when a stockout occurs. This research extends the current understandings of consumer responses to out-of-stocks by considering an omni-channel retail context.

Furthermore, given the shift towards an omni-channel retail environment, wherein consumers have increased expectations and immediate switching capabilities (Brynjolfsson et al. 2013), it is essential for retail managers to understand consumer behavior and how consumers evaluate different fulfillment operations. This research highlights that a fast stockout recovery is essential for positive consumer perceptions. However, it is important to understand that not all recovery efforts will be evaluated by consumers equally. This research shows that the shopping context (purchase criticality) as an important effect on how consumers perceive different recovery attributes. Managers may wish to gain an understanding of the recovery attributes that are most valued by consumers to increase consumer satisfaction and repurchase intentions. This research considers the attributes of convenience and speed. These attributes are evaluated considering the situational involvement of the consumer in the shopping process and thus provide further insights for managers. This research shows that consumers evaluate the attributes differently based on their situational involvement. Thus, managers should adjust their recovery strategies according to consumer's situational involvement to provide the most value and satisfaction to consumers.

Dissertation Outline

Following the introduction in chapter one, chapter two focuses on how omni-channel fulfillment operations are related to a retailer's performance. Next, chapter three constitutes the

qualitative study, which explores operational ambidexterity within the drop-shipping context. Chapter four consists of a series of experiments that investigate how omni-channel fulfillment operations impact service recovery after a stockout has occurred. Lastly, chapter five will conclude this dissertation by summarizing the grand findings of this dissertation.

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II. Essay 1

The Impact of Operational Fulfillment Ambidexterity on Retail Firm Performance

Introduction

In early 2013, Macy's announced that it would be dedicating an additional 200 stores by the end of the year for the purpose of fulfilling online orders (Ryan 2014). Now, Macy's is one of the leading retailers competing in the current retail landscape. By integrating their physical and electronic fulfillment operations (referred to as an omni-channel) (Brynjolfsson et al. 2013), Macy's was able to gain more flexibility to efficiently and effectively fulfill consumer demand and address increasing consumer expectations. However, anecdotal evidence with regards to the effectiveness of omni-channels is mixed. While some retailers have reported performance improvements due to the implementation of omni-channel fulfillment operations (Forrester Research, Inc. 2014), others failed to report any performance enhancements whatsoever (PwC 2015). Because technological advancements are thought to disrupt and alter the traditional retail landscape (Brynjolfsson et al. 2013; Rigby 2011), it is pivotal to understand why some retailers might be able to succeed within this new omni-channel reality while others might not be able to thrive.

Macy's standing as one of the leading retailers in the U.S. is largely due to its emphasis on improving existing fulfillment operations while simultaneously developing new fulfillment services, such as online ordering and in-store pickup options (Vishwanath and Mulvin 2001). In particular, when retailers fulfill online customer orders from physical stores, it allows the retailer to leverage pre-established fulfillment operations (Metters and Walton 2007), while simultaneously employing new fulfillment services for consumers. This anecdotal evidence suggests that retailers may need to develop "ambidextrous" fulfillment operations to compete and survive within this new reality of omni-channel. Using the theoretical underpinnings of ambidexterity (e.g. Tushman and O'Reilly 1996; Raisch and Birkinshaw 2008), this study

investigates how retailers manage and prioritize their investments and developments with regards to their fulfillment operations and how that may lead to improvements in a retailer's operational and financial performance.

Rothaermel and Alexandre (2009, 759) define ambidexterity as an “individual's ability to use both hands with equal ease”. In the organizational management literature, ambidexterity is used to describe the concept of balancing existing activities (exploitation) and new activities (exploration) (March 1991). Thus, the main premise of ambidexterity is that firms can achieve higher performance outcomes if they are able to balance activities pertaining to exploration and exploitation (March 1991). It is widely accepted within the management literature that firms will achieve higher performance outcomes if they are able to become “ambidextrous” (Lubatkin 2006; He and Wong 2004; Junni et al. 2013). Similarly, the operations management literature suggests that firms that are able to exhibit ambidexterity in their operational activities might be able to achieve superior performance outcomes (Patel et al. 2012). Alternatively, those companies which fail to establish a balance between their exploration and exploitation activities, might not achieve optimal performance outcomes. A company that focuses exclusively on exploitation may lack the necessary capabilities to respond appropriately to changes in the environment (Levitt and March 1988). Correspondingly, a company that focuses exclusively on exploration may find itself in an reiterative circle of search leading to no performance enhancements (Levinthal and March 1993).

The majority of extant research exploring fulfillment operations uses analytical modeling to analyze the link between single and multi-channel fulfillment operations and estimate potential cost trade-offs (e.g. Bretthauer et al. 2010; Alptekinoglu and Tang 2005). This body of research is limited insofar as it lacks an in-depth exploration of this linkage

between fulfillment operation and firm performance. Furthermore, a limited number of studies have developed empirical models to study the impact of fulfillment operations on operational (Randall, Netessine, and Rudi 2006) and financial performance (Xia and Zhang 2010). However, research exploring the link between a retailer's fulfillment operations and its operational and financial performance within an omni-channel retail context is still lacking.

This research will make several contributions to the operations and supply chain management literature. First, it empirically explores the potential benefits of ambidextrous fulfillment operations within the U.S. retail industry. Prior research suggests that ambidexterity may be advantageous for firms to achieve higher performance outcomes, specifically within service industries (Junni et al. 2013). Furthermore, while the majority of operational ambidexterity research relies solely on survey data, this study uses a combination of data extracted from content analyses and financial information from Compustat to overcome the limitations of using survey data, such as common method and key informant bias (Roth 2007; Gattiker and Parente 2007). Research implementing quantitative content analyses is limited in the operations management discipline (Montabon et al. 2007), but remains an interesting and innovative approach to analysis, particularly in this field (Tangpong 2011). Thus, this research follows Boyer and Swink's (2008) call to employ diversified data sources in operations management research and specifically addresses Tangpong's (2011) suggestion to use content analysis tools for operations management research.

The remainder of this manuscript will first provide an overview of the fulfillment operations literature. Next, the theoretical underpinnings and hypotheses will be presented following by an overview of the methodological approach and the results. The paper concludes with a discussion of the research findings and implications.

Literature Review

Consolidating physical and electronic retail channels in order to achieve a seamless retail environment carries some operational challenges, specifically in terms of order fulfillment, insofar as this act essentially necessitates a redesign of the retail supply chain. The physical retail environment is characterized by central warehouses and distribution centers that deliver products by the truck-load to respective retail stores, where end-consumer demand is fulfilled (Metters and Walton 2007). In the electronic retail environment, retailers take a different approach and end-consumer demand is directly fulfilled from a central warehouse location (Metters and Walton 2007). With the advancement of omni-channel retailing, however, online orders may be fulfilled either by a central warehouse or a dedicated store(s), hence combining the benefits of both approaches and fostering synergy effects across channels (Agatz et al. 2008). This is particularly advantageous for retailers, as their aim is ultimately to fulfill demand as efficiently as possible, be it by a store, distribution center, or manufacturer (Strang 2013). Nonetheless, this introduces new complexities to the retail supply chain and also impacts operations.

The more recent online fulfillment literature can be distinguished into two streams of research. The first stream focuses exclusively on online fulfillment operations (e.g. Rabinovich 2005; Netessine and Rudi 2006; Acimovic and Graves 2015). Internet retailers can fulfill end-consumer demand via their own inventory stocking locations, through an external supplier that directly fulfills end-consumer demand upon the retailer's request (also known as drop-shipping), or by using a hybrid of these two strategies. The optimal fulfillment strategy for retailers depends on various external factors, such as drop-shipping mark-up, transportation costs (Netessine and Rudi 2006), market value, product popularity (Bailey and Rabinovich

2005), product variety, demand uncertainty, and firm age (Randall et al. 2006), to name a few. For example, retailers using drop-shipping may optimize their profits by dividing incoming orders based on high and low priority (Ayanso et al. 2006) and may achieve higher fulfillment performance due to emergency transshipments (Rabinovich 2005) or inventory consolidation (Rabinovich and Evers 2003).

The second stream considers fulfillment operations within a multi-channel context (i.e. retailers that operate physical stores and have an online presence). Integrating physical and electronic channels allows retailers to offer new and different fulfillment services to end-consumers, such as online ordering and in-store pick up or return (Vishwanath and Mulvin 2001). Accordingly, these new services also require retailers to rework their fulfillment strategies. For example, retailers may need to evaluate whether online demand should be fulfilled from a distribution center or from retail stores. Research shows that a retailer can determine the optimal number of stores which handle online order fulfillment based on the percentage of online sales (Bretthauer et al. 2010). Thus, retailers can potentially decrease their costs by selecting only dedicated stores to offer new fulfillment services, such as online ordering and in-store pick up or return (Mahar et al. 2014). Still issues may occur; for example, fulfilling online demand from in-store inventory could lead to a lack of inventory availability in stores (Bendoly 2004) and hence retailers could potentially face a loss in sales.

As was previously mentioned, the majority of the literature investigating fulfillment operations employs analytical research methods and focuses on optimizing cost trade-offs for various fulfillment options. Research exploring the potential operational and financial benefits for retailers employing omni-channel fulfillment operations is still lacking. Xia and Zhang (2010) are among one of the first to empirically investigate the potential advantages of multi-

channel retailers in comparison to traditional retailers. Their findings show that retailers operating multiple channels achieve superior operational and financial performance outcomes in comparison to single-channel retailers. However, their research focuses exclusively on comparing different types of retailers and does not consider the impact of different fulfillment operations, per se. In addition, their study only considers retailers operating up until 2008, which was before the majority of retailers developed omni-channel fulfillment operations. Further research has corroborated their findings (Forrester Research, Inc. 2014), while others have contradicted it, failing to report any performance improvements due to the implementation of omni-channel fulfillment operations (PwC 2015).

Given such limited, yet diversified and seemingly conflicting findings, a study that further investigates the impact of omni-channel fulfillment operations on the performance of retail firms is undoubtedly warranted. In this way, this research contributes to the relevant literature stream by empirically examining the operational and financial effects retailers from three different retail segments (general merchandise, drug and food, and apparel) might experience when implementing omni-channel fulfillment operations.

Conceptual Framework and Hypotheses

Ambidexterity is a relatively recent theoretical view which has primarily been addressed by organizational research (Raisch and Birkinshaw 2008) but has, of late, also been used in the operations management discipline (e.g. Patel et al. 2012; Kristal et al. 2010). Ambidexterity originated in the organizational learning literature (March 1991) and implies that in order to be successful, firms should meet current business demands (exploitation) while simultaneously adapting to environmental changes (exploration) (Duncan 1976; Gibson and Birkinshaw 2004; Tushman and O'Reilly 1996).

According to March (1991, 71) exploitation is defined as a firm's activities that are characterized by, for example, refinement, efficiency, implementation, and execution, whereas exploitation is understood as a firm's activities that include risk taking, experimentation, flexibility, discovery, and innovation to name a few. Contrary to earlier research, which argued that firms cannot achieve alignment between their exploration and exploitation activities (Hannan and Freeman 1977), March (1991) suggests that firms that are able to create and foster such a balance and in so doing, will achieve greater performance outputs. Considered individually, exploitation is likely to lead to more short-term performance enhancements, whereas exploration is believed to impact long-term performance (March 1991). However, taken together a firm balancing exploratory and exploitative firm activities is likely to achieve short-term, as well as long-term performance outcomes, and hence, better performance outcomes over all.

Based on the theoretical underpinnings of ambidexterity, I developed a model proposing that a retailer's operational and financial performance is dependent on the balance it maintains between its exploratory and exploitative fulfillment operations. Furthermore, external factors, such as firm-specific characteristics (e.g. resource endowment) is believed to further amplify the relationship between ambidexterity and firm performance, which are thus accounted for in the theoretical model outlined in Figure 1.

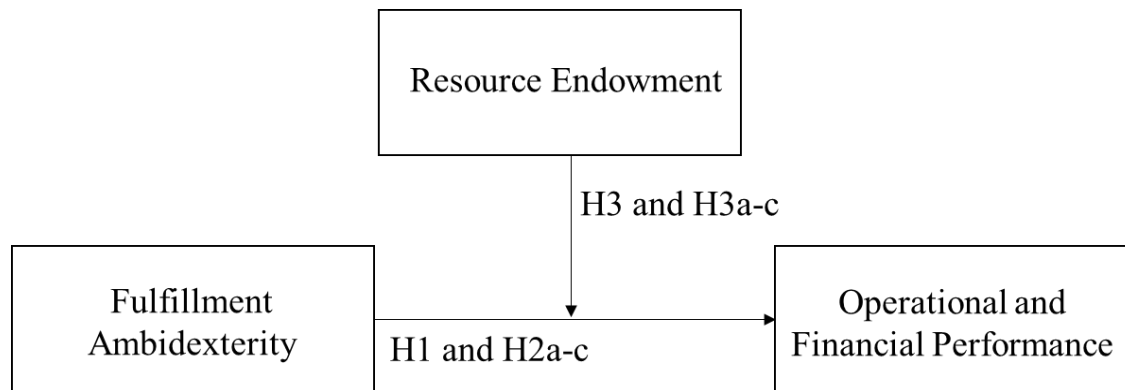


Figure 2: Theoretical Model

For this study, I build upon the exploration and exploitation constructs and define them within the context of retail fulfillment operations, where *exploratory fulfillment operations* are denoted by activities which aim to develop and establish new and innovative fulfillment options and *exploitative fulfillment operations* are denoted by activities that help to improve and refine pre-established fulfillment operations. Following Uotila et al. (2009), the balance between exploration and exploitation is readily apparent when looking specifically at a firm’s relative exploration activities. A low relative exploration indicates that retailers primarily focus on exploitative fulfillment operations whereas a high relative exploration is an indicator for retailers focusing primarily on exploratory fulfillment operations.

Successful omni-channel fulfillment operations are dependent on inventory management and inventory allocation in the supply chain (e.g. Bretthauer et al. 2010; Alptekinoğlu and Tang 2005). Following prior research, *operational performance* is defined as the extent to which a retailer is able to effectively manage its inventory (Alan et al. 2014; Gaur et al. 2005). Thus, for the purpose of this study operational performance refers to a firm’s inventory turnover, gross margin return on investment, and cash conversion cycle. Financial performance, as it is defined in the extant literature, is understood in terms of return based metrics, such as Return on Assets and Return on Investment (e.g. Carr 1999; Vickery et al.

2003), or market value based metrics, like Tobin's Q (Jacobs et al. 2010; Uotila et al. 2009). In line with the previous research then, exploring the impact of ambidexterity on financial performance, i.e. market value, seems appropriate (Uotila et al. 2009), especially since market value has the advantage of capturing long-term and short-term performance effects (Lubatkin and Shrieves 1986; Allen 1993). Thus, for the purposes of this research, *financial performance* is defined as market value.

Exploratory and exploitative activities are fundamentally different in terms of their underlying structures, processes, and resources; this causes tension between exploratory and exploitative activities within a firm (He and Wong 2004). For example, firms face significant risks in terms of not achieving optimal performance outcomes when they exclusively emphasize one activity (e.g. exploration or exploitation) over the other. Firms focusing on exploitation might experience short-term performance benefits, however, they might fail to report positive long-term performance outputs, since these firms are not able to adapt to environmental changes (Uotila et al. 2009). As a result, these companies are likely to experience a competency trap since they lack the necessary capabilities to adjust and address changes in their environment (Levitt and March 1988). For example, Radio Shack announced bankruptcy in early 2015 after failing to adapt to changes in the retail sector due to the emergence of the Internet (Ruiz and De La Merced 2015). Radio Shack is thus an example of a retailer that focused on exploiting its pre-existing fulfillment operations in its physical stores, without taking into account changes in the online retail environment. As a result, they were not able to sustain future activities and were forced to declare bankruptcy.

Alternatively, retailers focusing exclusively on exploratory activities might find themselves exposed to the risk of a reiterative circle of searching for and developing new

fulfillment operations (Levinthal and March 1993) with highly variable and often volatile long-term benefits (Uotila et al. 2009). Since these retailers' pre-existing competencies and capabilities are not continuously refined or improved in a timely manner, they miss out on realizing many short-term benefits (March 1991). For instance Amazon, a retailer known for its innovativeness always exploring new fulfillment activities, reported positive profits for the very first time eight years after the company was founded (Stone 2013).

In sum, based on the premises of ambidexterity, firms concentrating on either exploitative or exploratory activities, but not both, will experience less than optimal performance outcomes (March 1991). Consequently, rather than focusing on trade-offs between exploration and exploitation, research shows that companies should become ambidextrous to achieve superior firm performance. The tenets of ambidexterity calls for retailers to establish a balance between refining their pre-existing fulfillment operations and discovering new fulfillment operations (e.g. offering online orders and in-store pick up) in order to achieve superior operational and financial performance outcomes. Prior research has demonstrated that firms can achieve higher performance outcomes if they are able to balance their exploitative and exploratory activities (He and Wong 2004; Junni et al. 2013; Cao et al. 2009). The literature situated in the operations management realm has corroborated this claim, evidencing the importance of ambidextrous operations in order to achieve better performance outcomes (Patel et al. 2012). Thus, an inverted U-shape relationship is hypothesized:

H1: A retailer's relative exploration exhibits a curvilinear relationship on the retailer's financial performance such that retailers focusing predominantly on *either* exploitative (low relative exploration) *or* exploratory (high relative exploration) fulfillment operational activities will exhibit lower Tobin's Q than retailers balancing exploitative *and* exploratory (medium relative exploration) fulfillment operational activities.

H2: A retailer's relative exploration exhibits a curvilinear relationship on the retailer's operational performance such that:

H2a: Retailers focusing predominantly on *either* exploitative (low relative exploration) or exploratory (high relative exploration) fulfillment operational activities will exhibit lower Inventory Turns than retailers balancing exploitative *and* exploratory (medium relative exploration) fulfillment operational activities.

H2b: Retailers focusing predominantly on *either* exploitative (low relative exploration) or exploratory (high relative exploration) fulfillment operational activities will exhibit lower GMROI than retailers balancing exploitative *and* exploratory (medium relative exploration) fulfillment operational activities.

H2c: Retailers focusing predominantly on *either* exploitative (low relative exploration) or exploratory (high relative exploration) fulfillment operational activities will exhibit higher Cash Conversion Cycles than retailers balancing exploitative *and* exploratory (medium relative exploration) fulfillment operational activities.

Based on our discussion above, retailers concentrating on exploitative or exploratory activities face the risk of either achieving only short-term benefits or only long-term benefits leading to less than optimal performance outcomes overall (March 1991). Literature suggests that the ambidexterity-performance relationship might also depend on firm-specific factors, such as resource endowment, which refers to a firm's availability of resources (Raisch and Birkinshaw 2008). According to the theoretical underpinnings of ambidexterity, exploratory and exploitative activities stand in competition for a firm's available resources (March 1991), as firms face the challenge of deciding which activities to allocate their available resource to.

The management and allocation of available resources within a firm depends on the firm's organizational structure (Moch 1976). Thus, the success of balancing exploratory and exploitative fulfillment operations will depend to the extent that a retailer is able to manage and allocate its resources accordingly. In general, large firms can be characterized by having a complex hierarchical structure impeding the resource allocation within the organization (Blau 1968). Contrary, small firms lacking a complex structural hierarchy are able to allocate resources fairly easy across the organization to various business activities (Moch 1976). Thus, specifically large firms might experience difficulty in managing and attaining their resource

allocating in a balance of exploratory and exploitative business activities. However, for small firms lacking a complex organizational structure it can be easier to cope with the management and allocation of resources making the achievement and attainment of a balance between exploitation and exploration more beneficial. Prior research has shown that smaller firms with limited resource availability benefit most by focusing on achieving a balance between exploitation and exploration (Cao et al. 2009). Therefore, I hypothesize:

H3: Resource endowment moderates the relationship between a retailer's relative explorative omni-channel fulfillment operational activities and its financial performance such that the relationship between a retailer's relative explorative omni-channel fulfillment operational activities and its Tobin's Q is negatively moderated by resource endowment.

H4: Resource endowment moderates the relationship between a retailer's relative explorative omni-channel fulfillment operational activities and its operational performance such that:

H4a: Resource endowment negatively moderates the relationship between a retailer's relative explorative omni-channel fulfillment operational activities and its Inventory Turn.

H4b: Resource endowment negatively moderates the relationship between a retailer's relative explorative omni-channel fulfillment operational activities and its GMROI.

H4c: Resource endowment positively moderates the relationship between a retailer's relative explorative omni-channel fulfillment operational activities and its Cash Conversion Cycle.

Methodology

Data

The data for this study are compiled from two different data sources. Firm-level financial data were collected from Compustat and firm-level data pertaining to a retailer's omni-channel fulfillment operations were collected from electronic press releases from the Lexis-Nexis database. This approach is in line with other research using secondary data to investigate the ambidexterity-performance relationship (e.g. Uotila et al. 2009). Furthermore,

scholars have called for more research employing longitudinal data sets to explore the impact of ambidexterity on firm performance as a way to gain a better understanding of the effects over time (Kristal et al. 2010; Patel et al. 2012).

While most retailers introduced omni-channel fulfillment operations after 2010, leading omni-channel retailers, such as Macy's and Walmart, began as early as 2007/2008. To ensure these earlier press releases are taken into account, the longitudinal data were collected starting from 2004 until 2014, spanning a ten year period. This time period has been selected to ensure that sufficient data are available pertaining to retailer omni-channel fulfillment operations, insofar as it is a fairly recent phenomenon.

Sample

Following prior research (Alan et al. 2014; Gaur et al. 2005), the selection of retail firms was based on the four-digit Standard Industry Classification (SIC) codes that the U.S. Bureau of Commerce assigns to each company within industry segments. The sample includes 164 publicly traded retailers from 12 different retail industry segments, which is in line with previous research focusing on the context of the retail industry (Gaur, Fisher, and Raman 2005). Based on the SIC codes and similarity in terms of products sold by the retailers, we created three SIC groups. SIC group 1 consolidates general merchandise stores, SIC group 2 food and drug stores, and SIC group 3 apparel retailers. Table 1 summarizes the retail industry segments and their respective SIC codes. A total of 25 retailers was removed from the sample due to not having at least four consecutive yearly observations between 2004 and 2014 or being international retailers. The final sample consists of 39 U.S. retailers in SIC group 1, 44 U.S. retailers in SIC group 2, and 56 U.S. retailers in SIC group 3. The overall sample has a total of 1289 firm level observations.

Firms operating in highly dynamic and competitive environments are more prone to become ambidextrous than firms operating in less dynamic and competitive environments (Raisch and Birkinshaw 2008). SIC groups 1 through 3 represent different subgroups of retailers facing unique environmental conditions within their respective retail segments. For example, SIC group 2 (food and drug stores) is associated with a less dynamic and competitive retail environment in comparison to SIC group 1 (general merchandise stores) and 3 (apparel) (Mazzone & Associates, Inc. 2015). Hence, one would expect that the predicted relationships might depend on the retail segment that retailers are operating in and thus, I subsequently test the hypotheses for each individual SIC group to control for the unique environmental settings each retail segment is facing and to gain more nuanced insights.

Table 1: Retail Industry Segments with SIC Codes

SIC group	SIC codes	Industry segment	Retail Example
1	5311	Department Stores	Macy's
	5331	Variety Stores	Walmart
	5731	Radio, TV, Consumer Electronics Stores	Best Buy
	5945	Hobby, Toy, and Game Shops	Toys R Us
	5700	Home furniture and Equipment Stores	Bed Bath and Beyond
2	5400; 5411	Food Stores	Kroger
	5912	Drug and Proprietary Stores	Walgreens
3	5600- 5699	Apparel and Accessory Stores	Gap Inc.

Content analysis

This research employed a structured content analysis of press releases concerning U.S. retailers as a way to capture activities pertaining to omni-channel fulfillment operations. The extant operations and supply chain management research that employs structured content

analyses is limited, but such a method may prove particularly useful in extracting and analyzing data from archival documents, such as press releases or company reports (Tangpong 2011). For example, this method has been used by operation and supply chain scholars to explore firms' social responsibility (Tate et al. 2010) and environmental management activities (Montabon et al. 2007; Hofer et al. 2012). Thus, this research approach is in line with other studies implementing structured content analysis. The press releases were collected from the Lexis-Nexis database and I limited the search within the database to the archives of *Business Wire and PR Newswire*. Only those press releases that contained the name of the retailer in the headline and discussed a retailer's fulfillment operations were included. Once all press releases were collected, duplicates were removed and the word frequency for exploratory and exploitative words using Atlas.Ti was extracted. With the availability of content analysis software, manual coding has been widely replaced by automated computer coding. Research shows that there is no significant difference in the accuracy between automated and human coding (King and Lowe 2003), thus automated coding is a feasible alternative to human coding procedures (Neuendorfer 2002) and is used for the purpose of this research.

This methodological approach is in line with Uotila et al. (2009) who developed a methodology to assess a firm's ambidexterity based on secondary data and frequency word counts. I extended Uotila et al.'s (2009) methodological approach by tailoring the operational definition of exploration and exploitation to a supply chain and operations management context. Uotila et al. (2009) used the rather general definition for exploration and exploration following March (1991). March (1991) refers to exploration as terms such as "search, variation, risk taking, experimentation, play, flexibility, discovery, innovation" and

exploitation as terms such as “refinement, choice, production, efficiency, selection, implementation, execution.”

To extend and adjust the operational definition of exploitation and exploration to a supply chain and operations management context, I developed a list containing synonyms of the proposed terms by March (1991) from three different online dictionaries (Theasaurus.com, oxforddictionaries.com, and Merriam-webster.com). Any word duplicates were removed leaving a list of 384 potential synonyms. Two independent coders were selected to evaluate each of the word, determining whether they should be included as a synonym within the context of supply chain and operations management or not. The coders were provided a detailed description for the coding process. The percent agreement between the two independent coders was 80.7%. Any discrepancies between the two coders were resolved by the primary researcher. A total of 40 additional synonyms representing the supply chain and operations management context were included to operationalize exploration and exploitation. Table 2 summarizes the word roots which were used in this research.

Table 2: Operationalization of Exploration and Exploitation

	Word roots
Exploration	explor* , search* , variation* , risk* , experiment* , play* , flexib* , discover* , innovat* , analy*, investig*, reserch*, study*, pursu*, adjust*, change*, develop*, modific*, redesign*, revamp*, shift*, transform*, test*, trial*, interact*, operat*, accomodat*, cooperat*, resilience*, variab*, identifi*, utili*
Exploitation	exploit* , refine* , choice* , production* , efficien* , select* , implement* , execute* , expan*, improve*, upgrade*, assembl*, build*, construct*, manufactur*, output*, produc*, capab*, capacit*, pick*, execut*, handl*, operat*, fulfill*

Note: Words in **bold** indicate the original synonyms proposed by March (1991)

Independent Variables

Exploration and Exploitation

Following the approach of Uotila et al. (2009), the main variable of interest is a retailer's *relative* amount of exploratory versus exploitative omni-channel fulfillment activities that can be observed at the firm-level. The relative amount of exploration versus exploitation was calculated for each retailer (by year) by dividing the number of word occurrences that relate to exploratory activities by the sum of exploratory and exploitative words. This approach was used previously by Uotila et al. (2009) to measure companies' ambidexterity based on data from a structured content analysis;

Resource Endowment

Following prior literature, firm size is an effective proxy from which to measure a firm's resource availability (Cao et al. 2009; Lin et al. 2007), since large firms often have higher resource availability than small firms (Chen and Hambrick 1995; Boyer et al. 1996). Firm size has been operationalized in various ways, but is most commonly done so in terms of the number of employees a firm has, i.e. its human resources (e.g. Cao et al. 2009; Koufteros et al. 2007) or with regards to a firm's sales in dollars (e.g. Hofer et al. 2012) or assets (e.g. Lin et al. 2007; Eroglu and Hofer 2011) which refers to its physical resource availability. In the context of this research, a firm's physical resources are most appropriate to study the ambidexterity-performance relationship. Since this research focuses on omni-channel fulfillment operations, resources for day-to-day operations (current assets) as well as fixed physical resources (fixed assets) are expected to play an important role for retailers developing ambidextrous fulfillment operations. Thus, in line with previous operations management

research, firm size will be measured in terms of a retailer's total assets (e.g. Eroglu and Hofer 2011).

Dependent Variables

Operational and Financial Performance

For retailers, inventory management is one of the key operational activities. Retailers strive to reduce their optimal inventory levels to enhance their overall competitiveness and performance. Since omni-channel fulfillment operations are directly related to a restructuring of inventory allocation and management in the retail supply chain, inventory effectiveness is an appropriate operational outcome to explore. Prior research has primarily focused on inventory productivity (e.g. Chen et al. 2007; Huson 1995; Gaur et al. 2005; Alan et al. 2014) and several different measures have been proposed, such as inventory turnover or gross margin return on inventory (GMROI) (Alan et al. 2014). Following Alan et al. (2014), I will focus on inventory turnover and GMROI as our inventory productivity measures. In addition, I focus on the cash conversion cycle as an additional important operational outcome variable (e.g. Hendricks et al. 2009) since it reflects how fast a company can turn its resource investments into cash. The three measures were calculated as follows:

(i) *Inventory Turnover (IT)*

$$IT_{it} = \frac{COGS_{it} - LIFO_{it} + LIFO_{i,t-1}}{INV_{it} + LIFO_{it}}$$

(ii) *GMROI*

$$GMROI_{it} = \frac{Sales_{it} - COGS_{it} + LIFO_{i,t} - LIFO_{i,t-1}}{INV_{it} + LIFO_{it}}$$

(iii) *Cash Conversion Cycle (CCC)*

$$CCC_{it} = \text{Days inventory outstanding}_{it} + \text{days sales outstanding}_{it} \\ - \text{days payable outstanding}_{it}$$

Prior research has highlighted the important linkage between a firm's operational and financial performance (e.g. Hendricks and Singhal 2005; Hendricks and Singhal 2009; Alan, et al. 2014). Accordingly, this study also pays particular attention to a retailer's financial performance. In line with previous research, market value serves as an appropriate outcome variable (Uotila et al. 2009). Market value has been operationalized in the operations management literature as Tobin's Q (e.g. Setia and Patel 2013; Modi and Mishra 2011) and has the advantage of capturing long-term and short-term performance results (Lubatkin and Shrieves 1986; Allen 1993). Tobin's Q (TQ) is calculated as follows:

$$(i) TQ_{it} = \frac{\text{Market value of assets}}{\text{Book value of assets}}$$

Since the data set spans a time period of 10 years, a dummy variable to account for the economic recession occurring in late 2008 was included. Year 2004 through 2008 are coded as 0 and years 2009 through 2014 are coded as 1. Hence, the year dummy is capturing the potential impact the economic recession of 2008 might have had on retailers' financial and operational performance. Table 3 provides an overview of the variable definitions and descriptive statistics.

Table 3: Variable Description and Descriptive Statistics

Variable	Description	Mean	Std. deviation
TQ	Tobin's Q is calculated as a retailer's market value of assets over its book value of assets. Compustat: $(AT-CEQ+CSHO*PRICE)/AT$	1.93	1.73
TQ_lagged	Tobin's Q lagged by one period.	1.93	1.78
IT	Inventory turn	7.26	9.21
IT_lagged	Inventory turn lagged by one period	7.24	9.28
CCC	Cash conversion cycle	52.71	46.85
CCC_lagged	Cash conversion cycle lagged by one period.	52.82	43.93
GMROI	Gross margin return on investment	3.48	3.38
GMROI_lagged	Gross margin return on investment lagged by one period	3.43	2.92
RELEXP	Relative exploration	0.21	0.29
TA_log	Log transformation of total assets	6.99	1.86

N=138

Empirical Analysis and Results

A dynamic panel data model was used to test the hypotheses. Based on the characteristics of the data set, a two-step dynamic GMM estimator was applied using `xtabond2` in STATA (Roodman 2009). The data set is unbalanced and has missing values. The GMM estimator accounts for missing values by using orthogonality conditions and hence, exploits all the information that is potentially available in the data set using internal instrument (Roodman 2009). Since the number of instruments is quartic in the time period, I controlled for the number of instruments used in the model by employing the `collapse` demand in STATA. The dynamic GMM model is an appropriate estimator for a dynamic model with a large number of cross-section units (N=131 retailers) and a small time period (T=11 years). Furthermore, the explanatory variables cannot be assumed to be strictly exogenous and hence, one must account for potential endogeneity. The difference GMM estimator allows to estimate models with predetermined and/or endogenous explanatory variables.

The year dummy and log transformed total assets were treated as strictly exogenous variables. The lag of the dependent variables entered the model as endogenous variables, and following Uotila et al. (2009) relative exploration was treated as a predetermined variable. For each of the four dependent variables I estimated three models: Model 1 is the base model including the control variables, model 2 includes the main effect variables and tests Hypotheses 1 and 2, and model 3 includes the interaction terms to test Hypothesis 3 and 4.

For SIC group 1 (general merchandise stores) there is a significant curvilinear relationship between relative exploration and Tobin's Q. The result indicates that retailers in this segment who are able to balance exploitative and exploratory fulfillment operational activities (medium relative exploration) exhibit higher Tobin's Q than retailers who focus predominately on either exploitative (low relative exploration) or exploratory (high relative exploration) fulfillment operational activities. Hence, *H1 is supported for SIC group 1*. However, resource endowment does not function as a moderator of the relationship between relative exploration and retailers' financial performance, leading to rejecting H3 for SIC group 1. Furthermore, for the remaining dependent variables (IT, GMROI, and CCC) no significant effect of a retailer's relative exploration was detected suggesting that retailers in SIC group 1 do not gain operational efficiencies due to becoming more ambidextrous in terms of their fulfillment operations. *We reject H2a, H2b, and H2c for SIC group 1*. Moreover, resource endowment does not moderate the relationship between a retailer's relative exploration and its operational performance. Therefore, *H4a, H4b, and H4c are rejected*. **Error! Reference source not found.** reports the statistical results for SIC group 1.

Table 4: Empirical Results of the Dynamic GMM models for SIC group 1

DV: Tobin's Q	SIC1			DV: IT	SIC1		
	Model 1	Model 2	Model 3		Model 1	Model 2	Model 3
RELEXP		1.903*** (0.593)	2.927 (2.187)	RELEXP	0.091 (0.308)	0.360 (0.999)	
RELEXP ²		-1.637** (0.807)	-2.140 (3.225)	RELEXP ²	-0.041 (0.371)	-1.102 (1.506)	
RELEXP*TA_log			-0.151 (0.232)	RELEXP*TA_log		-0.030 (0.103)	
RELEXP ² *TA_log			0.073 (0.328)	RELEXP ² *TA_log		0.126 (0.155)	
TQ_lagged	0.707*** (0.135)	0.682*** (0.135)	0.426*** (0.104)	IT_lagged	0.383** (0.165)	0.419*** (0.141)	0.435*** (0.128)
TA_log	-0.032 (0.026)	-0.068* (0.039)	-0.028 (0.043)	TA_log	0.111 (0.107)	0.143 (0.111)	0.127 (0.113)
yeardummy	0.236*** (0.078)	0.289*** (0.048)	0.242*** (0.068)	yeardummy	-0.096 (0.064)	-0.100 (0.074)	-0.088 (0.061)
constant	0.593* (0.329)	0.642* (0.347)	0.798* (0.414)	constant	1.545 (1.121)	1.213 (1.082)	1.308 (1.032)
Wald Chi ²	37.59 (3)	72.42 (5)	58.59 (7)	Wald Chi ²	6.39 (3)	13.04 (5)	23.69 (7)
Hansen	0.020	0.525	0.967	Hansen	0.223	0.380	0.970
AR(1) z	-1.59	-1.60	-1.64	AR(1) z	-1.63	-1.70	-1.70
AR(2) z	-1.50	-1.45	-1.57	AR(2) z	0.99	1.01	1.01
Number of instruments	13	35	57	Number of instruments	23	34	56

Note: TQ_lagged=Tobin's Q lagged by one period; IT_lagged=Inventory turn lagged by one period; CCC_lagged=Cash conversion cycle lagged by one period; GMROI_lagged=Gross margin return on investment lagged by one period; RELEXP=Relative exploration; TA_log=Log transformation of total assets

Table 4: Continued

DV: CCC				DV: GMROI			
	SIC1				SIC1		
	Model 1	Model 2	Model 3		Model 1	Model 2	Model 3
RELEXP		-1.110 (16.55)	-101.290** (39.695)	RELEXP		0.414 (0.439)	0.908 (2.132)
RELEXP ²		-4.340 (19.283)	91.080 (4.663)	RELEXP ²		-0.334 (0.438)	-1.408 (2.132)
RELEXP*T A_log			10.692** (4.663)	RELEXP*T A_log			-0.054 (0.167)
RELEXP ² *T A_log			-9.108 (9.067)	RELEXP ² *T A_log			0.124 (0.225)
CCC_lagged	0.120 (0.344)	-0.061 (0.139)	0.345** (0.149)	GMROI_lagged	0.522 (0.335)	0.467* (0.271)	0.0408** (0.197)
TA_log	-0.737** (3.099)	-9.380** (4.396)	-7.223*** (2.540)	TA_log	0.039 (0.044)	0.011 (0.042)	0.010 (0.044)
yeardummy	2.056 (2.186)	4.132 (5.465)	5.280 (4.160)	yeardummy	0.046 (0.065)	0.031 (0.058)	0.019 (0.059)
constant	115.902** (46.36)	145.688*** (42.694)	100.013*** (22.417)	constant	0.614 (0.675)	0.958 (0.732)	1.090** (0.507)
Wald Chi ²	21.38 (3)	8.11 (5)	42.67 (7)	Wald Chi ²	7.79 (3)	56.23 (5)	57.77 (7)
Hansen	0.536	0.443	0.978	Hansen	0.083	0.579	0.993
AR(1) z	-0.53	-0.25	-2.10	AR(1) z	-1.31	-1.40	-1.45
AR(2) z	-0.85	-0.49	0.94	AR(2) z	0.99	0.097	0.96
Number of instruments	13	36	57	Number of instruments	12	34	56

Note: TQ_lagged=Tobin's Q lagged by one period; IT_lagged=Inventory turn lagged by one period; CCC_lagged=Cash conversion cycle lagged by one period; GMROI_lagged=Gross margin return on investment lagged by one period; RELEXP=Relative exploration; TA_log=Log transformation of total assets

For SIC group 2 (food and drug stores) model 2 for Tobin's Q indicates that there is no direct effect of relative exploration on Tobin's Q, and hence I am *rejecting H1 for SIC group 2*. When the interaction terms are added to the model the results indicate that there is a significant curvilinear relationship between relative exploration and Tobin's Q depending on resource endowment. Based on theory a relationship resembling an inverted U-shape was predicted, however, the results indicate that for Tobin's Q the relationship follows the pattern of a U-shape. Hence, the results suggest that retailers in the SIC group 2 achieve higher financial performance outcomes in terms of Tobin's Q if they either focus on exploitative (low relative exploration) or exploratory (high relative exploration) fulfillment operational activities rather than balancing exploitative and exploratory fulfillment operational activities (medium relative exploration) and this effect is even stronger for retailers with smaller resource endowment than for retailers with lower resource endowment. Thus, *H3 is also rejected*.

For operational performance there is no effect of relative exploration on inventory turnover and also the interaction is not significant leading to the *rejection of H2a and H4a for SIC group 1*. While I do not observe a significant direct effect of a retailer's relative exploration on GMROI, I do observe a significant interaction term. For GMROI, the signs of the coefficients are in line with the predictions indicating an inverted U-shape which depends on resource endowment. The sign of the interaction terms suggest that the inverted U-shape is even more prone for retailers with small resource endowment than retailers with large resource endowment which is in line with the predictions. Thus, *H2b is rejected but H4b for SIC group 2 is accepted*.

For the cash conversion cycle the results indicate that retailers who are able to balance exploitative and exploratory fulfillment operational activities (medium relative exploration)

achieve lower cash conversion cycles than retailers who focus predominately on either exploitative (low relative exploration) or exploratory (high relative exploration) fulfillment operational activities. Thus, there is *support for H2b for SIC group 2*. Also, the interaction term is significant and the sign of the coefficient is in line with the predictions indicating that retailers with smaller resource endowment achieve better cash conversion cycles than retailers with high resource endowment. Therefore, *H4c for SIC group 2 is accepted*. Table 5 reports the statistical results for SIC group 2.

Table 5: Empirical Results of the Dynamic GMM models for SIC group 2

DV: Tobin's Q				DV: IT			
	SIC2				SIC2		
	Model 1	Model 2	Model 3		Model 1	Model 2	Model 3
RELEXP		-0.878 (1.444)	-1.551 (5.483)	RELEXP		-2.980 (4.796)	3.857 (13.990)
RELEXP ²		2.978 (3.881)	13.914** (6.759)	RELEXP ²		-2.110 (7.013)	-11.489 (18.180)
RELEXP* TA_log			0.103 (0.712)	RELEXP* *TA_log			-0.926 -1.583
RELEXP ² *TA_log			-1.670** (0.742)	RELEXP* *TA_log			1.377 (2.113)
TQ_lagged	0.951*** (0.148)	0.826*** (0.085)	0.626*** (0.074)	IT_lagged	0.644*** (0.017)	0.685*** (0.043)	0.666*** (0.052)
TA_log	-0.007 (0.033)	-0.017 (0.045)	0.155 (0.155)	TA_log	0.257 (0.346)	0.245 (0.331)	0.290 (0.424)
yeardummy	0.170** (0.070)	0.102 (0.171)	-0.088 (0.213)	yeardummy	0.076 (0.472)	-0.316 (0.857)	-0.413 (1.00)
constant	0.073 (0.457)	0.185 (0.699)	-0.277 (1.128)	constant	2.416 (1.954)	3.522 (2.465)	3.699 (2.531)
Wald Chi ²	83.31 (3)	351.50 (5)	221.09 (7)	Wald Chi ²	1681.25 (3)	769.73 (5)	795.74 (7)
Hansen	0.345	0.230	0.856	Hansen	0.425	0.422	0.851
AR(1) z	-1.73	-1.98	-2.15	AR(1) z	-1.15	-1.12	-1.13
AR(2) z	-1.09	-1.07	-1.16	AR(2) z	-0.98	-1.01	-1.00
Number of instruments	13	35	57	Number of instruments	23	34	56

Note: TQ_lagged=Tobin's Q lagged by one period; IT_lagged=Inventory turn lagged by one period; CCC_lagged=Cash conversion cycle lagged by one period; GMROI_lagged=Gross margin return on investment lagged by one period; RELEXP=Relative exploration; TA_log=Log transformation of total assets

Table 5: Continued

DV: CCC	SIC2			DV: GMROI	SIC2		
	Model 1	Model 2	Model 3		Model 1	Model 2	Model 3
RELEXP		-15.636 (14.112)	-123.794*** (33.218)	RELEXP		1.298 (2.770)	13.242 (9.983)
RELEXP ²		34.025* (18.440)	196.235*** (42.076)	RELEXP ²		-3.560 (4.094)	-27.611* (14.677)
RELEXP* TA_log			15.942*** (5.945)	RELEXP* TA_log			-1.597 (1.128)
RELEXP ² *TA_log			-24.544*** (8.120)	RELEXP ² * TA_log			3.261* (1.712)
CCC_lagged	2.548*** (0.793)	0.439 (0.326)	0.805*** (0.174)	GMROI_lagged	0.267 (0.913)	0.297 (0.539)	0.357 (0.400)
TA_log	-1.829 (6.670)	2.400 (1.574)	1.907 (1.602)	TA_log	-0.342 (0.458)	-0.515 (0.334)	-0.718* (0.437)
yeardummy	9.146 (15.246)	-6.338* (3.859)	-6.180** (2.758)	yeardummy	0.003 (0.458)	0.368 (0.547)	0.613 (0.482)
constant	-22.896 (31.691)	-0.475 (20.284)	-5.918 (16.675)	constant	5.521 (6.863)	6.821 (4.362)	8.013* (0.482)
Wald Chi ²	34.75 (3)	16.67 (5)	123.57 (7)	Wald Chi ²	7.32 (3)	29.91	116.55
Hansen	0.261	0.294	0.902	Hansen	0.825	0.787	0.908
AR(1) z	-2.27	-1.26	-2.20	AR(1) z	0.02	-0.18	-1.41
AR(2) z	0.59	1.27	1.10	AR(2) z	-0.50	-0.56	-1.38
Number of instruments	13	36	57	Number of instruments	12	34	56

Note: TQ_lagged=Tobin's Q lagged by one period; IT_lagged=Inventory turn lagged by one period; CCC_lagged=Cash conversion cycle lagged by one period; GMROI_lagged=Gross margin return on investment lagged by one period; RELEXP=Relative exploration; TA_log=Log transformation of total assets

For SIC group 3 (apparel) model 2 for Tobin's Q support a curvilinear relationship *in line with the predictions of H1*. Hence, in the apparel retail segment retailers who are able to balance exploitative and exploratory fulfillment operational activities (medium relative exploration) achieve higher financial performance than retailers who focus predominately on either exploitative (low relative exploration) or exploratory (high relative exploration) fulfillment operational activities. However, the interaction term was not significant and hence *H3 is rejected for SIC group 3*.

For operational performance there is no direct effect of relative exploration on Inventory Turnover. Thus, *H2a for SIC group 3 is rejected*. However, the interaction term for Inventory Turnover is significant and, in line with the predictions, negative. This result suggests that retailers who are able to balance exploitative and exploratory fulfillment operational activities (medium relative exploration) achieve higher inventory turnover rates than retailers who focus predominately on either exploitative (low relative exploration) or exploratory (high relative exploration) fulfillment operational activities especially for retailers who have small resource endowment. Thus, *H4a is accepted for SIC group 3*. Also, there is no significant direct or interaction term for the Cash Conversion Cycle leading to the *rejection of H2c and H4c for SIC group 3*. For GMROI I observe a significant curvilinear relationship between a retailer's relative exploration and its GMROI in line with the predictions and hence, *supporting H2b for SIC group 3*. The results indicate that retailers who are able to balance exploitative and exploratory fulfillment operational activities (medium relative exploration) achieve higher GMROI than retailers who focus predominately on either exploitative (low relative exploration) or exploratory (high relative exploration) fulfillment operational activities. Resource endowment does not moderate the relationship and thus, *H4b is rejected for SIC*

group 3. Table 6 provides an overview of the statistical results for SIC group 3 and Table 7 provides a summary of the results overall.

Table 6: Empirical Results of the Dynamic GMM models for SIC group 3

DV: Tobin's Q	SIC3			DV: IT	SIC3		
	Model 1	Model 2	Model 3		Model 1	Model 2	Model 3
RELEXP		1.589*** (0.581)	2.451 (4.243)	RELEXP	-0.256 (0.443)		4.281* (2.596)
RELEXP ²		-1.689** (0.677)	-0.110 (5.153)	RELEXP ²	0.105 (0.505)		-6.566* (3.580)
RELEXP*TA_log			-0.130 (0.616)	RELEXP*TA_log			-0.669 (0.434)
RELEXP ² *TA_log			-0.218 (0.750)	RELEXP ² *TA_log			0.978* (0.571)
TQ_lagged	0.875*** (0.072)	0.842*** (0.075)	0.794*** (0.067)	IT_lagged	0.276 (0.366)	0.351 (0.228)	0.277* (0.162)
TA_log	-0.041 (0.052)	-0.046 (0.056)	-0.032 (0.049)	TA_log	0.051 (0.129)	-0.030 (0.117)	-0.116 (0.130)
yeardummy	0.346*** (0.059)	0.292*** (0.065)	0.315*** (0.065)	yeardummy	0.048 (0.150)	0.0003 (0.162)	0.044 (0.143)
constant	0.297 (0.309)	0.323 (0.319)	0.335 (0.304)	constant	2.964 (2.024)	3.251** (1.517)	4.266** (1.374)
Wald Chi ²	171.88 (3)	171.24 (5)	186.48 (5)	Wald Chi ²	1.91 (3)	8.30 (5)	18.96 (7)
Hansen	0.056	0.490	0.379	Hansen	0.285	0.325	0.517
AR(1) z	-1.63	-1.69	-1.73	AR(1) z	-1.04	-1.88	-2.20
AR(2) z	-1.67	-1.64	-1.58	AR(2) z	-1.17	-1.11	-1.11
Number of instruments	13	34	54	Number of instruments	23	33	53

Note: TQ_lagged=Tobin's Q lagged by one period; IT_lagged=Inventory turn lagged by one period; CCC_lagged=Cash conversion cycle lagged by one period; GMROI_lagged=Gross margin return on investment lagged by one period; RELEXP=Relative exploration; TA_log=Log transformation of total assets

Table 6: Continued

DV: CCC				DV: GMROI			
	SIC3				SIC3		
	Model 1	Model 2	Model 3		Model 1	Model 2	Model 3
RELEXP		-4.722 (16.521)	-85.011 (85.477)	RELEXP		0.863*** (0.329)	1.060 (1.808)
RELEXP ²		6.279 (21.924)	82.068 (84.282)	RELEXP ²		-1.001** (0.409)	-1.388 (2.222)
RELEXP*TA_log			12.619 (13.115)	RELEXP*TA_log			-0.034 (0.267)
RELEXP ² *TA_log			-12.080 (13.045)	RELEXP ² *TA_log			0.069 (0.333)
CCC_lagged	1.082** (0.536)	-0.212** (0.088)	0.499* (0.294)	GMROI_lagged	1.073*** (0.221)	0.921*** (0.153)	0.780*** (0.121)
TA_log	0.172 (0.904)	-0.836 (4.847)	-0.896 (2.054)	TA_log	0.024 (0.017)	0.016 (0.026)	0.025 (0.039)
yeardummy	-0.035 (2.495)	-6.198* (3.282)	4.266** (2.100)	yeardummy	-0.037 (0.074)	-0.058 (0.053)	-0.056 (0.062)
constant	-8.060 (25.417)	73.629** (33.387)	34.817 (24.256)	constant	-0.413 (0.604)	0.069 (0.460)	0.486 (0.383)
Wald Chi ²	19.30 (3)	15.01 (5)	30.77 (7)	Wald Chi ²	54.58 (3)	72.24 (5)	111.02 (7)
Hansen	0.267	0.259	0.434	Hansen	0.064	0.313	0.505
AR(1) z	-1.73	-0.64	-1.87	AR(1) z	-2.52	-2.57	-2.51
AR(2) z	-0.56	-1.16	-0.39	AR(2) z	0.36	0.43	0.47
Number of instruments	13	35	54	Number of instruments	12	33	53

Note: TQ_lagged=Tobin's Q lagged by one period; IT_lagged=Inventory turn lagged by one period; CCC_lagged=Cash conversion cycle lagged by one period; GMROI_lagged=Gross margin return on investment lagged by one period; RELEXP=Relative exploration; TA_log=Log transformation of total assets

Table 7: Summary of Results

	Predictors	Hypothesis	SIC Group 1 (39 companies)	SIC Group 2 (44 companies)	SIC Group 3 (56 companies)
Tobin's Q	RELEXP	H1	supported	not supported	supported
	RELEXP* TA_log	H3	not supported	not supported	not supported
Inventory turnover	RELEXP	H2a	not supported	not supported	not supported
	RELEXP* TA_log	H3	not supported	not supported	supported
GMROI	RELEXP	H2b	not supported	not supported	supported
	RELEXP* TA_log	H4b	not supported	supported	not supported
Cash conversion cycle	RELEXP	H2c	not supported	not supported	not supported
	RELEXP* TA_log	H4c	not supported	supported	not supported

Note: RELEXP=Relative exploration; TA_log=Log transformation of total assets

Discussion

The empirical results support that retailers in certain segments who are able to balance exploitative and exploratory fulfillment operational activities achieve higher financial performance than retailers who focus predominately on either exploitative or exploratory fulfillment operational activities. This is specifically the case for general merchandise (SIC group 1) and apparel (SIC group 3) retailers operating in highly dynamic and competitive retail segments. It is suggested that retailers who are becoming ambidextrous in terms of their fulfillment operations are able to harvest short-term as well as potential long-term financial benefits. Hence, these retailers are likely to gain a financial advantage over other retailers focusing on either exploitation or exploration despite increasing fulfillment costs.

Based on the empirical evidence, food and drug stores (SIC group 1) do not seem to benefit financially from being ambidextrous in terms of their fulfillment operations. The food

and drug retail segment can be characterized as being relatively mature and stable (Mazzone & Associates, Inc. 2015). Since the reason for a firm to pursue explorative activities is to adapt to changes in the environment, firms operating in stable environments might not need to invest in explorative activities and achieve a balance between exploitative and exploratory activities. Prior research suggests that achieving a balance between exploration and exploitation is specifically important for firms operating in highly dynamic environments and does not have a significant performance impact for firms operating in stable environments (Zahra and George 2002).

In addition to exploring the linkage of operational ambidexterity and financial performance, I also examined the potential impacts on a retailer's operational performance. While the theoretical underpinnings of ambidexterity and its impact on a firm's financial performance have received support in prior research (e.g. He and Wong 2004; Uotila et al. 2009), extending it to a firm's operational performance is rather new. A retailer's ambidexterity in terms of omni-channel fulfillment operations did not lead to enhancement in terms of inventory turns. This was a consistent finding across all three SIC groups and anecdotal evidence might explain the lack of support. Retailers investing into omni-channel fulfillment operations frequently report operational inefficiencies due to exploring new fulfillment opportunities while exploiting already established ones (Aptos, Inc. 2016). For example, until recently American Eagle operated separate distribution centers for its in-store and online fulfillment services which increased its operational expenses (Guillot 2016). Since the emergence of the omni-channel retail environment is a rather recent phenomenon and retailers are still struggling to adjust to the operational challenges, the data might have captured a time period which is characterized by operational inefficiencies.

However, I do observe that apparel retailers (SIC group 3) who are becoming operationally ambidextrous in terms of their fulfillment activities achieve a higher GMROI than apparel retailers focusing on either exploitation or exploration. Thus, operationally ambidextrous apparel retailers have a greater ability to turn their respective inventory into cash which might also be due to generally higher margins (Mazzone & Associates, Inc. 2015) and the notion that 18% of each sale has been shown to come from satisfying consumers' omni-channel expectations (Aptos, Inc. 2016).

Moreover, the insights from the results pertaining to the potential moderating effect of firm size are more nuanced. Based on the theoretical underpinnings we expected small retailers to be better at managing and allocating their available resources due to the lack of a complex organizational structure (Moch 1976) and hence, to be better attain the balance between exploratory and exploitative fulfillment operations. In line with the predictions, the results illustrate that resource endowment plays an important role in the context of omni-channel retailing specifically when focusing on operational performance outcomes. For example, while there is lack of evidence of operational ambidexterity impacting performance outcomes for SIC group 2 overall, the results show that the effect is contingent on retailer size. Hence, although larger retailers might have more resources available, in line with prior research (Cao et al. 2009) I found evidence that smaller retailers benefit more from achieving and attaining a balance between exploitative and exploratory activities which might be due to their ability to easier cope with their resource allocation and management.

Theoretical Contributions

By employing a relatively novel data collection and generation approach I was able to provide more nuanced insights into the phenomenon under study. Ambidexterity has only recently been addressed in the operations management literature. The limited number of studies use survey data providing only subjective insights from key informants at one specific point in time. To overcome these limitations, I followed the call for research implementing content analysis (Tangpong 2011) and using a variety of different data sources (K. Boyer and Swink 2008) for operations management studies. By combining the ambidexterity data extracted from press releases and actual financial and operational measures from Compustat, I provided objective measures for the ambidexterity-performance relationship. This approach led to a longitudinal data set which allowed me to investigate the phenomenon over time overcoming the limitations of using survey data (Kristal et al. 2010; Patel et al. 2012).

In addition, I am building on the methodological approach of Uotila et al. (2009) who defined exploitation and exploration in a broad business context following the original definitions from March (1991). I recognized this as a limitation and systematically adjusted the definitions for exploitation and exploration to a supply chain and operations management context. Hence, I extended the vague and rather broadly held theoretical definitions of exploitation and exploration to the operations management context.

Furthermore, by considering three sub segments of retailers in this study, I was able to provide more nuanced insights for the importance of the environmental context when examining the impact of operational ambidexterity on performance. The environmental circumstances seem to play an important role for our understanding of why some retailers are able to achieve performance enhancements due to balancing exploratory and exploitative

fulfillment operations while others may not. Hence, this study highlights the environmental context as an important boundary condition for the ambidexterity-performance relationship.

Lastly, the premises of ambidexterity might provide a theoretical explanation for the reporting of mixed performance outcomes of retailers operating in an omni-channel retail environment (PwC 2015). Based on this research, retailers failing to report any performance enhancements due to developing omni-channel fulfillment operations might solely focus on exploring new fulfillment operations rather than striving for a balance between exploiting their already established fulfillment operations while simultaneously developing new fulfillment operations. Hence, this research furthers our understanding of the ambidexterity-performance relationship for retail supply chain management research.

Managerial Implications

While the development of omni-channel fulfillment operations is still growing, it is slowly becoming the norm. Based on a recent survey, for 80% of retailers omni-channel fulfillment operations are either not profitable or they are not aware of it (Aptos, Inc. 2016). I provide evidence to managers that specifically within the general merchandise and apparel retail segment the investment in omni-channel fulfillment operations improves a retailer's profitability. Hence, specifically retailers operating in highly dynamic and competitive retail segments might benefit financially from establishing omni-channel fulfillment operations.

However, managers should also be aware of the potential operational inefficiencies they might face especially at the beginning of investing in omni-channel fulfillment operations. As the results indicate, retailers in the apparel segment who have invested in developing omni-channel fulfillment operations for probably the longest period of time are just seeing now at

least some positive impacts on their operational performance. Thus, while retailers developing omni-channel fulfillment operations might achieve financial improvements rather in a short-term, the potential operational improvements might only be achieved after a longer period of time.

Furthermore, it is suggested that large retailers as well as small retailers seem to benefit from investing into omni-channel fulfillment operations. While small retailers might not have as many resources available as large retailers do, the former might benefit most from achieving a balance between exploiting already established and exploring new fulfillment operations rather than focusing on either exploration or exploitation. Larger retailers, however, have the advantage of being able to draw upon their available pool of slack resources (Chen and Hambrick 1995) and maintain periods of focusing on either exploration or exploitation. Thus, specifically managers of smaller retailers that currently focus on either exploitation or exploration should allocate their limited resources accordingly and try to achieve a balance between these both activities.

Future Research

The contextual setting selected for this research is quite unique. The data set represents a time period (2004-2014) where omni-channel retailing just started to emerge and grow over the last couple of years. The selected time period is characterized by retailers suffering from operational inefficiencies due to developing omni-channel fulfillment operations (Aptos, Inc. 2016). Once omni-channel becomes more mature, retailers might actually be able to gain operational efficiencies. Therefore, future research should extend this study to a later point in time when omni-channel retailing will be more mature. A replication of the current study

would provide further insights on the linkage between operational ambidexterity and financial and operational performance at different life cycle stages of omni-channel retailing.

Furthermore, the sample is constrained to publicly traded retailers in the U.S. and hence, the predictions are limited in terms of generalizability. Thus, future research endeavors could extend this research to other geographical regions. Each country has a unique retail landscape, and being able to contrast the operational ambidexterity performance relationship across different countries might provide more nuanced insights. Also, future research might consider exploring online retailers and the extent to which these retailers develop ambidextrous fulfillment operations within an omni-channel retail environment. This kind of research might provide us with a better understanding of the operational ambidexterity-performance relationship within another unique retail context. However, the linkage between operational ambidexterity and performance does not have to be solely investigated within the retail industry. Extending this research to other industries might provide further interesting insights.

Lastly, future research might also want to explore additional boundary conditions. The rapid developments in technology (Brynjolfsson et al. 2013; Rigby 2011) provide retailers with new and innovative technological options, which have the potential to enhance the performance of their omni-channel fulfillment operations (Anderson and Lee 2000). Operations and supply chain managers suggest that enabling inventory visibility across retail channels is important in facilitating successful omni-channel fulfillment operations (Strang 2013). 48% of retail managers perceive inventory visibility as a major inhibitor for successful omni-channel fulfillment operation (Aptos, Inc. 2016). Thus, exploring the potential moderating effect of inventory visibility might be an important consideration for future research.

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III. Essay 2

Assessing the Impact of Retail Omni-Channel Fulfillment Operations on the Upstream Supply Chain

Introduction

The development of omni-channel fulfillment operations has led to the emergence of new operational complexities in the retail supply chain. Managers are now faced with the challenge of developing new ways to efficiently and effectively manage omni-channel operations to meet consumer expectations and achieve a competitive advantage (Brynjolfsson et al. 2013; Strang 2013). It has been suggested that in order for retailers to be successful, they should develop the necessary capabilities to fulfill consumer demand from anywhere – the store, the distribution center, and/or directly from suppliers (Strang 2013). While the role of retailers, as it pertains to fulfillment operations, has received a lot of attention in the literature (e.g. Randall et al. 2006), research investigating suppliers and their operational capabilities for successful demand fulfillment within this new reality is lacking. Specifically, considering the recent emergence of drop-shipping as a viable fulfillment option in the omni-channel retail environment suggest that suppliers will experience significant changes to their fulfillment operations which warrants further research.

Drop-shipping, also known as consumer direct fulfillment, refers to a fulfillment strategy where end-consumer orders are fulfilled directly from suppliers upon a retailer's request (Cheong et al. 2015). While this fulfillment strategy has been predominantly used in online retailing (e.g. Randall et al. 2006; Netessine and Rudi 2006), it can also be successfully implement in an omni-channel retail environment. Contrary to traditional retail supply chain management, suppliers may now engage directly with end-consumers, directly fulfilling end-consumer demand in the name of a retailer (Agatz et al. 2008).

As a result, suppliers are likely to experience a disruption in their current fulfillment operations and might develop new fulfillment capabilities while refining pre-established ones

in order to succeed within the new reality of omni-channel retailing. This suggests that suppliers may need to become “ambidextrous” in terms of their fulfillment operations in order to adapt to the changes in the retail environment. This is particularly important when considering the fact that suppliers might not only fulfill pallet size retail orders but simultaneously may also develop the necessary capabilities to fulfill individual consumer orders (Agatz et al. 2008).

Ambidexterity is simply defined as an “individual’s ability to use both hands with equal ease” (Rothaermel and Alexandre 2009, 759). Within a business context, prior research defines ambidexterity as a balance of activities pertaining to exploitation and exploration (March 1991). Thus, ambidexterity refers to firms being able to be aligned and efficient in meeting current business demands (exploitation) while simultaneously adapting to environmental changes (exploration) (Duncan 1976; Gibson and Birkinshaw 2004; Tushman and O’Reilly 1996). Building on this, the concept of operational ambidexterity, which refers to “an operational unit’s simultaneous pursuit of exploration and exploitation [activities]” (Patel et al. 2012), has recently been introduced to the operations management literature. Relevant research shows that firms which are able to exhibit ambidexterity in their operational activities tend to achieve superior performance outcomes (Patel et al. 2012).

Operations and supply chain management research falls short when it comes to exploring how companies actually achieve operational ambidexterity. Even in the management literature, research considering the antecedents of ambidexterity is lacking (Adler et al. 1999; Siggelkow and Levinthal 2003). However, it is pivotal to gain a thorough understanding of the drivers, barriers, and complexities that lead firms to achieve operational ambidexterity, specifically within the new reality of omni-channel retailing, where operational ambidexterity

might be the key factor to a supplier's success. In response, the proposed study addresses the following research questions: (1) To what extent do suppliers exhibit ambidextrous fulfillment operations within the omni-channel retail environment? (2) What are the enablers and barriers for suppliers to develop ambidextrous fulfillment operations?

Since the concept of operational ambidexterity is still relatively new and this research is exploratory in nature, a qualitative research approach will be used to address the aforementioned research questions. This is in line with the operations management literature calling for more qualitative research to address operational phenomena (Barratt et al. 2011; McCutcheon and Meredith 1993). In addition, the majority of the literature investigates drop-shipping from the perspective of retailers (e.g. Rabinovich 2004, Randall et al. 2002), developing mainly analytical models (e.g. Yao et al. 2008). Hence, by employing a qualitative research approach we address the methodological shortcomings associated with quantitative research methods and aim to provide a more thorough and realistic understanding of drop-shipping operations (Flynn 1990).

The remainder of the paper will provide a brief overview of the relevant fulfillment operations literature and discuss the theoretical foundations. Subsequently, the methodological approach as well as the data collection and analysis processes will be discussed.

Literature Review

The emergence of the Internet led to a disruption in how supply chain activities are managed and executed (Anderson and Lee 2000). Traditionally, suppliers fulfilled retailers' pallet-sized orders, but given the changing retail environment, suppliers are increasingly expected to also fulfill individual orders from end-consumers in the name of the retailer (Agatz et al. 2008). While this latter fulfillment option, also referred to as drop-shipping, is a

fulfillment strategy that has been predominately used in online retailing (Rabinovich et al. 2008; Bailey and Rabinovich 2005), it may prove a viable fulfillment option across other retailer environments as well (Randall et al. 2002).

Drop-shipping has been exclusively explored within the context of online retailing (e.g., Rabinovich et al. 2008; Ayanso et al. 2006; Acimovic and Graves 2015) and three streams of research can be distinguished. The first stream of research concentrates on the impact of drop-shipping on fulfillment performance (e.g., Rabinovich 2005). More specifically, this body of work investigates how drop-shipping performance can be enhanced through emergency transshipment (Rabinovich 2005), inventory consolidation (Rabinovich and Evers 2003), and coordinating order-to-ship times and delivery times (Rabinovich 2004). Furthermore, in the case of drop-shipping, retailers are now primarily concerned with attracting end-consumers, while suppliers are concerned with fulfillment operations. This functional separation is likely to lead to difficulties in the management of the fulfillment processes (Gan et al. 2010; Yao et al. 2008). However, if suppliers provide poor fulfillment performance, end-consumers are likely to hold the retailer accountable (Bulger 2012; Rabinovich 2005). Prior research highlights the importance of the relationship between high fulfillment performance and end-consumer satisfaction and future purchase behavior (e.g. Esper et al. 2003; Rao et al. 2011). Taken together, this stream of literature suggests that drop-shipping is likely to improve an online retailer's fulfillment performance considering different members of the supply chain.

While the first stream of research focuses on the potential performance outcomes, the second stream investigates the conditions under which drop-shipping might be superior to other fulfillment options for online retailers. This body of work provides evidence that online retailers should consider product (Randall et al. 2002) and environmental characteristics

(Netessine and Rudi 2006) when deciding to engage in drop-shipping operations. For example, Randall et al. (2002) found that it is more desirable for online retailers to have heavy and bulky products fulfilled via drop-shipping. Moreover, with the option of employing different fulfillment operations retailers are challenged by deciding which fulfillment option, or mix therefore, is most desirable. The majority of the research supports that a mixed approach in terms of fulfillment operations is most profitable (e.g., Bailey and Rabinovich 2005; Netessine and Rudi 2006). For instance, Bailey and Rabinovich (2005) show that online retailers are better off using drop-shipping in combination with owning inventory. Overall, this body of work suggest that drop-shipping operations constitutes as one option of their overall fulfillment portfolio and should be employed based on evaluating more nuanced product and environmental characteristics.

The third stream of research focuses on exploring how retailers best manage the relationship with their drop-shipping partners. Retailers give up a fair amount of control when implementing drop-shipping (Rabinovich et al. 2008); this suggests the difficulty retailers face in holding their suppliers accountable for high fulfillment performance standards. To address this issue, different management strategies, pertaining to the retailer-supplier relationship in a drop-shipping context, have been investigated. For example, research shows that revenue sharing incentives tend to improve the reliability of a drop-shipper (Yao et al. 2008). The elimination of information asymmetry in the retailer-supplier relationship has also proved beneficial, insofar as discrepancies of demand and inventory information might lead to either excessive inventory or inventory unavailability (Gan et al. 2010; Cheong et al. 2015). In addition, retailers and suppliers may experience cost reductions and performance improvements if information accuracy can be mitigated via contracts or through information

transparency (i.e. sharing demand and inventory information), for example (Gan et al. 2010; Cheong et al. 2015). These findings are in line with other research that considers the importance of visibility for successful supply chain management (Williams et al. 2013).

Nevertheless, the current literature falls short in addressing other important research endeavors pertaining to drop-shipping. As most intriguing appears to be the fact that within the new omni-channel retail environment suppliers are expected to develop drop-shipping fulfillment operations to meet individual end-consumer demand (orders), while simultaneously fulfilling pallet size retail orders. These different fulfillment operations are likely to rely on different operational processes and capabilities leading to tensions in suppliers' overall fulfillment processes. Furthermore, the use of drop-shipping operations is likely to dramatically increase over the next three years (Ames 2016) leading to significant changes in a supplier's fulfillment operations and hence, inducing more complexity to the retail supply chain. Thus, considering that suppliers play an even more critical role in achieving high fulfillment performance outcomes, an investigation of how suppliers develop drop-shipping operations and integrate these with already established fulfillment operations provides a much needed extension to the extant literature. Next, the theoretical underpinnings of ambidexterity are offered as a way to provide further insight into this topic.

Theory

Over the last decade, ambidexterity has emerged as a new theoretical paradigm in the organizational management literature (O'Reilly and Tushman 2013; Raisch and Birkinshaw 2008). The main tenet of ambidexterity, as it is understood in this context, is that in order for firms to achieve superior performance outcomes, they must strike a balance between their exploration and exploitation activities (Tushman and O'Reilly 1996).

According to March (1991, 71) exploitation refers to a firm's activities, which are characterized by "refinement, choice, production, efficiency, selection, implementation, and execution," whereas exploration activities are characterized by "search, variation, risk taking, experimentation, play, flexibility, discovery, and innovation". Firms that focus exclusively on one activity or the other will likely experience less than optimal performance outcomes. Firms emphasizing exploitation activities might not be able to adequately respond to environmental changes, due to a lack of the necessary capabilities to do so (Levitt and March 1988), and firms emphasizing exploration activities might get trapped in an reiterative circle of searching for new alternatives, without achieving satisfactory performance outcomes (Levinthal and March 1993).

Ambidexterity has recently been applied to study operations and supply chain management phenomena (e.g. Patel et al. 2012; Kristal et al. 2010; Blome et al. 2013). Aligning the two competing organizational activities (exploitation and exploration) is recognized by operations and supply chain management scholars as a potential option for companies wanting to overcome the trade-offs between operational efficiency and adaptability (e.g. Kristal et al. 2010; Patel et al. 2012). The extant operations and supply chain management literature pertaining to ambidexterity is very limited. The few studies that do investigate ambidexterity within operations and supply chain management do so providing empirical evidence for the ambidexterity-performance relationship. For example, Kristal et al. (2010) conceptualized supply chain ambidexterity and showed that implementing an ambidextrous supply chain strategy is helpful in developing supply chain capabilities and competencies, which leads to increased firm performance outcomes. Thus, future research is warranted to gain a better understanding of how companies become operationally ambidextrous.

Prior research has shown that especially companies operating in highly dynamic environments are likely to showcase ambidexterity (Junni et al. 2013). Due to the emergence of omni-channel retailing, the retail supply chain management can be described as rapidly changing and hence, highly dynamic. In order to succeed within this highly dynamic retail environment, suppliers must both sustain and improve current fulfillment operations while simultaneously developing new ones. In this way, the context of drop-shipping serves as a suitable domain to inform this study on operational ambidexterity.

Methodology

Insofar as the proposed research questions are rather exploratory in nature, a qualitative research approach has been deemed most appropriate for this study (Ellram 1996). Adopting a qualitative approach allows to study the underlying structures, processes, and interrelationships of suppliers' ambidextrous fulfillment operations in great detail and depth (Gephart 2004). Furthermore, such a method will allow to investigate the phenomenon in an actual contextual setting (Meredith 1998). Thus, I employ an inductive research paradigm (Warren and Karner 2005), specifically implementing a case study approach (Yin 2009).

I developed a multi-case study design following the logic of literal replication with the aim of identifying cases that would provide similar results (Yin 2009). Through careful case consideration I ensured that the selected cases would be representative of the phenomenon of interest. Thus, the initial population consisted of retail suppliers with freight and drop-shipping operations. Since fulfillment operations likely depend on product characteristics (Randall, Netessine, and Rudi 2006) and suppliers generally manage a broad variety of different products and brands, I selected the business unit as our unit of analysis.

The focal company for this research is a large U.S. based appliance manufacturer consisting of several business units managing a broad variety of products and brands. Due to the broad variety of product and brands, the focal company is overseeing different fulfillment operations to meet the specific brand and product requirements. For the first case I selected a fairly new business unit (ALPHA) that just recently started to establish drop-shipping operations. The second business unit (BETA) is a well-established business unit with its own fulfillment operations and has been engaged in drop-shipping operations for a longer period of time. ALPHA and BETA operate as separate business units and their main offices are located in different cities in the U.S. Table 1 summarizes the characteristics of the selected cases.

Table 1: Overview of Case Characteristics

	Case characteristics	Number of informants	Number of Interviews	Informants' Functional areas
ALPHA	ALPHA is a recently established business unit within the focal company. The current goal of ALPHA is to gain more brand recognition among end-customers. ALPHA manages different fulfillment processes for a large appliance.	8	7	Logistics and operations management, marketing, information systems, and finance
BETA	BETA is a well-established business unit within the focal company and manages its own separate operations. BETA offers and manages different fulfillment options for small appliances.	5	4	Logistics and operations management,

Data collection

Multiple data collection methods were employed to gather rich descriptive data for the qualitative study. In-depth interviews enable researchers to perceive the world through the eyes of their research participants, which might not otherwise be possible with quantitative methods

(Charmaz 2014). Thus, the primary data collection method were in-depth interviews via case method which was triangulated with secondary qualitative data retrieved from news articles.

The primary researcher spent four days on site to conduct the interviews with several informants for each case study. While higher level managers are able to provide more strategic insights on the phenomenon of interest (Joshi et al. 2003), lower level managers are able to provide more tactical insights on the phenomenon of interest. Thus, I interviewed informants from different organizational levels. In addition, the primary researcher had the opportunity to visit and tour two of the focal company's distribution centers to observe the operational activities. Throughout the four day visit, the primary researcher also had a chance to closely shadow the key informant.

I carefully developed a semi-structured interview guide with open-ended questions to guide the conversation, and probes to ask for additional description and details. Appendix A provides an overview of the actual interview guide. The interviews lasted between 20 to 100 minutes, and all interviews were audio-recorded with the permission of the informants and professionally transcribed leading to a total of 160 pages of qualitative text. I conducted seven interviews at ALPHA and five interviews at BETA. Out of the total of 12 participants, nine held higher managerial positions and three lower level managerial positions. Four participants held positions outside the operations/logistics area providing cross-functional insights about the phenomenon of interest.

To gain even more in-depth insights and knowledge on the phenomenon of interest I collected secondary qualitative data in the form of online news articles discussing drop-shipping operations. Using news articles discussing the topic of interest allows us to triangulate our data (Patton 1990). The online news articles were collected from the top online supply

chain management publications for industry professionals by Friddell (2015). Out of the originally listed 12 top supply chain management publications we selected the ones most relevant to retail supply chain management and with an open search option for articles on the website. I conducted an initial search on each of the online publications' websites with the search terms "drop-shipping" and "drop-ship". Table 2 summarizes the top supply chain management publications used for this research and the number of initial articles from each publication. The initial search resulted in 98 articles. Next, I removed any duplicates and articles published before the year 2010 since omni-channel retailing especially gained traction after 2010. The final sample constitutes 43 articles for further content analysis.

Table 2: Selected Online Supply Chain Publications and Number of Initial Articles

Online Source	Number of Initial Articles
CSCMP'S Supply Chain Quarterly	3
DC Velocity	15
Inbound Logistics	21
Logistics Management	1
Material Handling & Logistics	22
Supply Chain Brain	20
Supply Chain Management Review	0
Supply and Demand Executives	11
Total	93

Data Analysis

The basis for the within-case analysis (Yin 2009) constitutes an initial coding and focused coding phase of all interviews resulting in a detailed, descriptive memo for each case (Ellram 1996; Barratt et al. 2011). Coding allows the researcher to connect contextual rich descriptions with more abstract theoretical categories, which served as the "bones of the analysis" (Charmaz 2014, p.113).

The initial coding phase allowed for the emergence of a wide array of theoretical concepts and ideas stemming from the data (Charmaz 2014). In the initial coding phase, I assigned a code to a smaller segment of data (i.e. sentence). After the initial coding phase, I moved on to the focused coding phase, during which I sorted, synthesized, and organized large amounts of data into more parsimonious codes.

After going through several iterations between the data and codes and organizing the focused codes in a structured manner, I conducted a cross-case analysis. This analysis allowed me to compare and identify commonalities and differences across the two cases, which allowed for a more complete and holistic understanding of the phenomenon of interest (Eisenhardt 1989; Yin 2009). Lastly, I triangulated the findings from the two cases studies by using a content analysis of the news articles I collected. The news articles were coded using the focused codes emerging from the interview data to substantiate the findings.

To assess the thoroughness of the case study approach, I carefully addressed the proposed evaluation criteria for case study research (Yin 2009; Eisenhardt 1989; Voss, Tsikriktsis, and Frohlich 2002; Stuart et al. 2002): construct validity, internal validity, external validity, and reliability in the case study design and execution. Table 3 summarizes the evaluation criteria and how they were implemented.

Table 3: Case research validity and reliability based on Yin 2009, Eisenhardt 1989, Voss, Tsikriktsis, and Frohlich 2002, and Stuart et al. 2002

Evaluation Criteria	Tactic Used
<i>Construct Validity</i> (define the appropriate operational measures for the concepts under study)	Defining concepts a priori (drop-shipping, operational ambidexterity, exploitation, and exploration). Literature driving development of interview guide. Using multiple informants per case. Triangulating data with news articles.
<i>Internal Validity</i> (trying to uncover causal relationships)	Grounding research in existing literature and theory. Using multiple informants. Matching patterns across cases. Employing an iterative approach between findings and literature.
<i>External Validity</i> (identifying the context to which the research is generalizable)	Following a replication logic. Providing a description of the case context and situation. Comparing findings with literature and theory.
<i>Reliability</i> (ensuring that research can be repeated with achieving the same results)	Using a case study protocol. Providing clear guidelines of the data collection process. Recording and transcribing of interviews.

Emerging Themes and Concepts

The following section describes in detail the themes and concepts that emerged from the analysis of the cases and secondary qualitative data. From the data, two frameworks emerged. The first framework is associated with drop-shipping operations and focuses on the drivers and operational challenges thereof. The second framework is grounded in the theoretical underpinning of ambidexterity and captures the underlying mechanisms of

operational ambidexterity. Figure 1 illustrates the general framework pertaining to establishing drop-shipping operations that emerged from the data and Table 4 provides descriptions and examples of the emerging themes. From the analysis of the cases and news articles three main themes emerged, which are denoted as *drivers*, *operational challenges*, and *outcomes*.

Figure 1: Drop-shipping operations: Drivers and operational challenges

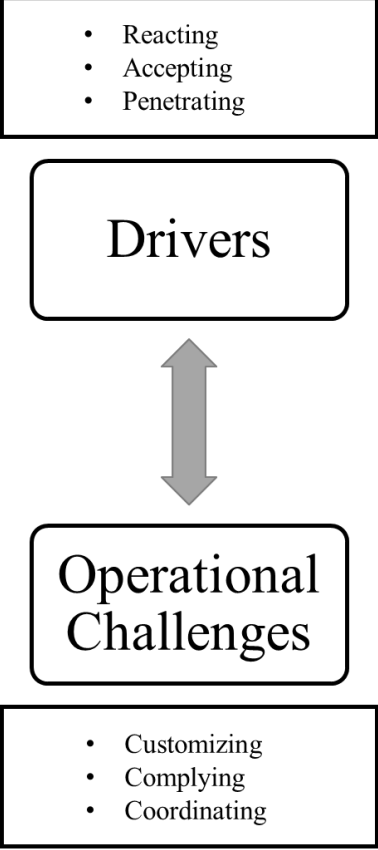


Table 4: Description and examples for emerging codes

Category	Code	Description	Example
<i>Drivers</i>	Reacting	refers to the supplier developing drop-shipping operations to address the changing retail environment	"The market for supply chain design is growing as more companies realize they have to reexamine their networks, and make sure their network of distribution centers and plants are in line with changing market conditions." "So it came out of necessity really, where retailer A and retailer B were not going to hold inventory, they wanted us to just ship direct to their consumers."
	Accepting	refers to the supplier developing drop-shipping operations as a necessity	"I think when XYZ was originally launched the perspective was to let's get in as many doors as we can"
	Penetrating	refers to the supplier developing drop-shipping operations to gain access to more end-customers	
<i>Operational challenges</i>	Customization	refers to the supplier's problems with customizing the drop-shipping processes	"Now since the consumer's ordering them, instead of a two-pack of blenders, they want a single blender."
	Complying	refers to the individual supply chain members problems with adhering to requirements	"Really as we were onboarding them, trying to get that information on them on the front end." "We're expected to get the D to C orders out the door within 24 hours of receiving them here. So that's how the people on the floor are supposed to prioritize the work."
	Coordinating	refers to supplier's problems with managing the drop-shipping operations	

Drivers of drop-shipping operations

The analysis demonstrates that there are three predominant reasons why suppliers business units/companies decide to establish drop-shipping operations. The first driver of establishing drop-shipping is that suppliers are *reacting* to the changes in the retail environment. Consumer expectations in this new omni-channel retail environment are steadily increasing especially due to the “Amazon effect” (Ames 2016). As a theme the “Amazon effect” emerged from the secondary qualitative data. The “Amazon effect” refers to Amazon’s offering of free and fast shipping which consequently leads to consumers expecting an equivalent high service offerings to be the norm across other retailers (Shiphawk 2015). Within this new retail environment constituting of high consumer expectations and a fierce competition from other businesses, ALPHA considers it as a necessity for businesses to rethink and restructure fulfillment operations. A marketing manager at ALPHA notes: *“If people are going online and order their stuff themselves it affects how much brick-and-mortar do you need anymore? How many real buildings? You know, everyone had to redefine.”* Hence, suppliers seem to develop and establish drop-shipping operations to “redefine” themselves and to adequately react to the changes occurring in the retail environment.

A second theme that emerged for the drivers for drop-shipping operations is *accepting* drop-shipping operations as a requirement from the retailer. The case observations indicate that the retailer plays an important role for suppliers to establishing drop-shipping observations for two reasons. Specifically, the observations for ALPHA substantiate that retailers *“rule the show”* almost forcing the business unit to engage in drop-shipping. Hence, suppliers might not have another choice than to follow the retailer’s requirement and establish drop-shipping operations. One of the logistics/operations managers stated: *“Well, their role was really to*

force our hand to develop that because they weren't going to sell with us if we weren't going to ship direct to consumer."

Another reason why suppliers simply accept the fact that they have to establish drop-shipping operations might be due to product characteristics. ALPHA, managing a large and heavy appliance, experienced reluctance from retailers to further stock the product due to the weight and length dimensions of the product. A logistics/operations manager from ALPHA noted: *"Again, it'd be something they don't handle very well with the size and that. So they said, "If you want to do business here, you're going to do it direct to consumer."*

Lastly, suppliers establish drop-shipping operations as a way of directly *penetrating* the consumer market. In the drop-shipping model the retailer as *"middleman"* is removed, providing suppliers with direct access to end-customers. In addition, suppliers are also able to offer a larger product variety to end-customers to subsequently increase their market share. Thus, the overarching theme of directly penetrating the consumer market consists of accessing end-customers and of servicing end-customers better with a larger product variety. In the case of BETA, a logistics/operations manager extensively discussed that drop-shipping operations were established to have access to a larger end-customer base to gain a competitive advantage. The manager noted: *"We want to expand drop ship because we think we'll be able to sell a bigger assortment of products for our retailers and they don't have to hold the inventory. There is a belief that we are missing out on sales and so we need to expand it to more retailers and more footprints."*

Operational challenges of drop-shipping operations

Operational challenges associated with establishing and managing drop-shipping operations emerged as another major theme from the data. While suppliers are used to the processes of fulfilling freight orders for their retailers, the requirement of directly fulfilling end-customer orders involves new processes for the supplier. Hence, suppliers adding drop-shipping operations to their fulfillment capabilities are likely to experience operational tensions and challenges

The first operational challenge emerging from the cases was *customizing* the drop-shipping fulfillment process. For example, end-customers might wish to have the product wrapped in gift-wrapping paper or attach a personal note to their order leading to highly customized orders. One factor contributing to the high customization of the drop-shipping process are any value-added services the supplier is executing. Hence, each end-customer order is not only different in terms of the products that need to be picked but also in terms of what additional services the end-customers request. A logistics/operations manager from APLPHA referred to value-added services as “*a nightmare*” since it adds additional complexity to the fulfillment process. A manager from BETA further elaborated: “*Like with Product X, Product X is kind of a huge nightmare because the CO2 tanks in them make them hazmat so we have to ship them out specially so they have to be in the VAS station to be specially processed so that they go out hazmat. So there’s a lot of stuff that happens in the VAS station.*”

A second factor contributing to customizing the drop-shipping process is the volume. The cases indicate that especially when only a low volume is fulfilled via drop-shipping, the fulfillment process is prone to be highly manual in nature. In the case of ALPHA, handling a small volume for drop-shipping, every step in the drop-shipping process was manually in the

beginning. A marketing manager noted: *“I mean a lot of the stuff we did was manual. I mean we actually have been drop manual, we manually dropped documents and manually send trucks and manually fix problems. So it was a nightmare from our perspective and trying to start business.”*

A second operational challenge that emerged from the data was *complying* with retailer requirements. The secondary qualitative data specifically highlighted the importance of vendor compliance for successful drop-shipping operations. Our secondary qualitative data indicate that *“The urgency around attaining the perfect order through compliance programs is amplified, thanks to a number of factors”* (Terry 2013), one of these factors being the *“increasing use of direct shipping from vendors.”* However, the observations from the cases indicate that achieving compliance might not be an easy endeavor for suppliers. Suppliers work with a great number of retailers and hence, have to adhere to a lot of different requirements dictated by the retailers. A specific problem ALPHA experienced was that the requirements were only communicated after the sales agreement had been signed, increasing time pressure on other business functions to comply with the requirements. An information systems manager from ALPHA described: *“Their mission is go out and get sales agreements. So they go out and do that and we’re – I don’t want to say the afterthought, but once they get the sales agreement, then they send us all the information with a deadline that sometimes we can meet and sometimes we can’t meet. 99 percent of the time we do meet it, but if it’s a real short time frame, we meet it but we don’t meet it following the processes that we like to follow, but we need to follow to make sure that we have everything covered.”*

The third theme that emerged was *coordinating* with other external and internal entities to establish drop-shipping operations. Carriers play an important role in the success of drop-

shipping processes. ALPHA described an incident where carriers were reluctant to adjust their processes to ensure that the product arrives at the end-customer's house undamaged. The failure to coordinate with the carrier from the beginning on resulted in damaged products and hence, in unsatisfied end-customers. Consequently, ALPHA started to adjust its packaging to prevent damage and coordinated with the carrier to ensure that the product is handled in a different manner. A logistics/operations manager recalled: *“Getting them (the carrier) to look at a different shipment with different requirements reliably is incredibly difficult when they're just used to turning numbers.”*

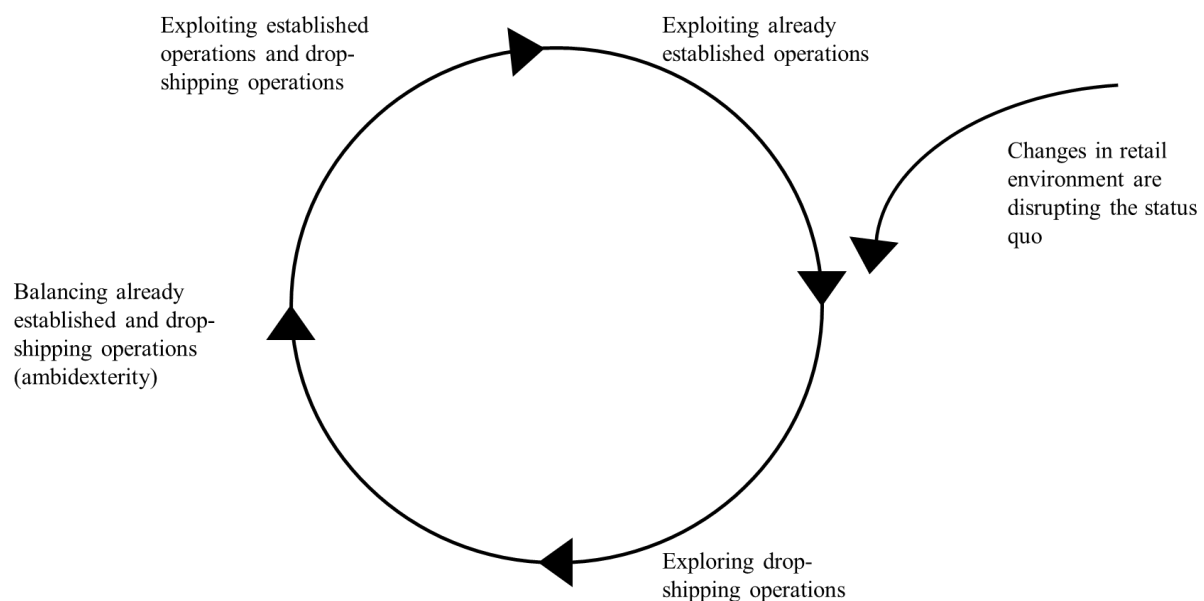
Also, coordinating with internal business functions constitutes a challenge when establishing drop-shipping operations. ALPHA described a situation where the sales team agreed with the retailer on doing drop-shipping without consulting the logistics/operations managers first. After the agreement had been signed, ALPHA discovered that it actually did not have the necessary capabilities in place. *“So that capability didn't exist and the people over here behind me that handle all the major stuff had no clue as to how to do any of that.”*

In addition, the observations suggest that coordinating with the IT department is also of essence. In the cases, the majority of orders arrived through the EDI system. However, the EDI systems were configured to receive standardized retail orders but with drop-shipping the EDI systems need to be compatible to receive orders where the ship to address is different for each end-customer. ALPHA and BETA spend ample amount of time and effort with the IT department to coordinate the new system configurations. A manager from ALPHA stated: *“Chris (name changed by the author) was tremendous in the process of setting them up 'cause he knew what the requirements were and what the capabilities were versus what we had on*

hand and he figured out how to do the processing of the EDI to override the ship to and to do an appropriate direct consumer order taking.”

The general framework of drivers and operational challenges discussed above provides interesting insights and a more nuanced understanding of the phenomenon of drop-shipping. In a second level of interpretation I was focusing on uncovering the findings pertaining to the interrelationships of exploitation, exploration, and ambidexterity to gain a better understanding how suppliers become operational ambidextrous. Figure 2 illustrates the emerging findings from the second level analysis.

Figure 2: The cyclicity of exploitation and exploration



Operational ambidexterity: An emerging process model

Prior to becoming ambidextrous, suppliers focus on *exploiting their already established operations* (freight operations) to gain further operational efficiencies. In the case of ALPHA standard operating procedures have been developed and are already in place to execute freight operations. However, through a continuous improvement program developed by the mother

company the already existing operating procedures are steadily refined to increase performance. A manager from ALPHA noted: “*[the mother company’s] really good at continuous improvement, and putting projects around things, and trying to take as much of that variation as we can out of the system. We have a pretty solid black belt program and green belt program to go in and try to lean out the operations and dummy proof them as much as we can.*”

The focus of improving already established operations gets *disrupted by the changing retail environment*. Thus, suppliers seek to reinvent themselves and rethink their fulfillment operations to stay competitive within this new omni-channel retail environment which subsequently leads to the exploration of drop-shipping operations. A manager from ALPHA stated: “*But the ability for people to go online and learn about the product and see what’s going on Facebook and Twitter and you know. That’s what we learned on the major appliance side years, several years ago was what how much more educated consumers are today. They walk in with their iphone and their ipad. They know more about the appliance than you do. They have got all their reviews and all the lots and everything right there in front of them. They can check your price against whoever they want to standing right in front of you.*”

Furthermore, the cases show that once the supplier acknowledges the changing retail environment, the supplier enters a phase of predominately *exploring drop-shipping* as a new fulfillment operation. ALPHA experienced the changing retail environment as a disrupting factor to their already established fulfillment operations which led ALPHA to “*look around at what the processes were inside of [the mother company] for direct to consumer.*”

Once the supplier enters the phase of focusing on exploring drop-shipping operations, the suppliers experiences the need for *balancing already established fulfillment operations with*

developing the new drop-shipping operations (ambidexterity). The findings from the cases suggest that it depends on the volume how suppliers will manage to keep the balance between the different operational activities. ALPHA and BETA have highly integrated fulfillment processes whereas BETA's seemed more advanced since they are automated. ALPHA, processing a small volume of drop-ship orders and having manual processes, highly integrated its processes for drop-shipping with its already existing operational processes. Moreover, this highly integrative approach of balancing freight with drop-ship operations was noted by a manager from ALPHA as *"being the parasite"* and *"piggybacking."* A manager further explained: *"We had to fit our processes to hit their processes because it's just economically desirable to have one additional [product] or five [name of the product removed by the author] units go in with a truckload of other stuff."*

Most interestingly, from the conversations with managers from BETA (processing a higher volume of drop-ship orders and having an automated system), it emerged that as volume is further increasing the managers will look into separating freight fulfillment operations from drop-shipping operations to some degree. Currently BETA experiences difficulties in terms of balancing freight with drop-ship orders since each of these activities has different requirements. A manager from BETA explained: *"When they get mixed together, they're not really mixed together. It's just these happen before these will happen, so we see really big spikes in our small pack volumes and then our freight volumes die off. They just conversely work against each other. So an issue with that process is not being able to differentiate them through our operational how we process them, which results in delayed times to focus on one group or the other."*

The cases furthermore indicate that the phase of focusing on exploring drop-shipping operations return to a phase of exploitation. However, in this next phase of exploitation the supplier improved both, freight and drop-shipping operations suggesting that there might be a dynamic component associated with exploitation and exploration. For instance, ALPHA described a situation where the business unit earlier engaged in exploring how the EDI processes for drop-shipping operations can be developed. Once these EDI processes had been developed, they can now be exploited and implemented with other trade partners. A manager from ALPHA recalled: *“Now, if we’re gonna maintain Retailer X I’m gonna work on getting them on EDI just because it needs to happen. Once I get them into [...] then I think I have an already established and I can just add it as an offering, so I don’t have to go back and redo all the testing that I’d done before. So I think that’ll be a big win for us.”* Thus, our cases provide evidence for a cyclicity between exploitation and exploration.

Discussion and Literature Integration

The case studies in combination with the secondary qualitative data provide interesting and nuanced understandings of drop-shipping operations and operational ambidexterity. However, to gain a broader understanding of the meaning of the findings, they should be considered within the extant literature. Thus, to further interpret the findings I synthesized and integrated the prior literature on drop-shipping and operational ambidexterity into the discussion. While this research corroborates some prior findings, it more importantly offers interesting and new insights into themes not addressed in the prior literature stimulating potential future research ideas.

Drop-shipping

Research on drop-shipping is limited and mainly focuses on investigating the phenomenon from the perspective of online retailers, providing insights when it would make sense for a retailer to engage in drop-shipping (Randall et al. 2006). In line with the finding that retailers are an important driver for suppliers to establish drop-shipping operations, the drop-shipping literature further substantiates that retailers serve as a driver for suppliers to develop drop-shipping operations (e.g. Rabinovich 2005; Randall et al. 2006; Bailey and Rabinovich 2005). However, the findings of this study indicate that other drivers for establishing drop-shipping operations may exist which could be categorized as being external (reacting to the changing retail environment) or internal (penetrating to the market) to the supplier. The most interesting finding probably is that while suppliers might develop drop-shipping operations to service their retailers, suppliers establish drop-shipping operations for their own benefits. Thus, this research contributes to the extant drop-shipping literature by providing an explanation of why suppliers establish drop-shipping operations.

Retailers deciding to engage in drop-shipping leave their suppliers not only with the associated costs and risks but also the responsibility of executing all fulfillment operations to the retailer's standards (Rabinovich et al. 2008). While the decision for retailers to engage in drop-shipping might be more strategic in nature, the suppliers will take on all operational responsibility and associated challenges. Therefore, this research extends the current drop-shipping literature by shifting the research focus away from retailers to suppliers; and hence, shifting the focus from a strategic towards a more tactical perspective since suppliers will be required to figure out the details as it pertains to establishing efficient drop-shipping operations.

The findings pertaining to the operational challenges of *complying* and *coordinating* suggest that these issues are rooted within the broader subject of managing relationships in supply chain management. The findings advocate that businesses appear to still operate within functional silos and lack coordination with other supply chain partners although extensively discussed in the literature (e.g. Stank et al. 1999; Fawcett and Magnan 2002). Furthermore, the finding of suppliers *complying* with retailers' requirements could be perceived as one mechanism that governs the supplier-retailer relationship. Overall, these findings suggest that there might also be a relational component to establishing and managing successful drop-shipping operations such as supplier accommodation (Murfield and Esper 2016) or internal and external integration (Flynn et al. 2010).

Furthermore, prior studies employed only quantitative methods to investigate the impacts of drop-shipping operations (e.g., Bendoly 2004; Elliot Rabinovich 2005). While quantitative methods are appropriate to explore specific relationships between two or more variables deduced from theory, these methods do not allow for a richer and descriptive exploration of the phenomenon. By employing a qualitative approach using a case study designs and secondary qualitative data, this research provides a rich and descriptive understanding of drop-shipping operations uncovering the associated drivers and operational challenges. Therefore, this research helps and extends our current understanding of the drivers of drop-shipping operations and associated operational challenges.

Operational ambidexterity

The notion of ambidexterity has only recently been introduced to the operations management field and the resulting research is fairly limited (Patel et al. 2012; Kristal et al. 2010). In an operations management context, the theoretical premises of ambidexterity suggest

that companies exploiting already existing operational activities while exploring new operational activities will achieve higher performance outcomes than if the company focuses on either of these two activities (Duncan 1976; Gibson and Birkinshaw 2004; Tushman and O'Reilly 1996). The limited body of work on operational ambidexterity focuses exclusively on testing the theoretical underpinnings of ambidexterity rooted in the field of management neglecting why and how firms develop and manage operational ambidexterity. The qualitative research approach provided me with the opportunity to stimulate a discussion about the theoretical understanding of operational ambidexterity.

A key findings from this research suggest that exploration of new operational activities require a “trigger” or “disruptive event”. This observation suggests that in the context of dropshipping, environmental changes may serve as a trigger shifting the focus of companies away from exploiting already existing business activities and leading them to focus on exploring of new business actions. Prior research has shown that firms facing a highly competitive and dynamic environment exhibit tendencies to engage in exploring new business activities (Jansen et al. 2005; Auh and Menguc 2005) and support our observations.

This research further enhances our understanding of operational ambidexterity by providing at least some insights into the widely debate about the appropriate internal structural solution to manage ambidexterity. The ambidexterity literature lacks a clear understanding whether ambidexterity is achieved through integration or separation (Raisch and Birkinshaw 2008). From the management literature addressing ambidexterity structural differentiation emerged as one option to successfully manage ambidexterity (e.g., Tushman and O'Reilly 1996; Gilbert 2005). However, the extent to which these structural differences should be integrated is not well understood yet, and hence, warrants further investigation. Considering

operational ambidexterity in the context of drop-shipping, the findings of this study suggest that if the processes volume for drop-shipping is low, a higher degree of operational integration is appropriate while a lower degree of integration (or separation) is perceived to be more appropriate with higher volume. Thus, this research exposed volume to be an important contingency factor to consider when investigating the structural solution for managing operational ambidexterity.

In addition, I was able to present some evidence suggesting that exploitation and exploration occur in a cyclical nature, suggesting that suppliers shift between phases of exploiting established operations and exploring new operations. The cyclical nature of exploitation and exploration in a drop-shipping context might suggest that operational ambidexterity is a dynamic process rather than a static status. This observation is further substantiated by Nickerson and Zenger (2002) and Siggelkow and Levinthal (2003) who suggested that firms cycle through phases of exploitation and exploration. Thus, suggesting that there is critical dynamic component to exploration and when it actually transfers into exploitation. However, prior research on operational ambidexterity focused on investigating the phenomenon at a specific point in time, neglecting any potential effects over time.

Based on the discussed findings future operational ambidexterity is warranted. The discussed findings pertaining to operational ambidexterity uncover additional interesting and relevant research areas to grow the understanding of operational ambidexterity within the supply chain and operations management field. Table 5 provides suggestions for additional research in different areas pertaining to operational ambidexterity.

Table 5: Future operational ambidexterity research

Research Area	Future operational ambidexterity research
<i>Antecedents of operational ambidexterity</i>	Investigate antecedents that shift suppliers from focusing on exploiting already established fulfillment operations to exploring new fulfillment operations.
<i>Managing operational ambidexterity</i>	Explore how suppliers balance already established operations with new operations depends on the processed volume such that a low volume may be associated with a higher degree of process integration than a high volume.
<i>Role of time for operational ambidexterity</i>	Consider the potential time effects on exploration and exploitation. Exploration of new operational activities is finite in time duration and hence, there is a specific point in time when explorations of new operational activities turns into exploitation of established operational activities.

Managerial Implications and Future Research

Managerial implications

The importance for suppliers to be able to provide drop-shipping operations for their customers is further increasing. The majority of retail managers expect to increase their use of drop-shipping over the next three years (Ames 2016). I provide insights to managers that the request for drop-shipping might take the supplier as a surprise with a lack of preparedness. Hence, in anticipation of more demand for drop-shipping operations from retailers, suppliers should evaluate whether they already have the necessary drop-ship capabilities in house and develop a plan for implementation to be better prepared for this new fulfillment option. In addition, establishing drop-shipping operations constitutes a great opportunity for suppliers to gain access to a broader end-customer base. Therefore, suppliers might want to consider establishing drop-shipping operations as a viable option to further penetrate the market and to grow their market share.

Furthermore, when establishing drop-shipping operations suppliers should work closely with other supply chain members. This research indicates that retailers play an important role for establishing successful drop-shipping operations. Suppliers are likely to provide drop-shipping solutions to a broad retailer base and hence, will have to adhere to different compliance guidelines. Retailers could help suppliers to achieve higher compliance rates by aligning their compliances with the ones from other retailer. For example, the Retail Value Chain Federation works with retailers to arrange the used terminology and terms to support the operations of the suppliers (Terry 2013).

Moreover, this research suggests that the importance of carriers and other internal departments for successful drop-shipping operations cannot be neglected. For example, if the product is damaged during the delivery process because the carrier is reluctant to adjust its handling operations from freight to individual end-customer orders, end-customer responses might be negative impacting suppliers and retailers alike. Hence, carriers should be informed and integrated into establishing drop-shipping operations early on to ensure carriers have the necessary capabilities and operating procedures in place. In addition to integrating carriers, managers should also strengthen the integration of departments within the company. As the findings of this research show, especially the sales and operations functions still appear to be not integrated leading to major issues. Thus, the internal integration especially between sales and operations but also with other functional areas should be increased.

Lastly, the findings of this research suggest that suppliers should carefully evaluate the degree of integrating their drop-shipping operations with its freight operations. Suppliers that drop-ship only low volumes might benefit from a higher degree of integration with the already

established freight operations. However, suppliers that drop-ship large volume might benefit from a lower level of integration between its freight and drop-ship operations.

Limitations and future research

This research is grounded in the context of drop-shipping and hence, might not be generalizable to other contexts. Future research might consider other contextual settings that would suggest suppliers to exhibit operational ambidexterity to provide further insights. Such an extension of this research would further provide understanding into why and how suppliers become operationally ambidextrous.

In addition, this research is qualitative in nature and thus, provides only an exploratory, rich and deep description of drop-shipping and operational ambidexterity. While this research reveals several themes and their potential interrelationships, future research might wish to complement it by employing a quantitative research approach. For example, survey research could be used to further investigate the potential drivers of drop-shipping and hence, of operational ambidexterity.

Lastly, I conducted two case studies that lend themselves for a literal replication. However, to gain further theoretical insights on how suppliers become and manage operational ambidexterity further case studies would be required to allow for a theoretical replication (Yin 2009). Thus, to extend this research one might consider cases with suppliers that do not have established drop-shipping operations yet to better contrast them against our findings.

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Appendix A

Interview Guide

Opening:

- Introduction of interviewer and participant
- Short overview of purpose of the study
- Assure participant confidentiality and get consent form signed:

Before we begin, I would like to thank you for participating in this interview and for your willingness to be part of my dissertation project on omni-channel fulfillment. I

would like to also inform you that this interview is confidential. Your name, address, and other identifying information will not be used in any form. Any names mentioned during the interview will be omitted from transcription to provide confidentiality (e.g., names of co-workers). While there are no physical risks involved in this research, this interview will be recorded. I want to confirm that you realize that you can stop at any time and choose not to participate and there will be no penalty for choosing to do so.

- Ask for permission to audiotape the interview

Questions:

1. Could you provide me with a brief overview of your job title and work responsibilities?
2. Could you describe the fulfillment operations your company currently engages in?
3. How do you manage your established brick-and-mortar fulfillment operations?
4. What helps you to manage your established brick-and-mortar fulfillment operations?
5. How do you refine your established brick-and-mortar fulfillment operations?
6. What are some problems you encounter when refining your established brick-and-mortar fulfillment operations?
7. Could you tell me about the source of these problems?
8. How does your current brick-and-mortar fulfillment operations compare to the brick-and-mortar fulfillment operations of other suppliers?
9. What changes/improvement to your brick-and-mortar fulfillment operations are you planning to implement to address the challenges of omni-channel retailing?
10. What helps you to manage the development of new fulfillment operations such as drop-shipping?

11. How do you develop drop-shipping operations?
12. What are some problems you encounter when developing drop-shipping operations?
13. Could you tell me about the source of these problems?
14. How do you manage your brick-and-mortar and your drop-shipping operations?
15. What are some problems you encounter when managing your brick-and-mortar and your drop-shipping operations?
16. How do retailers impact your fulfillment operations overall?
17. How do end-consumers impact your fulfillment operations overall?
18. In what way, if any, do other external factors (industry etc.) impact your fulfillment operations?
19. Is there anything else you would like to add? Is there something else that I should know?

Follow up/Probes:

- Please describe that in more detail.
- Please explain that more.
- Can you give me an example of that?
- Can you tell me a little more about that?
- What do you mean with that?
- Can you think of any related issues?

IV. Essay 3

Leveraging Omni-Channel Fulfillment Operations for Service Recovery

Introduction

Frequent stockouts are a major concern for retailers. This is because stockouts often lead to negative consumer behavior (Zinn and Liu 2001) and substantial financial losses for retailers (Aastrup and Kotzab 2009). However, within the new reality of omni-channel retailing, described as a seamlessly integrated retail environment of physical and electronic channels (Brynjolfsson et al. 2013), retailers have new options to potentially “save the sale” in the case of a stockout. Following a stockout, a retailer may offer to order the unavailable product online and ship it to either the store or directly to the customer’s home. For example, in early 2015, JC Penney, a national, mid-range department store in the U.S., began offering free online shipping of unavailable products to the store. Thus, in the case of a stockout, JC Penney leverages its omni-channel fulfillment operations to provide their customers with products, even though the product is unavailable in the store. This example illustrates that omni-channel retailers might now have the necessary retail service operations to provide consumers with a more timely and convenient stockout recovery than in the past. While retailers might have the necessary service fulfillment operations in place to recover from a stockout, it is important to gain an understanding of how consumers evaluate these services (Roth and Menor 2003).

Prior research demonstrates that service failures lead to negative consumer attitudes and behaviors, such as dissatisfaction (e.g. Allen et al. 2014), negative word-of-mouth (e.g. Lin et al. 2011), or customer complaints (Knox and van Oest 2014). Having a service recovery strategy in place (Kelly et al. 1993) provides companies with the opportunity to transform negative consumer attitudes and behaviors into positive ones (Bitner et al. 1990). Service operations literature specifically stresses the importance of consumers’ “fairness” perceptions when evaluating a company’s recovery efforts (Craighead et al. 2004). Positive post-recovery

perceptions can be achieved if a retailer meets consumers' recovery expectations through offering the right bundle of recovery strategies. This in turn is likely to translate into more equitable ("fair") perceptions leading to improved post-recovery satisfaction levels (e.g. Roggeveen et al. 2012).

In the case of a stockout, retailers traditionally had either no or only limited options to recover from such a failure. For instance, a retailer could provide consumers with alternative substitute products (Breugelmans et al. 2006) or offer a rain check (Kelley et al 1993). However in an omni-channel retail environment, a retailer's operational activities can now be used to recover from a stockout (Miller et al. 2000). One interesting issue that emerges within the omni-channel retail environment is whether consumers perceive it as "fair" if the retailer leverages its omni-channel fulfillment operations to recover from a stockout. It is also suggested from prior literature that situational factors, such as purchase urgency, might play an important role when investigating consumer responses to stockouts (e.g. Zinn and Liu 2008; Zinn and Liu 2001; Peinkofer et al. 2015). Hence, contextual effects influence whether consumers evaluate a retailer's recovery strategy as more equitable ("fairer"). Thus, while fulfillment operations now play a new and increasingly important role in stockout recovery these emerging issues warrant further exploration. This is specifically important considering that the majority of retailers still struggle with implementing and managing their omni-channel operations, despite the fact that omni-channel fulfillment is slowly becoming standard (Forrester Research, Inc. 2014).

Therefore, the purpose of this paper is to examine how omni-channel fulfillment operations can be used to recover from a stockout. More precisely the aim is to investigate (1) how, in the case of a stockout, different attributes of a retailer's omni-channel fulfillment

operations impact consumer satisfaction and their evaluation of a retailer's physical distribution service quality (PDSQ); (2) how do consumers evaluate these service recovery attributes in terms of perceived "fairness"; and, (3) the role the purchase experience's contextual effects have on consumers' evaluation of a retailer's stockout recovery strategy.

Using equity theory (Adams 1965), this manuscript implements a series of experimental studies to explore the impact omni-channel fulfillment operations have on consumer satisfaction levels and PDSQ evaluations. More precisely, the studies examine if various fulfillment service attributes, such as convenience and speed, positively impact consumer satisfaction after a stockout. To that end, this manuscript will also investigate the underlying mechanisms for "why" satisfaction occurs. Additionally, I consider the shopping context of the consumer (i.e. whether the consumer needs vs. does not need a particular product). Thus, this manuscript will contribute to the growing body of literature examining consumer issues in supply-chain and operations management (e.g. Rao et al. 2011b; Griffis et al. 2012b).

The remainder of this manuscript is organized as follows: reviews of the relevant literature pertaining to inventory availability, fulfillment operations, service recovery, and associated supply-chain issues are presented. The manuscript then proceeds by introducing the theoretical framework and research hypotheses.

Literature Review

Fulfillment Operations

The body of literature focusing on consumer issues in the fields of operations and supply-chain management is still growing. Over the last decade, two distinct streams of

literature have emerged. The first stream considers investigates inventory management, product distribution, and order fulfillment strategies within an online retailing context (e.g. Rabinovich and Evers 2003; Rabinovich 2004; Griffis et al. 2012b; Cheong et al. 2015). This body of research focuses on the internal or operational aspect of retail service operations (Roth and Menor 2003). For instance, researchers investigate whether inventory consolidation (Rabinovich and Evers 2003) and emergency transshipments (Rabinovich 2005) can prevent or improve order fulfillment. They also investigate how trade-offs in actual and signaled order-to-shipment and delivery times impact consumer attitudes (Rabinovich 2004). Further, this stream of research considers the potential cost trade-offs between various fulfillment strategies, such as inventory holding and transportation costs (e.g. Cheong et al. 2015; Netessine and Rudi 2006; Bendoly et al. 2007). Overall, this stream of literature argues that retailers should develop and then leverage an online channel to achieve high product availability and fulfillment performance. Moreover, implementing an omni-channel supply-chain enables retailers to evaluate different fulfillment strategies in terms of cost and profitability.

The second stream focuses on consumers' responses to order fulfillment processes and failures, particularly late deliveries (Rao et al. 2011b), product returns (Griffis et al. 2012a; Rao et al. 2014), and stockouts (e.g. Dadzie and Winston 2007; Pizzi and Scarpi 2013). This stream highlights the growing importance of consumer-level variables, such as consumer satisfaction (e.g. Esper et al. 2003) and perceptions of PDSQ (e.g. Koufteros et al. 2014). For example, Boyer and Hult (2006) find that different order fulfillment strategies impact consumer retention differently and Rao et al. (2011a) show that the perceptions of a retailer's PDSQ positively correlate with consumer satisfaction and retention levels.

The second stream specifically highlights the importance of retailers achieving positive consumer PDSQ perceptions (e.g. Rao et al. 2014; Rabinovich and Bailey 2004; Griffis et al. 2012b). Understanding how consumers evaluate a retailer's service operations is key to offering superior retail services (Roth and Menor 2003). Consumers are more satisfied and more likely to re-purchase from a retailer when they perceive a retailer's PDSQ performance to be high (Rao et al. 2011a). Consumer perceptions of PDSQ gain further importance when evaluating a stockout recovery within an omni-channel retail context. If a stockout occurs, consumers tend to negatively evaluate a retailer because their PDSQ is presumed to be insufficient. However, by leveraging established omni-channel fulfillment operations, retailers might be able to turn this negative situation into a positive PDSQ evaluation. Since failures in the fulfillment process are likely to result in negative reactions from consumers and may lead to a loss of sales, this stream of research emphasizes the importance of retailers and their respective supply-chain members to provide reliable and exceptional fulfillment services to consumers.

Inventory Availability

Inventory availability constitutes a key operations performance measure of retail supply-chains (Emmelhainz et al. 1991), however poor supply-chain management (DeHoratius and Raman 2008; Ettouzani et al. 2012; Raman et al. 2001) may result in stockouts that negatively impact manufacturers, retailers, and consumers. Stockouts fall under typical retail operation failures (Kelley et al. 1993) and a growing body of literature investigates the potential impact of stockouts for upstream and downstream supply chain members has emerged.

Research has established that consumers negatively react to retail operation failures (e.g. Pizzi and Scarpi 2013; Kim and Lennon 2011; Rao et al. 2011b; Oflaç et al. 2012). For example, Pizzi and Scarpi (2013) show that stockouts negatively impact re-patronage behavior and Rao et al. (2011b) provide evidence for delivery failures leading to a decrease in the frequency and size of future orders. Therefore, retailers need to implement recovery strategies to mitigate these negative reactions. With regard to stockouts, Kim and Lennon (2011) and Breugelmans et al. (2006) argue online retailers should inform their consumers up front about inventory availability. And Pizzi and Scarpi (2013) suggest that online retailers can mitigate negative consumer responses by taking responsibility for the stockout. These strategies only lessen, but do not fully recover, consumer dissatisfaction following an operational failure. However, within the new reality of omni-channel retailing, retailers have the opportunity to fully recover from a stockout by leveraging their omni-channel fulfillment operations.

To summarize, prior research has contributed to an understanding of how consumers respond to stockouts in a single-channel retail setting. With the growth of online retailing over the past decade, the vast majority of work has been conducted exclusively within an online retailing context (e.g. Griffis et al. 2012a; Pizzi and Scarpi 2013; Rao et al. 2011b). A small body of literature has started to explore how consumer dissatisfaction resulting from retail service failures might be mitigated. However, important research opportunities have not yet been addressed, such as how an omni-channel retail environment disrupts and alters traditional consumer behavior and expectations pertaining to stockouts. Moreover, extant research has not considered how omni-channel fulfillment operations may help to recover consumer satisfaction following a stockout. Thus, there is an opportunity for the service recovery literature to provide

further insights with regard to how and why omni-channel fulfillment operations as a recovery strategy can impact consumer satisfaction levels and PDSQ evaluations.

Service Recovery

A stockout constitutes a service failure, which refers to any service that is unfulfilled, delayed, or does not meet consumer expectations (Bitner et al. 1990). Service recovery is conceptualized as a firm strategy (Hart et al. 1990) that attempts to restore a damaged relationship between a company and a consumer (Knox and van Oest 2014). However, service failure literature demonstrates that each recovery strategy achieves, if at all, different levels of improved consumer satisfaction. In fact, a strategy's success depends on a series of factors, such as failure type and magnitude (e.g. Kelley et al. 1993; Smith et al. 1999; Blodgett et al. 1997). Considering these prior findings, it is of great importance to carefully evaluate which recovery strategies lead to improved consumer satisfaction positive evaluations of a retailers' PDSQ in the case of a stockout in an omni-channel retail setting.

This manuscript integrates the discussed streams of literature and addresses the research gaps outlined above by: (1) extending the conversation of stockouts into an omni-channel retail environment and (2) investigating which omni-channel fulfillment operations are most advantageous to recovering consumer satisfaction and improving a retailer's PDSQ perceptions after a stockout.

Conceptual Framework

Equity theory (Adams 1965) posits that a consumer's response derives from comparing their internal calculation of outcomes to inputs to the perceived ratio of an average consumer's outcomes to inputs. Consumer dissatisfaction is than a perceived imbalance or inequity arising

from receiving a lower outcome than the average consumer, providing more inputs than the average consumer, or a combination of both (Oliver 1980). Therefore, according to equity theory, a consumer experiencing a stockout will receive a lower outcome than the average consumer which leads to an imbalance between a consumer's ratio of outcomes to inputs and an average consumer's ratio of outcomes to inputs. This imbalance, or perception of inequity, leads to consumer dissatisfaction (Kim and Lennon 2011; Pizzi and Scarpi 2013).

Research has positioned equity theory as an applicable lens to study consumer responses to service recoveries (e.g. Grewal et al. 2008; Smith et al. 1999; Roggeveen et al. 2012). This theory has also been applied to studying supply chain failures, such as late deliveries (Rao et al. 2011b) and supply chain recoveries, such as returns management (Griffis et al. 2012a).

Figure 1 was developed to guide this research and is based on the theoretical foundations of equity theory. In general, the framework for this research proposes that a fast and efficient recovery process impact satisfaction levels and PDSQ perceptions, with regard to a retailer's omni-channel fulfillment operations aimed at restoring consumers' perceived inequity after experiencing a stockout.

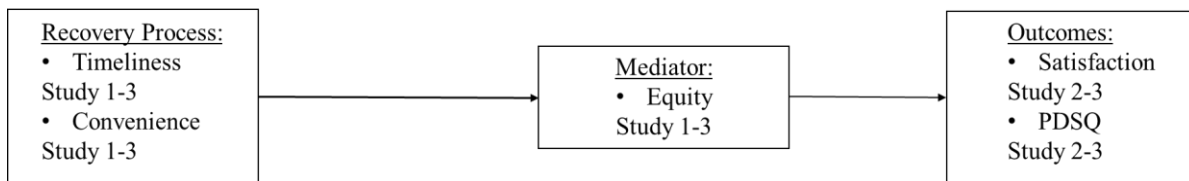


Figure 3: Framework

This research consists of four experimental studies including one pretest and three main studies. The pretest helped develop and refine the experimental stimuli for the main studies and

was used to ensure only the variables of interest were manipulated (Perdue and Summers 1986; Knemeyer and Naylor 2011).

Study 1

This study focuses on developing the foundational relationships between a timely and convenient stockout recovery on consumers' equity perceptions. Based on these underlying relationships, Studies 2 and 3 enhance the baseline model, evaluate other consumer outcome variables, and introduces more sophisticated variations of the proposed relationships.

Retail evaluations depend, at least partly, on different facets of the recovery process (Tax et al. 1998). For the purpose of this research, I am particularly concerned with the *dimensions of speed and convenience*. Speed refers to how fast the recovery strategy is (i.e. next day vs. 9 days) (Smith et al. 1999). Convenience is a nonmonetary attribute that refers to consumers designating limited effort in order to acquire a product (Berry et al. 2002). In this paper, convenience is defined as the location where an (formerly) unavailable product is delivered (i.e. the consumer's home vs. the store).

Extant literature demonstrates that successful recovery strategies lead to enhanced consumer satisfaction (Allen et al. 2014; Roggeveen et al. 2012; Tax et al. 1998) and positive company evaluations (e.g. Maxham and Netemeyer 2002). These positive consumer responses result from repairing the consumers' view of equity on the part of the retailer (e.g. Roggeveen et al. 2012). According to equity theory (Adams 1965), inequality can be restored either through matching or even exceeding the outcome or through minimizing the investment of additional inputs. In the case of a stockout, a retailer can match the outcome by offering consumers who experience a stockout the option of having the product provided through another channel, for instance. During the stockout recovery process, the consumer is likely to

invest additional time and effort until the unavailable product is received. In accordance with equity theory (Adams 1965), the retailer should try to minimize the additional consumer inputs, such as time and effort to rectify perceived equity imbalances.

For example, a retailer could provide a fast recovery to minimize consumer waiting times. The literature suggests a fast recovery is perceived as “fairer” by consumers in comparison to a slow recovery (Hart et al. 1990; Smith et al. 1999). In a stockout situation, a retailer has the opportunity to leverage its omni-channel fulfillment operations to provide a fast recovery from the failure in the primary retail channel by delivering the unavailable product through another channel thereby minimizing the time a consumer invests waiting for the product. Hence, consumers are more likely to have higher equity perceptions when the recovery is fast than when it is slow.

Similarly, a retailer could offer delivering the unavailable product to a more convenient location to minimize the additional effort a consumer invests during the recovery process. In a stockout situation, a retailer has the opportunity to leverage its omni-channel fulfillment operations to have the (formerly) unavailable product delivered to a more convenient location and thus, minimize the additional effort consumers invest during the recovery process (Berry et al. 2002). Hence, consumers are likely to have higher equity perceptions when the product is delivered to a more convenient location than when it is delivered to a less convenient location. Thus, I hypothesize:

- H1a: A speedy (slow) recovery leads to a higher (lower) levels of perceived equity.**
- H1b: A more convenient (less convenient) location leads higher (lower) levels of perceived equity.**

While speed and convenience, when considered individually, are likely to lead to higher perceptions of equity, the complete recovery strategy should be seen as a bundle of resources (Smith et al. 1999). According to equity theory (Adams 1965), equity can be achieved by minimizing the additional inputs, in terms of time and effort, a consumer invests in the recovery process. Minimizing additional inputs can be achieved by providing a speedy recovery and having the product delivered to a more convenient location.

Building on the discussion of H1a and H1b, I would predict that a slow recovery speed is likely to lead to low equity perceptions because the consumer will have to invest more time. However when considering speed and convenience as a bundle of resources, a consumer's overall additional inputs can be minimized by the retailer and equity can be approximated by offering a more convenient delivery location since consumers. Accordingly, the consumer will invest less effort overall even when the recovery is slow.

Similar logic applies when the product is delivered to a less convenient location. Again, delivering a product to a less convenient location increases consumers' time input. However, considering speed and convenience as a bundle of recovery resources (Smith et al. 1999), having a speedy recovery but delivering the product to a less convenient location is likely to be perceived as more equitable because overall, the consumer will have to invest less additional time during the recovery process. Since, perceived equity depends on how consumers interpret the entire recovery process in terms of speed and convenience, I hypothesize:

H2a: When recovery speed is slow, having the product delivered to a more convenient location will lead to higher levels of perceived equity than when the product is delivered to a less convenient location

H2b: When the product is delivered to a less convenient location, a fast recovery will lead to higher levels of perceived equity than a slow recovery.

Pretest

Before the hypotheses were tested in Study 1, a pretest was conducted to ensure the validity of our experimental manipulations. For the pretest, I developed a hypothetical shopping scenario following the guidelines of Rungtusanatham et al. (2011). In the pre-design stage, I consulted in-store policies of omni-channel retailers to explore the different fulfillment options stores typically provide to consumers in the case of a stockout. Based on this review, I identified those retailers who deliver products to a consumer's home or to the store. Additionally, retailers differ depending on their speediness of delivery (i.e. next day or 9 days). Once I identified these key factors, I developed the written version of the hypothetical shopping scenario. This step involved the careful development of a common and experimental module (Rungtusanatham et al. 2011). The common module included all the statements that are constant across all groups and the experimental module included all the statements that varied across experimental groups. The final experimental conditions were reviewed by a total of six experts. Integrating their feedback into the experiment enhanced the instructions and scenario clarity. The final experiment for the pretest was a 2 (Convenience: delivered to the home vs. to the store) x 2 (Speed: next day delivery vs. 9 days delivery) between subjects design, including one control group.

A total of 170 students (61.8% male; mean age of 23.12 years) were recruited from five different business courses at a large, public university in the southern United States. Participants received course credit in exchange for participating in the pretest. All participants were randomly assigned (Bachrach and Bendoly 2011; Knemeyer and Naylor 2011) to one of the five experimental conditions.

To evaluate convenience and speed among the different groups, I excluded our control group from the analysis. I conducted a MANOVA with convenience and speed as the dependent variables, both measured on a 7-point Likert-scale (1=strongly disagree; 7=strongly agree), and “to where” the product was delivered (home vs. the store) and “when” the product was delivered (next day vs. 9 days delivery) as the independent variables. There is a significant main effect for “to where” on convenience, $F(1,126) = 56.34, p < 0.001, \eta^2 = 0.31$, indicating that when the product is delivered to the consumer’s home ($M_{home} = 6.27$) participants evaluate this as being more convenient than if the product is delivered to the store ($M_{store} = 4.21$). The main effect for “when” on convenience was not significant. There is also a significant main effect for “when” on speed, $F(1,126) = 109.20, p < 0.001, \eta^2 = 0.47$, indicating that when the product is delivered the next day ($M_{next_day} = 2.58$), participants evaluate this as having to wait less than if the product is delivered in 9 days ($M_{9_days} = 5.58$). The main effect for “where” on speed was not significant at the $\alpha = 0.05$ level. No significant interaction effects were observed.

To evaluate whether participants were aware of their respective experimental condition, a contingency table analysis was conducted (Bachrach and Bendoly 2011; Perdue and Summers 1986). The large effect sizes for the convenience condition with $\chi^2 = 63.36, p < 0.001$, Cramer’s $V = 0.65$ and the speed condition with $\chi^2 = 74.330, p < 0.001$, Cramer’s $V = 0.70$ indicate most of the participants were able to identify their respective groups, which supports the validity of our manipulations (Miller 2002).

Study 1: Method

Study 1 constituted a 2 (Convenience: delivered to the home vs. to the store) x 2 (Speed: next day delivery vs. 9 days delivery) between subjects design, including one control group and a total of 222 adults from the U.S. participated in the web-based survey via Amazon

Mechanical Turk (MTurk) (Knemeyer and Naylor 2011; Goodman et al. 2013). Participants were randomly assigned to one of the five experimental conditions. The age range of the sample is from 18 to 73, with a mean age of 35.4 years, and approximately 65% of the participants were female. The median combined household income was \$40,000 - \$49,999, and about 87% reported at least some college education.

Study 1: Dependent variables and manipulation check measures

The outcome variable of interest in Study 1 was “equity” (Smith et al. 1999) consisting of three dimensions: distributive (which evaluates the outcome), procedural (which evaluates the process in which the outcome is achieved), and interactional equity (which refers to employees behavior). Appendix A provides a detailed overview of the item descriptions.

To assess whether participants were aware of their respective treatment condition, two one-item measures were used asking participants to indicate to where the tablet would be delivered (to the home or to the store) and when the tablet would be delivered (the next day or in 9 days). Additionally, an instructional manipulation check (Oppenheimer et al. 2009) was included at the end of the survey to ensure that participant were aware of the instructions.

Study 1: Manipulation checks

To assess whether participants were aware of their respective experimental conditions (Perdue and Summers 1986; Bachrach and Bendoly 2011), two-way contingency table analyses were conducted. The significance and large effect sizes (*Cramer's V*=0.943 and 0.977; convenience and speed, respectively) are in line with pretest 1 and hence, confirm the validity of our experimental manipulations (Miller 2002).

Study 1: Analysis and results

To test H1a, H1b, H2a, and H2b a two-way ANOVA was conducted with speed (next day vs. 9 days) and convenience (home vs. store) as fixed effects and equity was included as the dependent variable. The analysis shows that there is a significant main effect of speed ($F(1,176)=7.68; p<0.01, \eta^2 = 0.04$) on equity, indicating that consumers exhibit higher perceptions of equity if the recovery is fast ($M_{\text{fast}} = 6.05$) rather than slow ($M_{\text{slow}} = 5.45$). Thus, *H1a is supported*. The main effect of convenience is not significant at the 0.05 level, ($F(1,176)=5.49; p=0.053; \eta^2 = 0.02$). Thus, *H1b is only partially supported*. No significant interaction effect was revealed.

To test H2a and H2b I build on the ANOVA results by conducting pairwise comparisons of convenience on equity when the recovery speed is slow and speed on equity when the delivery location is less convenient. The results show that for the slow recovery condition, convenience does not enhance perceptions of equity ($p = 0.240; M_{\text{home}} = 5.70, M_{\text{store}} = 5.40$). Thus, *H2a is not supported*. For the condition when the product is delivered to a less convenient location, speed significantly enhances perceptions of equity ($p = 0.08; M_{\text{nextday}} = 5.84, M_{\text{9days}} = 5.40$). Thus, *H2b is partially supported*.

Study 1: Discussion

The findings of Study 1 suggest that providing a fast recovery is more essential to achieving higher perceptions of equity than providing a more convenient delivery location. The finding that the recovery attribute of convenience has, in general, only a limited effect on perceptions of equity further supports this interpretation.

Although these findings provide some insights into which attributes of an omni-channel fulfillment operations may impact consumer perceptions of equity, this study has its limitations. Study 1 does not consider other relevant consumer related outcome variables such as satisfaction or perceptions of a retailer's service quality. Thus, Study 2 introduces post-recovery satisfaction and physical distribution service quality as two new outcome variables. Furthermore, Study 2 will provide insights into the underlying processes of "why" consumers experience post-recovery satisfaction and positive evaluations of a retailer's PDSQ. Building on Study 1, it seems to be the case that consumers evaluate different recovery attributes as more "equitable" (fairer) which in turn might then lead to heightened satisfaction levels.

Study 2

This study investigates whether consumers' post-recovery satisfaction levels and perceptions of a retailer's PDSQ are indirectly impacted through their perceptions of equity. Equity theory suggests that a consumer's recovery evaluation is a function of previously developed perceptions of equity (Adams 1965). These perceptions subsequently translates into enhanced consumer satisfaction (Roggeveen et al. 2012) and positive attitudes (Oliver 1980). Applied to our conceptual model, consumers with high equity perceptions (due to a fast or more convenient recovery) will be more satisfied and will have higher perceptions of PDSQ than consumers with low levels of perceived equity (due to a slow or less convenient recovery). For example, Roggeveen et al. (2012) provide evidence that equity is the underlying mechanism that restores satisfaction in a recovery involving consumer co-creation. I therefore postulate:

H3: The relationship between speed and convenience and satisfaction and PDSQ is mediated by perceived equity, such that:

H3a: Consumers experiencing a fast recovery will be more satisfied and have higher PDSQ perceptions than consumers experiencing a slow recovery, due to higher equity perceptions

H3b: Consumers having the product delivered to a more convenient location will be more satisfied and have higher PDSQ perceptions than consumers having the product delivered to a less convenient location, due to higher equity perceptions.

H3c: When recovery speed is slow, having the product delivered to a more convenient location will lead to higher levels of satisfaction and perceived PDSQ than when the product is delivered to a less convenient location, due to higher perceived equity.

H3d: When the product is delivered to a less convenient location, a faster recovery will lead to higher levels of satisfaction and perceived PDSQ than a slow recovery, due to higher perceived equity.

Study 2: Method

Study 2 also constituted of a 2 (Convenience: delivered to the home vs. to the store) x 2 (Speed: next day delivery vs. 9 days delivery) between subjects design, including one control group. A total of 261 adults from the U.S. participated in the web-based survey via Amazon Mechanical Turk (MTurk) (Knemeyer and Naylor 2011; Goodman et al. 2013). Participants were randomly assigned to one of the five experimental conditions. The age range of the sample was from 19 to 76, with a mean age of 36.6 years, and approximately 65.7% of the participants were female. The median combined household income was \$40,000 - \$49,999, and about 91% reported at least some college education.

Study 2: Dependent variables and manipulation check measures

The dependent variables in Study 2 are post-recovery satisfaction (Crosby and Stephens 1987) and the participant's perception of a retailer's PDSQ (Koufteros et al. 2014). A retailer's PDSQ is operationalized as having three dimensions: timeliness, availability, and condition. The measures were adapted from extant research. Timeliness refers to whether the product

would be delivered on time; availability refers to whether the retailer is able to provide the product when requested; and, condition refers to whether the product will arrive in good condition. Appendix A provides a detailed overview of the two scales used to measure the dependent variables.

Study 2: Convergent and discriminant validity assessments

Convergent and discriminant validity of the dependent measures were assessed through confirmatory factor analysis (CFA) using AMOS 22.0 for SPSS. A five-factor model, including satisfaction, timeliness, availability, condition, and equity was estimated. Equity was estimated as a second factor model consisting of three dimensions: distributive, procedural, and interactional equity. The CFA fit statistics support our model (Hu and Bentler 1999): $\chi^2 = 1175.35$, $df = 392$, $CFI = 0.93$, $RMSEA = 0.088$ (90% confidence interval: 0.082; 0.093), and $SRMR=0.043$.

In support of convergent validity the average-variance extracted (AVE) for each factor exceeds 0.5 (Fornell and Larcker 1981). Moreover, all Cronbach's alpha (α) values exceed 0.8 (Nunally and Bernstein 1994). In support of discriminant validity for each pair of factors, the AVE exceeded the phi-square correlation (ϕ^2) (Fornell and Larcker 1981). Table 1 provides a summary of the standardized loadings and Cronbach's α .

Table 1: CFA results Study 2

Item	Standardized loading	Cronbach's α
Equity1_distributive	0.97	0.98
Equity2_procedural	0.99	
Equity3_interactional	0.93	
Sat1	0.98	0.97
Sat2	0.95	
Sat3	0.92	
Time1	0.94	0.93
Time2	0.96	
Time3	0.97	
Time4	0.82	
Time5	0.89	
Time6	0.50	
Avail1	0.90	0.94
Avail2	0.89	
Avail3	0.88	
Avail4	0.84	
Avail5	0.81	
Cond1	0.92	0.91
Cond2	0.96	
Cond3	0.90	
Cond4	0.64	

Note: $\chi^2 = 1175.35$, $df = 392$, $CFI = 0.93$, $RMSEA = 0.088$ (90% CI: 0.082; 0.093), $SRMR = 0.043$

Study 2: Manipulation checks

Two-way contingency table analyses were conducted to assess whether participants were aware of their respective experimental conditions (Perdue and Summers 1986; Bachrach and Bendoly 2011). The significant and large effect sizes (*Cramer's V*=0.905 and 0.960 for convenience and speed respectively) of the manipulation checks are in line with pretest 1 and Study 1. Hence, the validity of our experimental manipulations are confirmed (Miller 2002).

Study 2: Analysis and results

To assess whether equity would function as a mediator between the recovery attributes and the dependent variables of interest I used PROCESS. PROCESS is a set of newly established SPSS macros and is based on an ordinary least square regression path analysis. These macros are suitable to estimate different types of statistical models, including simple mediation and moderation models as well as more advanced moderated-mediation models (Hayes 2013). I ran PROCESS model 4 and 8 (Hayes 2013), which resembles a simple mediation model and an advanced moderated-mediation model.

Contrary to the traditional view of Baron and Kenny (1986) who require a significant relationship between the independent and dependent variable to test for mediation, PROCESS adopts a more contemporary approach. PROCESS establishes mediation based on the only criteria that a significant indirect effect of X on Y through a mediating variable M ($a \times b$) exists (Zhao et al. 2010; Hayes 2009). Thus, it is not necessary to first establish a significant relationship between the X and Y variables to test for a mediation effect. To assess the significance of indirect effects PROCESS uses bootstrap confidence intervals (If 0 is not included in the estimated confidence interval of the indirect effect, mediation can be inferred).

First, I estimated a simple mediation model (PROCESS model 4) with speed as the sole predictor. The results show that equity functions as a mediator between speed on satisfaction (effect size: 0.41, Lower Limit: 0.13 and Upper Limit: 0.69) since 0 is not include in the bootstrap confidence interval. It can be inferred that consumers indicate significantly higher satisfaction levels when the product is delivered the next day vs. in 9 days, due to higher perceived equity. This finding is in line with Study 1. Similarly, equity also functions as a mediator between speed and timeliness (effect size: 0.33, Lower Limit: 0.10 and Upper Limit: 0.58), availability (effect size: 0.21, Lower Limit: 0.08 and Upper Limit: 0.41), condition (effect size: 0.15, Lower Limit: 0.06 and Upper Limit: 0.26), and overall PDSQ (effect size: 0.23, Lower Limit: 0.03 and Upper Limit: 0.34) indicating that consumers evaluate a retailer's PDSQ significantly higher when the product is delivered the next day vs. in 9 days, due to higher perceptions of equity. Based on these results, *H3a is supported*.

Next, I estimated a simple mediation model with convenience as the sole predictor. Results indicate that equity does not mediate the relationship between convenience on satisfaction (effect size: 0.25, Lower Limit: -0.05 and Upper Limit: 0.58), timeliness (effect size: 0.21, Lower Limit: -0.04 and Upper Limit: 0.48), availability (effect size: 0.13, Lower Limit: -0.02 and Upper Limit: 0.34), condition (effect size: 0.09, Lower Limit: -0.02 and Upper Limit: 0.21), or overall PDSQ (effect size: 0.14, Lower Limit: -0.04 and Upper Limit: 0.33) since 0 is included in the respective bootstrap confidence intervals. Thus, *H3b is not supported*. Table 2 summarizes the results of the simple mediation models.

Table 2: PROCESS model 4

Hypothesis	Relationship	Indirect Effect	CI
H3a	S-> Equity-> SAT	a*b (0.40*1.03)=0.41	(0.13; 0.69)*
H3a	S-> Equity->Timeliness	a*b (0.40*0.84)=0.33	(0.10; 0.58)*
H3a	S-> Equity->Availability	a*b (0.40*0.54)=0.21	(0.08; 0.41)*
H3a	S-> Equity->Condition	a*b (0.40*0.37)=0.15	(0.06; 0.27)*
H3a	S-> Equity-> PDSQ	a*b (0.40*0.58)=0.23	(0.06; 0.34)*
H3b	C-> Equity-> SAT	a*b (0.24*1.03)=0.25	(-0.05; 0.58)
H3b	C-> Equity-> Timeliness	a*b (0.24*0.88)=0.21	(-0.04; 0.48)
H3b	C-> Equity-> Availability	a*b (0.24*0.56)=0.13	(-0.02; 0.34)
H3b	C-> Equity-> Condition	a*b (0.24*0.38)=0.09	(-0.02; 0.21)
H3b	C-> Equity-> PDSQ	a*b (0.24*0.61)=0.14	(-0.04; 0.33)

Note: * significant since 0 is not included in the 95% Bootstrap confidence interval

Furthermore, I estimated a mediation model with speed and convenience as the two predictors to test H3c and H3d. Results indicate that contrary to our predictions, when recovery is slow, equity does not function as a mediator. Accordingly, having the product delivered to a more convenient location does not significantly improve post-recovery satisfaction (effect size: 0.38, Lower Limit: -0.07 and Upper Limit: 0.85), timeliness (effect size: 0.31, Lower Limit: -0.07 and Upper Limit: 0.68), availability (effect size: 0.20, Lower Limit: -0.01 and Upper Limit: 0.47), condition (effect size: 0.14, Lower Limit: -0.03 and Upper Limit: 0.33), or overall perceptions of PDSQ (effect size: 0.22, Lower Limit: -0.04 and Upper Limit: 0.48). Thus, *H3c is not supported*. However, *in support of H3d*, our results show that when the product is delivered to a less convenient location (store), having a fast recovery does lead to significantly higher levels of satisfaction (effect size: 0.55, Lower Limit: 0.16 and Upper Limit: 0.97),

timeliness (effect size: 0.45, Lower Limit: 0.09 and Upper Limit: 0.81), availability (effect size: 0.29, Lower Limit: 0.10 and Upper Limit: 0.57), condition (effect size: 0.20, Lower Limit: 0.06 and Upper Limit: 0.36), and overall perceptions of PDSQ (effect size: 0.31, Lower Limit: 0.07 and Upper Limit: 0.57) due to higher perceptions of equity. Table 3 summarizes the results of the conditional mediation models (PROCESS model 8).

Table 3: PROCESS model 8

Hypothesis	Relationship	Level	Cond. Indirect Effect	CI
H3c	S x C-> Equity->SAT	9 days	0.38	(-0.07; 0.85)
H3c	S x C-> Equity->Timeliness	9 days	0.31	(-0.07; 0.68)
H3c	S x C-> Equity->Availability	9 days	0.20	(-0.01; 0.47)
H3c	S x C-> Equity->Condition	9 days	0.14	(-0.03; 0.33)
H3c	S x C-> Equity->PDSQ	9 days	0.22	(-0.04; 0.48)
H3d	S x C-> Equity->SAT	store	0.55	(0.16; 0.97)*
H3d	S x C-> Equity->Timeliness	store	0.45	(0.09; 0.81)*
H3d	S x C-> Equity->Availability	store	0.29	(0.10; 0.57)*
H3d	S x C-> Equity->Condition	store	0.20	(0.06; 0.36)*
H3d	S x C-> Equity->PDSQ	store	0.31	(0.07; 0.57)*

Note: * significant since 0 is not included in the 95% Bootstrap confidence interval

Study 2: Discussion

In line with the findings of Study 1, Study 2 also supports that in the case of a stockout, in an omni-channel retail environment, a fast recovery plays a more important role in restoring post-recovery satisfaction and positive evaluations of a retailer's PDSQ than having the unavailable product delivered to a more convenient location. The data shows that when the product is delivered to a less convenient location higher satisfaction levels and higher perceptions of a retailer's PDSQ are due to higher levels of equity. Moreover, higher levels of

equity can be achieved by providing a fast recovery. Hence, it can be concluded that if a retailer does not have the capabilities to deliver the product to a more convenient location, speed might be of essence to achieving higher satisfaction levels and PDSQ perceptions.

While the findings of Study 2 shed some light on the importance of a fast vs. convenient recovery after a stockout, this study has its limitations. It was specifically surprising that some of the findings were contrary to the predictions based on equity theory. Hence, to further contribute to theory (Whetten 2009), I contextualized equity theory in Study 3 by considering a different shopping context.

Study 1 and subsequent Study 2 implemented a low purchase criticality scenario (i.e. temporal feelings of involvement that accompany a consumer during a particular shopping situation (Richins et al. 1992)) and, hence, provided only limited insights into consumers' responses to stockout recoveries. It is suggested that depending on the shopping context (i.e. low vs. high purchase criticality) consumers will evaluate an omni-channel retailer's stockout recovery strategies differently. These limitations will be addressed in Study 3 by integrating a high purchase criticality scenario into the experimental design.

Study 3

This study introduces purchase criticality and explores the boundary conditions of the proposed model. Within the context of retailing, purchase criticality or situational involvement is defined as the temporal feelings of involvement that accompany a consumer during a particular shopping situation (Richins et al. 1992). Extant literature has established, for example, that buying a gift for a friend results in higher purchase criticality compared to buying a product for oneself (Clarke and Belk 1979). Also, the criticality of a purchase (i.e. whether it is needed vs. not needed) has been shown to be an important factor when assessing

consumer responses to stockout recovery strategies (Zinn and Liu 2008, 2001). Accordingly, shopping situations that carry a high level of perceived risk or are, highly critical purchases are associated with higher levels of perceived consumer risk (Ostrom and Iacobucci 1995).

The service failure literature provides evidence that consumers perceive a service failure as being more severe during high purchase criticality than during low purchase criticality (e.g. Ostrom and Iacobucci 1995; Levesque and McDougall 2009). This suggests that providing a faster and more convenient recovery from a stockout, particularly within high purchase criticality, is important to restoring equity and consequently achieving high levels of consumer satisfaction and perceptions of a retailer's PDSQ.

Study 3: Method

Study 3 implemented a 2 (Convenience: delivered to the home vs. to the store) x 2 (Speed: next day delivery vs. 9 days delivery) between subjects design considering a high purchase criticality context. A control group with a low purchase criticality context was integrated into the experimental design. The low purchase criticality scenario asked participants to imagine they are buying a tablet for themselves whereas the high purchase criticality scenario prompted participants to imagine they are buying a tablet as a birthday gift for their spouse. A total of 274 adults from the U.S. participated in the web-based survey via Amazon Mechanical Turk (MTurk) (Knemeyer and Naylor 2011; Goodman et al. 2013). Participants were randomly assigned to one of the eight experimental conditions. The age range of the sample was from 19 to 74, with a mean age of 33.9 years, and approximately 50% of the participants were female. The median combined household income was \$40,000 - \$49,999, and about 90.5% reported at least some college education.

Study 3: Dependent variables and manipulation check measures

The dependent variables and manipulation check measures were identical to the ones from Study 1 and Study 2. As a new manipulation check measure for purchase criticality, Study 3 included the 20-item bipolar personal involvement inventory scale (Zaichkowsky 1994).

Study 3: Convergent and discriminant validity assessments

Convergent and discriminant validity of the dependent measures was assessed through confirmatory factor analysis (CFA) using AMOS 22.0 for SPSS. A five-factor model, including satisfaction, timeliness, availability, condition, and equity was estimated. Equity was estimated as a second factor model consisting of three dimensions: distributive, procedural, and interactional equity. The CFA fit statistics support our model (Hu and Bentler 1999): $\chi^2 = 1160.28$, $df = 392$, $CFI = 0.93$, $RMSEA = 0.085$ (90% confidence interval: 0.079; 0.090), and $SRMR=0.042$.

In support of convergent validity the average-variance extracted (AVE) for each factor exceeds 0.5 (Fornell and Larcker 1981). Moreover, all Cronbach's alpha (α) values exceed 0.8 (Nunally and Bernstein 1994). In support of discriminant validity for each pair of factors, the AVE exceeded the phi-square correlation (Φ^2) (Fornell and Larcker 1981). Table 4 provides a summary of the standardized loadings and Cronbach's α .

Table 4: CFA results Study 3

Item	Standardized loading	Cronbach's α
Equity1_distributive	0.98	0.97
Equity2_procedural	0.98	
Equity3_interactional	0.90	
Sat1	0.92	0.96
Sat2	0.95	
Sat3	0.97	
Time1	0.95	0.93
Time2	0.94	
Time3	0.96	
Time4	0.85	
Time5	0.92	
Time6	0.42	
Avail1	0.87	0.95
Avail2	0.93	
Avail3	0.90	
Avail4	0.85	
Avail5	0.87	
Cond1	0.95	0.93
Cond2	0.94	
Cond3	0.91	
Cond4	0.71	

Note: $\chi^2 = 1160.28$, $df = 392$, $CFI = 0.93$, $RMSEA = 0.085$ (90% CI: 0.079; 0.090), $SRMR = 0.042$

Study 3: Manipulation checks

Two-way contingency table analyses were conducted to assess whether participants were aware of their respective experimental conditions (Perdue and Summers 1986; Bachrach and Bendoly 2011). The significant and large effect sizes for convenience and speed (*Cramer's*

$V=0.923$ and 0.949), respectively are in line with prior studies and hence, confirm the validity of our experimental manipulations (Miller 2002). Additionally, a one-way ANOVA was conducted to check whether there is a significant difference between the low and high purchase criticality groups. The results indicate that the high purchase criticality condition leads to higher purchase criticality evaluations ($M_{\text{high_criticality}} = 5.56$) than the low purchase criticality condition ($M_{\text{low_criticality}} = 5.17$) with $F(1,273) = 14.55$, $p < 0.01$, $\eta^2 = 0.05$.

Study 3: Analysis and results

I replicated the analysis of Study 2, to assess whether the predictions in terms of speed and convenience on satisfaction and PDSQ would also hold in a high purchase criticality context. Table 5 and Table 6 summarize the results.

Table 5: PROCESS model 4

Hypothesis	Relationship	Indirect Effect	CI
H3a	S-> Equity-> SAT	1.04	(0.60; 1.50)*
H3a	S-> Equity-> Timeliness	0.84	(0.52; 1.15)*
H3a	S-> Equity-> Availability	0.72	(0.42; 1.04)*
H3a	S-> Equity-> Condition	0.54	(0.33; 0.79)*
H3a	S-> Equity-> PDSQ	0.72	(0.43; 1.00)*
H3b	C-> Equity-> SAT	0.60	(0.21; 1.02)*
H3b	C-> Equity-> Timeliness	0.54	(0.19; 0.93)*
H3b	C-> Equity-> Availability	0.43	(0.15; 0.77)*
H3b	C-> Equity-> Condition	0.33	(0.12; 0.58)*
H3b	C-> Equity-> PDSQ	0.50	(0.16; 0.78)*

Note: * significant since 0 is not included in the 95% Bootstrap confidence interval

Table 6: PROCESS model 8

Hypothesis	Relationship	Level	Cond. Indirect Effect	CI
H3c	S x C-> Equity->SAT	9 days	0.97	(0.36; 1.62)*
H3c	S x C-> Equity->Timeliness	9 days	0.80	(0.25; 1.36)*
H3c	S x C-> Equity->Availability	9 days	0.70	(0.26; 1.29)*
H3c	S x C-> Equity->Condition	9 days	0.51	(0.17; 0.93)*
H3c	S x C-> Equity->PDSQ	9 days	0.69	(0.28; 1.26)*
H3d	S x C-> Equity->SAT	store	1.37	(0.76; 1.97)*
H3d	S x C-> Equity->Timeliness	store	1.13	(0.66; 1.65)*
H3d	S x C-> Equity->Availability	store	0.98	(0.56; 1.56)*
H3d	S x C-> Equity->Condition	store	0.72	(0.43; 1.12)*
H3d	S x C-> Equity->PDSQ	store	0.97	(0.55; 1.39)*

Note: * significant since 0 is not included in the 95% Bootstrap confidence interval

First, I estimated a simple mediation model (PROCESS model 4) with speed as the sole predictor. The results show that equity functions as a mediator between speed and satisfaction (effect size: 1.04, Lower Limit: 0.60 and Upper Limit: 1.50) since 0 is not included in the bootstrap confidence interval. It can be inferred that consumers indicate significantly higher satisfaction levels when the product was delivered the next day vs. in 9 days, due to higher perceived equity which is in line with the findings of Study 2. Similarly, equity also functions as a mediator between speed and timeliness (effect size: 0.84, Lower Limit: 0.52 and Upper Limit: 1.15), availability (effect size: 0.72, Lower Limit: 0.42 and Upper Limit: 1.04), condition (effect size: 0.54, Lower Limit: 0.33 and Upper Limit: 0.79), and overall PDSQ (effect size: 0.72, Lower Limit: 0.43 and Upper Limit: 1.00) indicating that consumers evaluate a retailer's PDSQ significantly higher when the product is delivered the next day vs. in 9 days,

due to higher perceptions of equity. Based on these results, *H3a is supported considering a high purchase criticality context.*

Next, I estimated a simple mediation model with convenience as the sole predictor. Results indicate that equity does mediate the relationship between convenience and satisfaction (effect size: 0.60, Lower Limit: 0.21 and Upper Limit: 1.02), timeliness (effect size: 0.54, Lower Limit: 0.19 and Upper Limit: 0.93), availability (effect size: 0.43, Lower Limit: 0.15 and Upper Limit: 0.77), condition (effect size: 0.33, Lower Limit: 0.12 and Upper Limit: 0.58), and overall PDSQ (effect size: 0.50, Lower Limit: 0.16 and Upper Limit: 0.78) since 0 is not included in both bootstrap confidence intervals. This finding is in line with the predictions but contrary to the findings considering a low purchase criticality context. Thus, *H3b is supported considering a high purchase criticality context.*

Furthermore, I estimated a mediation model with speed and convenience as the two predictors to test H3c and H3d. In line with the predictions, the results indicate that when recovery is slow, equity does function as a mediator. Hence, having the product delivered to a more convenient location does significantly improve post-recovery satisfaction (effect size: 0.97, Lower Limit: 0.36 and Upper Limit: 1.62), timeliness (effect size: 0.80, Lower Limit: 0.25 and Upper Limit: 1.36), availability (effect size: 0.70, Lower Limit: 0.26 and Upper Limit: 1.29), condition (effect size: 0.51, Lower Limit: 0.17 and Upper Limit: 0.93), and overall PDSQ (effect size: 0.69, Lower Limit: 0.28 and Upper Limit: 1.26) due to higher equity perceptions. Thus, *H3c is supported considering a high purchase criticality context. In support of H3d*, the results show that when the product is delivered to a less convenient location (store), having a fast recovery does lead to significantly higher levels of satisfaction (effect size: 1.37, Lower Limit: 0.76 and Upper Limit: 1.97), timeliness (effect size: 1.13, Lower Limit: 0.66 and

Upper Limit: 1.65), availability (effect size: 0.98, Lower Limit: 0.56 and Upper Limit: 1.56), condition (effect size: 0.72, Lower Limit: 0.43 and Upper Limit: 1.11), and overall PDSQ (effect size: 0.97, Lower Limit: 0.55 and Upper Limit: 1.39) due to higher perceptions of equity.

Study 3: Discussion

Study 3 highlights the importance of the shopping context (i.e. purchase criticality) when recovering from a stockout. The results provide insights into the appropriateness of using equity theory to investigate stockout recovery. While in Study 2, which considered a low purchase criticality context, not all findings followed the predictions according to equity theory but when, considering a high purchase criticality context the results were in line with the predictions (Study 3). Thus, equity theory seems to be a better theoretical lens to predict consumer responses to failure recovery when purchase criticality is high. In addition, it seems to be more important to consider recovery attributes as bundles of recovery resources under a high purchase criticality context and its associated higher risk (Smith et al. 1999). While having the product delivered to a more convenient location vs. a less convenient location the data did not evidence significantly improve satisfaction or PDSQ levels when the recovery speed was low considering a low purchase criticality context. However, in a high purchase criticality convenience does have a significant and positive effect on satisfaction and PDSQ levels.

General Discussion and Implications

When considered as a whole, the three studies offer interesting insights especially pertaining to the role that equity plays in affecting post-recovery satisfaction and consumer

evaluations of a retailer's PDSQ. While the findings of this research, in general, indicate that consumers are more likely to have positive post-recovery satisfaction levels and evaluations of a retailer's PDSQ due to higher perceptions of equity after a stockout, this might only apply to specific cases. In Study 2 (low purchase criticality) I showed that, in general, equity mediates the relationship between a fast recovery and satisfaction and consumer perceptions of a retailer's PDSQ. However, in a low purchase criticality context, the data did not indicate convenience would enhance satisfaction levels and perceptions of PDSQ when the recovery is slow, which was contrary to the predictions based on equity theory. This suggests that convenience plays a less important role in affecting post-recovery consumer perceptions in a low purchase criticality context. Also, in a low purchase criticality context and with its associated low risk, simply providing a fast recovery might be evaluated as "fair" enough leading to higher satisfaction levels and perceptions of PDSQ. However, in the case of a high purchase criticality context which is associated with high risk, retailers should invest more effort in the recovery process by considering speed and convenience as a bundle of resources for the recovery process. Taken together the studies provide insights under which conditions equity serves as an important driver and thus, highlights how consumers perceive specific omni-channel fulfillment attributes when utilized to recover from a stockout situation.

Theoretical Implications and Future Research

This research makes several important contributions to the literature (see Table 7 for a summary). This manuscript spans the research areas of operations and marketing by investigating how omni-channel fulfillment operations can impact consumer perceptions. Specifically, through a series of experiments I highlight the importance of a retailer's omni-channel fulfillment operations for service recovery within an omni-channel retail environment.

More precisely, I show how omni-channel fulfillment operations can be used to recover from a stockout situation. Thus, this research specifically contributes to the growing literature stream associated with consumer issues in operations and supply chain management, which stresses the importance of operations management in creating end-consumer value (Flint and Mentzer 2006).

Table 7: Summary of contributions to the literature

Current Literature	Contribution to the Literature
Call for more integrated investigations of managerial processes in both marketing and operations/supply chain management (e.g. Esper et al. 2010; Stank et al. 2012; Jüttner et al. 2007).	Provides insights for stockout recovery situations and highlights the importance of research at the intersection of operations/supply chain management and marketing.
Research investigates behavioral responses to service failures more generally (e.g. Kelley 1993, Roggeveen 2012).	Considers PDSQ as an outcome variable to gain a more comprehensive understanding of how various consumer market segments perceive a retailers omni-channel fulfillment operations in the case of a stockout recovery. Provides a deeper understanding of the role omni-channel fulfillment operations for a service failure recovery.
Consumer response to out-of-stock research has predominantly focused on single channel retailing (e.g. Zinn and Liu 2001, 2008, Peinkofer et al. 2015).	Extends the consumer response to out-of-stock literature by considering the new omni-channel environment.
Equity theory has been shown to be appropriate to study service failure recovery in marketing (e.g. Grewal et al. 2008; Smith et al. 1999; Roggeveen et al. 2012).	Provides evidence for the suitability of equity theory to explore stockout recovery. Identifies a boundary condition of equity theory since the theory is does only explain higher satisfaction and positive evaluations of a retailer's PDSQ for specific "bundles" of recovery attributes.

From a theoretical perspective, I was able to show that equity is the driving force behind restoring post-recovery satisfaction levels and achieving positive consumer perceptions

of a retailer's PDSQ. More specifically, I was able to show that depending on the bundle of recovery attributes and the shopping context, equity might or might not be the driving force impacting consumers' post-recovery evaluations. Consumers are likely to evaluate different recovery strategies as being more or less "fair". Supported by the findings of this research, some recovery strategies do not significantly impact consumers' fairness perceptions and hence, their satisfaction and evaluations of a retailer's PDSQ. For example, I failed to show that equity mediates the relationship between convenience on satisfaction and PDSQ when purchase criticality is low. In addition, purchase criticality may present a boundary condition of equity theory and future research is needed to firmly establish these boundary conditions. For example, future research should explore why equity theory seems to be more appropriate when explaining consumer responses to stockout recovery when the purchase criticality is high. Conversely, research is also needed to better understand why in a low purchase criticality convenience does not have a significant impact on satisfaction levels and PDSQ evaluations.

Additionally, this research contributes to the literature that investigates how consumers respond to stockouts. Historically, this body of work has exclusively focused on exploring consumer responses to stockouts in a single channel setting (e.g. Zinn and Liu 2008; Pizzi and Scarpi 2013). However, with the emergence of omni-channel retailing, firms now have new options in how they handle stockouts. This research extends the current understandings of consumer responses to stockouts by considering supply chain focused psychological variables in an omni-channel retail context. Specifically, by introducing PDSQ as an outcome variable, this study further enhances prior research investigating how consumers evaluate a retailer's PDSQ capabilities to the contextual setting of a stockout recovery.

While considering supply chain-focused psychological variables provides insight into how consumers evaluate an omni-channel retailer's fulfillment operations, it does not provide insights into actual consumer behaviors. Thus, future research should integrate actual consumer behaviors to see how stockout recovery strategies influence other important variables, such as shopping frequency and average money spent on subsequent shopping trips.

Furthermore, this research considered how omni-channel retailers can leverage recovery attributes from a stockout in a brick-and-mortar environment and thus, the findings might not be generalizable to online stockouts. Since stockouts are also likely to occur within the online retail environment, future research should investigate which recovery attributes are most effective to recover from an online stockout. For consumers experiencing a stockout in a brick-and-mortar store a fast recovery seems to be essential in improving satisfaction levels but consumers experiencing an online stockout might prefer different recovery attributes and evaluate a fast recovery as less important since they were already willing to wait for the product to be shipped.

However, this research only considered two different recovery attributes (speed and convenience). Based on prior findings (Forrester Research, Inc. 2014), recovery strategies that rely on shipping products tend to increase costs. This additional cost needs to be considered when developing and implementing a stockout recovery strategy. Therefore, future research should incorporate other important recovery attributes to allow a better assessment of how consumers evaluate an omni-channel retailer's recovery efforts.

In addition, Esper et al. (2003) find that online consumer satisfaction levels might also be impacted by the selection of the 3PL carrier. Hence, future research might also want to

incorporate how brick-and-mortar consumers evaluate a retailers' stockout recovery efforts based on the carrier selection delivering the product.

Managerial Implications

Within the omni-channel retail environment, consumers' expectations around a retailer's omni-channel capabilities are steadily increasing (Forrester Research, Inc. 2014). 45% of consumers indicate that in the case of a stockout they would very likely take advantage of having the unavailable product shipped to their home; however, only 21% indicated that they would be willing to have it shipped to the store (Forrester Research, Inc. 2014). It is important for managers to understand that not all recovery efforts are evaluated by consumers equally and will lead to positive post-recovery satisfaction levels. Managers need to gain an understanding of the recovery attributes that are most valued by their consumers in order to increase consumer satisfaction and evaluations of their PDSQ post-stockout. Thus, manager could use the insights from this research to determine which recovery strategies might be evaluated by their consumers as "fair" to ensure that after a stockout occurs and consumers experience dissatisfaction, satisfaction levels can be improved through offering the appropriate recovery strategy.

Also, Big Data and data analytics play an important role in implementing efficient and effective omni-channel fulfillment operations (Ferguson 2013). For example, Massey's Professional Outfitters was able to improve its efficiency and customer service by consolidating all its data from various channels into one platform (Berthiaume 2015). Managers can now leverage insights from Big Data and predictive analytics to anticipate which consumers are in need (high purchase criticality) or not in need (low purchase criticality) for a product. The tools to make predictions about consumers' purchase are emerging. For example,

Target was able to use consumer buying data to predict whether a female consumer was pregnant (Duhigg 2012). Knowing this type of information enables managers to adjust their stockout recovery strategy based on the consumers' shopping context, ensuring that the "best" recovery strategy is offered and post-recovery satisfaction levels are achieved.

For managers, this research shows that providing a fast stockout recovery is key in achieving higher post-recovery satisfaction levels and consumer perceptions of a retailer's PDSQ. Hence, managers should prioritize their investments and developments in terms of their omni-channel fulfillment capabilities to offer a fast stockout recovery. Omni-channel retailers could develop a ship-from-store program to provide online consumers who experience a stockout with the desired product in a timely manner. For instance, in early 2013, Macy's announced that it would be dedicating an additional 200 stores by the end of the year for the purpose of fulfilling online orders (Ryan 2014). And, in fact, 57% of retailers cite a shorter delivery time to customers as the most important reason for why these retailers would develop a ship-from-store program (Forrester, Inc. 2014).

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V. Conclusion and Future Research

This dissertation investigated and obtained a holistic understanding of the importance and impacts of omni-channel fulfillment operations for successful retail supply chain management. By considering three different echelons in the supply chain (supplier, retailer, and consumer) and employing different methodological approaches each essay by itself provided interesting insights and contributions. However, taken as a whole, several grand findings and contributions of this dissertation to understanding omni-channel fulfillment operations emerged.

In a grand scheme this dissertation provides evidence that across the supply chain the impacts of omni-channel fulfillment operations are mixed but interconnected. While some supply chain members (i.e. retailers and end-consumers) seem to benefit from omni-channel fulfillment operations overall, other supply chain members (i.e. suppliers) seem to be facing significant operational challenges. For example, in essay one, I was able to establish that at least some retailers financially and operationally benefit from omni-channel fulfillment operations, Furthermore, I showed that end-consumers and their individual shopping context also play an important role when investigating omni-channel fulfillment operations and should not be neglected. Specifically, this research revealed that, in the case of a stockout recovery, the perception of “fairness” is a driver of positive consumer evaluations of a retailer’s omni-channel fulfillment capabilities. However, essay two highlights the potential operational challenges that suppliers might experience when establishing omni-channel fulfillment capabilities.

Future research might therefore wish to explore another aspect of omni-channel fulfillment operations which spans across different members of the supply chain to further strengthen the mixed impacts. For example, it would be interesting to uncover how omni-

channel returns management will impact the different supply chain members. While consumers might perceive a retailers omni-channel return capabilities as positive, retailers and suppliers alike might struggle with developing the appropriate processes leading to new tensions and operational challenges in the reverse retail supply chain.

In addition, this research indicates that it is essential for supply chain members to become operationally ambidextrous to succeed in the omni-channel retail environment. This research supports the notion that retailers and suppliers refine already established fulfillment operations while simultaneously establishing new fulfillment operations. In the case of the retailers, I was able to provide evidence that depending on the retail segment, retailers appear to demonstrate positive financial and operational performance outcomes due to being operationally ambidextrous. In a similar vein, suppliers also exhibit operationally ambidextrous tendencies. Within the context of drop-shipping, suppliers will refine existing operational activities while simultaneously developing new drop-shipping operations. Hence, this dissertation provides evidence of the existence and necessity of operational ambidexterity in two different research settings.

This dissertation opens up the dialogue for more exploration of the operational ambidexterity phenomenon. The phenomenon is fairly new in the operations and supply chain management domain and has only received very limited attention. Future research will be necessary to shed even more light on the relationship of operational ambidexterity and performance. Specifically, future research might further investigate its impact on operational performance. While this research introduced operational performance as a new outcome variable, the statistical support was rather weak. Thus, future research might focus on studying when a firm might gain operational efficiencies from becoming operationally ambidextrous

and when not. Thus, specifically longitudinal research designs might be appropriate for future research endeavors.

Building on the previous conversation, this dissertation also highlights that operational ambidexterity and the impacts thereof are more nuanced. For retailers, I was able to identify that the respective retail segments and their associated environmental characteristics play an important role for the potential positive impacts of operational ambidexterity on retail firm performance. Also, the availability of resources appeared to constitute an interesting boundary condition. In addition, from a more internal perspective drop-shipping volume might constitute a boundary condition specifically as it relates to how to manage operational ambidexterity. Hence, environmental factors and other firm characteristics may constitute important boundary conditions and warrant further exploration to gain a better understanding.

It might be interesting to apply this research to other retail specific contexts and even other industries which are characterized by their individual environments. Also, more research is needed to better understand how operational ambidexterity is managed. While this research offers some new insights concerning the debate of structural integration or separation future research might consider additional conditions when it is more beneficial to structurally integrate or separate. This type of extension would allow to uncover additional nuances of the impacts of operational ambidexterity.

Moreover, this dissertation provides a more theoretical understanding of operational ambidexterity. While the limited operational ambidexterity literature has addressed the phenomenon from the perspective of *theory testing*, this dissertation employed an exploratory perspective to contribute to the understanding how operational ambidexterity is reached and managed. Specifically, this dissertation indicates that exploration needs to be “triggered” by an

external event and that exploration eventually turns into exploitation. However, this finding is specific to the context of suppliers and drop-shipping and might differ depending on other contexts or supply chain members. Future research might for example focus on gaining more theoretical insights by focusing on retailers. Retailers are standing under the continuous pressure of meeting end-consumer expectations and hence, might exhibit a different pattern of how to manage operational ambidexterity.

Lastly, this dissertation stresses the importance of how operational activities create value to end-consumers. The literature only recently gained traction on considering the value that operations and supply chain management activities has on end-consumers. This notion will gain even more importance within the omni-channel retail environment, where not only retailers but also suppliers stand in direct contact with end-consumers. In particular, this dissertation highlights how different attributes (speed and convenience) of omni-channel fulfillment operations can lead to positive consumer evaluations in the case of a stockout recovery. Thus, this research contributes to the evolving dialogue on how consumer insights provide valuable insights for retail supply chain strategy.

More research is needed in the future to gain a better and more nuanced understanding of the value that consumer insights offer to retail supply chain strategy. This is especially important considering that supply chains are perceived to be consumer driven. Therefore, future research should explore additional supply chain and operations management activities and how these may create end-consumer value. For example, it might be interesting to investigate how omni-channel return management activities impact consumers.

VI. Appendix



October 2, 2015

MEMORANDUM

TO: Simone Peinkofer
Terry Esper
Brent Williams
Ronn Smith

FROM: Ro ~~Windwalker~~
IRB Coordinator

RE: New Protocol Approval

IRB Protocol #: 15-09-131

Protocol Title: *Drop-Shipping: Omni-Channel Fulfillment Operations*

Review Type: EXEMPT EXPEDITED FULL IRB

Approved Project Period: Start Date: 10/02/2015, Expiration Date: 10/01/2016

Your protocol has been approved by the IRB. Protocols are approved for a maximum period of one year. If you wish to continue the project past the approved project period (see above), you must submit a request, using the form *Continuing Review for IRB Approved Projects*, prior to the expiration date. This form is available from the IRB Coordinator or on the Research Compliance website (<https://vpred.uark.edu/units/rscp/index.php>). As a courtesy, you will be sent a reminder two months in advance of that date. However, failure to receive a reminder does not negate your obligation to make the request in sufficient time for review and approval. Federal regulations prohibit retroactive approval of continuation. Failure to receive approval to continue the project prior to the expiration date will result in Termination of the protocol approval. The IRB Coordinator can give you guidance on submission times.

This protocol has been approved for 40 participants. If you wish to make any modifications in the approved protocol, including enrolling more than this number, 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.



April 17, 2015

MEMORANDUM

TO: Simone Peinkofer
Terry Esper
Brent Williams
Ronn Smith

FROM: Ro ~~Windwalker~~
IRB Coordinator

RE: New Protocol Approval

IRB Protocol #: 15-04-888

Protocol Title: Retail Service Recovery

Review Type: EXEMPT EXPEDITED FULL IRB

Approved Project Period: Start Date: 04/14/2015, Expiration Date: 04/13/2016

Your protocol has been approved by the IRB. Protocols are approved for a maximum period of one year. If you wish to continue the project past the approved project period (see above), you must submit a request, using the form *Continuing Review for IRB Approved Projects*, prior to the expiration date. This form is available from the IRB Coordinator or on the Research Compliance website (<https://vpred.uark.edu/units/rscp/index.php>). As a courtesy, you will be sent a reminder two months in advance of that date. However, failure to receive a reminder does not negate your obligation to make the request in sufficient time for review and approval. Federal regulations prohibit retroactive approval of continuation. Failure to receive approval to continue the project prior to the expiration date will result in Termination of the protocol approval. The IRB Coordinator can give you guidance on submission times.

This protocol has been approved for 2,300 participants. If you wish to make any modifications in the approved protocol, including enrolling more than this number, 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.