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Middle-Range Theorizing on Logistics Customer Service

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Middle-Range Theorizing on Logistics Customer Service

Abstract

Purpose – The purpose of this paper is to illustrate how a systematic application of middle-range theorizing, which pays particular attention to contexts and mechanisms, can be used to extend current knowledge on logistics customer service (LCS) in a number of critical areas.

Design/methodology/approach – The paper applies Stank *et al.*'s (2017) framework for middle-ranging theorizing in logistics to develop a research framework and agenda that can guide future LCS research. Results are generated through a review of the LCS literature and an application of the main concepts of middle-range theorizing.

Findings – The paper outlines opportunities for middle-range research that would extend LCS knowledge in the areas of (1) human and behavioral factors, (2) time-based competition, (3) supply chain complexity, and (4) digitization and technological innovation.

Research limitations/implications – Describing the main characteristics of middle-range theorizing and how middle-range theorizing can be fruitfully applied to LCS research should help to stimulate new knowledge creation in this important area of supply chain logistics management.

Practical implications – By focusing on *why* and *when* questions, middle-range theorizing engages with the practical realities of LCS that interest managers and students. Middle-range theorizing moves researchers toward developing a detailed understanding of what actually has to change in order for desired LCS-related outcomes to occur and the contextual factors likely impacting the change process. The paper should therefore allow managers to better translate LCS theory into action.

Originality/value – Middle-range theorizing remains new to the supply chain logistics field. The application of middle-range theorizing to LCS research, and logistics research more generally, demands new perspectives on established relationships with the potential to drive original research in areas most relevant to managers.

Keywords Logistics customer service, Middle-range theory, Behavioral logistics, Time-based competition, Supply chain complexity, Supply chain digitization

Paper type Conceptual paper

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Introduction

Logistics customer service (LCS) stands as one of the central themes of supply chain logistics management, with a substantial body of literature supporting LCS's impact on business performance (Leuschner *et al.*, 2013). Yet research on this important topic is in no way exhausted. Amazon's disruptive move into logistics services is just one recent example of how dynamic the LCS space remains (Schreiber, 2016). Indeed, understanding the specifics of how and why LCS works, and under what circumstances desired outcomes are likely to occur, is increasingly important for success in today's complex supply chain environment (Cassidy, 2017). Generating this type of knowledge requires a new approach to LCS research that moves beyond generalizable correlations between variables to focus on specific contexts and mechanisms that drive results. Middle-range theorizing offers such an approach (Merton, 1968).

Middle-range theorizing builds on accumulated evidence within a field of study to generate a contextually specific understanding of a limited set of phenomena (Merton, 1968). Researchers in strategy (Hult *et al.*, 2006), operations (Tenhiälä and Ketokivi, 2012), and marketing (Brodie and de Chernatony, 2009) have increasingly emphasized a middle-range approach to investigating business questions. Driving this trend is a demand for business theory that is grounded in observable realities and applicable to solving real-world problems (Fawcett and Waller, 2011). As Ketokivi (2006) noted, "middle-range theorizing [is] the appropriate way of developing managerially relevant theories, because application always occurs in a specific context" (217). Recently, interest in middle-range theorizing has begun to grow among supply chain and logistics researchers (Craighead *et al.*, 2016; Stank *et al.*, 2017), providing new opportunities for scholars.

The purpose of this research is to illustrate how a systematic application of middle-range theorizing can be used to extend current knowledge on LCS in four critical areas: (1) human and behavioral factors, (2) time-based competition, (3) supply chain complexity, and (4) digitization and technological innovation. To that end, the paper applies Stank *et al.*'s (2017) framework for middle-ranging theorizing in logistics to develop a research model and agenda to guide future research on LCS. The paper illustrates how researchers can add much-needed detail to LCS theory by focusing on the specific mechanisms that link LCS-related antecedents and outcomes, and contextual factors that impact the process through which outcomes are generated. The result is an agenda for middle-range theorizing that offers numerous opportunities for revitalizing research in the LCS arena.

Middle-Range Theorizing

Theory is centrally concerned with causation (Whetten, 1989): what are the relevant phenomena and how are these phenomena ordered as antecedents and outcomes? Theory is also concerned with the causal processes: why are phenomena linked and when do these linkages produce outcomes? (Whetten, 1989). Good theory is critical, not only for researchers, but also for managers (Christensen and Raynor, 2003). By answering questions of causal order, theory gives managers a basis for predicting outcomes, making theory integral to business planning. By describing causal processes, theory gets below the correlations among events to a deeper, more nuanced understanding of why particular outcomes occur in a given setting. This deeper, more contextualized understanding of the mechanisms linking specific events lets managers judge the meaning and importance of those events for their organization (Christensen and Raynor, 2003).

The managerial relevance of theory hinges on addressing both questions of causal order and causal processes (Christensen and Raynor, 2003). Over the past several decades, research on LCS has been largely focused on addressing causal order questions. By adopting general theoretical frames from more mature fields, researchers have successfully defined many of LCS's major concepts and identified their primary antecedents and outcomes (Defee *et al.*, 2010). However, such general theoretical frames (e.g., resource-based theory, transaction cost economics, contingency theory) define concepts and relationships at a high level of abstraction and therefore provide only the most general logic for why phenomena occur (Hunt, 1983). As a result, LCS research has tended to produce “black box” models, that is $x \rightarrow y$ models that demonstrate an antecedent is associated with an outcome but provide limited insight into the complex causal processes that link logistics phenomena with specific outcomes (Pawson and Tilley, 1997). By applying a rigorous process of middle-range theorizing to LCS, researchers can build on what is already *known* about LCS phenomena and their antecedents and outcomes, so as to explore what is *unknown* about the specific mechanisms and contexts that actuality drive particular results.

In contrast to the dominant research emphasis on highly generalizable theory and correlations, middle-range theorizing is focused on the specifics of *why* constructs are related and *under what conditions outcomes occur*. As described by Stank *et al.* (2017), middle-range theorizing uses a realist framework of *mechanism + context = outcomes* to illuminate the “black box” represented by the arrow in traditional $x \rightarrow y$ models. To that end, constructs are conceptualized in terms of their potential for change, causal mechanisms linking constructs are described in detail, and specific contexts or boundary conditions that enable (or inhibit) outcomes are identified (Pawson and Tilley, 1997; Busse *et al.*, 2017). This explicit focus on the operation of mechanisms in a context means that generalizability is limited by design. In other words,

middle-range theorizing incorporates a level of specificity that restricts the analysis of causal connections to a subset of phenomena operating within a given context (Merton, 1968). For instance, middle-range theorizing would focus on *logistics* customer service, rather than customer service more broadly, and aim at understanding the specific contexts and mechanisms *within the logistics domain* that drive relevant outcomes (Stank *et al.*, 2017). Table I and Figure 1 summarize the defining characteristics and the general process of middle-range theorizing, respectively.

---Insert Table I Here---

---Insert Figure 1 Here---

As depicted in Figure 1, the formulation of middle-range theories begins with empirical evidence that has accumulated about a phenomenon within a specific discipline (Moore *et al.*, 1980). Such evidence may have come from research that was originally motivated by general theoretical frameworks, but may also have come from more inductive observations of practice. In either case, middle-range theorizing differs from general theory by consolidating the empirical regularities that a community of researchers have established within their field into theoretical propositions that reflect the established body of evidence. Typically, this consolidation process revolves around established regularities that represent “core” or “central” tenets of a discipline (Stank *et al.*, 2017). Additional explanation of these established regularities in terms of more general theory is unnecessary for middle-range theorizing. Instead, the researcher moves directly from empirically derived propositions into new research that deepens contextual understanding of phenomena (Stank *et al.*, 2017). Essentially, middle-range theories are deeply embedded in disciplinary knowledge, lying between day-to-day working hypotheses and all-inclusive general theories (Merton, 1968).

Consolidating What We Know About Logistics Customer Service

LCS represents a “core” concept in supply chain logistics management, with decades of accumulated evidence on related antecedents and outcomes, making LCS a topic ripe for middle-range theorizing. Yet despite LCS’s importance for the field, there have been relatively few integrative reviews that systematically consolidate the empirical evidence related to LCS (Mentzer *et al.*, 1989; Yazdanparast *et al.*, 2010; Leuschner *et al.*, 2013). Moreover, such reviews have tended to focus on the outcomes of LCS (e.g., customer satisfaction or firm financial performance), with relatively little attention paid to logistics capabilities that enable service provision, or potential boundary conditions that may affect antecedent and consequent relationships. Middle-range theorizing can help to clarify LCS’s nomological network by consolidating empirical findings into a set of theoretical relationships that can serve as a framework for new research. Once this set of empirical relationships has been described, research can shift from general theoretical explanations of correlated phenomena to probing *why* and *when* these relationships operate within different contexts (Stank *et al.*, 2017). Thus, as a starting point, we summarize some of the most well-researched relationships in the LCS literature. Figure 2 depicts these relationships.

---Insert Figure 2 Here---

Logistics Customer Service

At a high level, LCS represents the ability to define relevant logistics value for specific market segments and then manage the tradeoffs between resource utilization and service provision to most profitably deliver that value (Stank *et al.*, 2012). Research suggests that LCS can be defined in terms of an organization’s ability to act along four primary dimensions: service quality, operational flexibility, innovativeness, and resource utilization (Yang and Lirn, 2017). LCS’s service quality dimension is rooted in traditional views of creating customer utility through the Seven R’s (Coyle

et al., 1992), while also incorporating aspects of personnel contact quality and information quality (Mentzer *et al.*, 2001). Operational flexibility refers to the extent to which a firm can quickly and effectively accommodate changes in customer requirements (Zhang *et al.*, 2005; Hartmann and De Grahl, 2011). The innovativeness dimension taps the extent to which a firm generates perspectives, practices, or offerings that are perceived as new and valuable to customers (Flint *et al.*, 2005; Wallenburg, 2009). Finally, resource utilization taps the extent to which logistics operations efficiently employ resources so as to maintain the profitability of customer relationships (Tracey, 1998; Yang and Lirn, 2017). Each of these dimensions adds a unique element of value for customers, and when combined, represent a system of strategic decision-making and action that enable a firm's logistics operations to act as a compelling marketplace force (Mentzer *et al.*, 2001).

Enabling Capabilities

To effectively carry out LCS activities, a firm must have or develop a number of enabling capabilities. First, firms must be able to generate a nuanced view of their market through customer segmentation (Mentzer *et al.*, 2004b). Doing so allows organizations to tailor logistics service offerings to best meet the relevant value needs of customers (Sharma and Lambert, 1990; Eckert and Goldsby, 1997). Second, firms must have the ability to build strong external relationships with customers as well as integrate the flow of goods and services internally across their own operations (Gimenez and Ventura, 2005). External customer integration allows firms to stay attuned to customer preferences and constraints, while internal integration improves the ability of firms to efficiently provide services that support customers' strategic objectives (Ellinger *et al.*, 1997; Zhao *et al.*, 2001). A third enabling capability involves the ability to manage the flow of information needed to execute logistics service operations (Speier *et al.*, 2008). Such an information management capability supports internal/external integration (Vickery *et al.*, 2003), while

enabling a number of critical service components including operational flexibility (Zhang *et al.*, 2006) and innovativeness (Hazen and Byrd, 2012). Finally, a firm must have the capability to define and measure relevant performance metrics, not only to monitor current performance but also to drive continuous improvement in their logistics operations (Fawcett and Cooper, 1998; Brewer and Speh, 2000; Gunasekaran *et al.*, 2004; Griffis *et al.*, 2007). Taken together, these more general capabilities enable a firm to appropriately manage the specific tradeoffs involved in delivering relevant logistics value to customers of choice. They therefore act as the practical antecedents to LCS activities.

Outcomes

A substantial amount of empirical research has been devoted to establishing outcomes related to LCS (Leuschner *et al.*, 2013). These outcomes can be divided into three broad categories of efficiency, effectiveness, and differentiation (Fugate *et al.*, 2010). With regard to efficiency, managing logistics operations so as to consistently deliver relevant value to customers of choice generates a number of cost savings. Visibility into customer needs lowers inventory costs through reductions in safety stock, obsolescence, insurance, and facility costs. Transportation costs are reduced due to fewer expedited and/or inaccurate shipments, and fewer returns. A focus on customer service also drives firms toward longer-term relationships with trading partners, which tend to lower operating costs over time (Holcomb, 1994; Heikkila, 2002; Mentzer *et al.*, 2004a). With regard to effectiveness, a substantial body of evidence supports the conclusion that LCS generates customer value. In particular, studies have established LCS as an important driver of customer satisfaction (Leuschner *et al.*, 2013). Finally, LCS serves as an important differentiator, generating customer loyalty (Wallenburg, 2009), referrals (Knemeyer *et al.*, 2003; Hartmann and De Grahl, 2011) and ultimately market share (Daugherty *et al.*, 1998; Stank *et al.*, 2003). Taken

together, the mix of efficiency, effectiveness, and differentiation gains from LCS is understood to improve firm profitability (O’Leary-Kelly and Flores, 2002; Vickery *et al.*, 2003).

Figure 2 presents an empirically based framework that consolidates established relationships in the LCS body of knowledge. Developing such a model is the starting point for middle-range theorizing. The next step is to pose and test interesting answers to why and when relationships hold.

Opportunities for Middle-Range Theorizing on LCS

As Figure 2 illustrates, dramatic “white spaces” still dominate the links between major LCS variables. Moreover, little is known about the impact of context on key relationships. Ultimately, this means that managers are left without the detailed knowledge they need to confidently take action and achieve desired results. Middle-range research can help fill in the missing puzzle pieces, allowing logistics theories to be translated into meaningful application.

Supply chain logistics remains a fast-evolving field and the need to deepen theoretical knowledge of key LCS relationships is particularly important in areas of the field experiencing the most rapid change (Stank *et al.*, 2015). In particular, logistics managers are under intense pressure to achieve high levels of LCS in the face of four key trends: (1) the increasing importance of understanding human and behavioral factors, (2) time-based competition and time pressure, (3) increasing supply chain complexity, and (4) rapid digitization and technological innovation (Stank *et al.*, 2015; Wieland *et al.*, 2016). To succeed in this dynamic environment, logistics managers must understand why and when factors in each of these areas impact LCS. The following section first discusses the central ideas of mechanisms and context in middle-range theorizing and then

highlights middle-range research opportunities related to the four key trends above. The aim is to move research toward developing LCS theory that managers can translate into action.

Mechanisms and Contexts

Explicit theorizing about the operation of mechanisms and contexts is a critical aspect of middle-range theorizing. Mechanisms are the underlying social and psychological processes that explain how and why initiatives bring about desired change (Pawson and Tilley, 1997). In the case of LCS, the basic mechanism linking activities and outcomes is a process whereby organizational actors integrate demand- and supply-side insights to develop a shared understanding of the capabilities, constraints, and opportunities that define the organization's response to the business environment (Esper *et al.*, 2010; Oliva and Watson, 2011). Within this broad process of developing an organizational response to the business environment, more specific causal mechanisms that link particular LCS phenomena can (and should) be theorized and tested.

For instance, the mechanism that links an organization's ability to integrate with external customers to the provision of high levels of LCS may be the perceived value of the customer relationship, coupled with the opportunity to act on that perceived value. Indeed, Enz and Lambert (2015) described just such a process. Their research reported on a manufacturing company with two key customers, A and B. The manufacturer had been able to establish a close collaborative relationship with A but not B, despite similarities across the two customers. In an effort to understand why, the manufacturer undertook a comprehensive review of the relationships, focusing particularly on the profit contribution of each. Initial perceptions were that the relationship with A was more valuable, leading to substantial investments in joint projects. However, perceptions changed as analysis of revenue and cost factors revealed that the relationship with B was three times as profitable. Managers' earlier view that the relationship with B was

simply about meeting customer specifications gave way to a new focus on initiatives that could create additional value for B. As a result, the relationship with B deepened, generating increased sales. Here the mechanism linking the manufacturer's integration capability to the actual provision of high levels of LCS was managers' perceptions, which began to change in the review process.

Middle-range theorizing also emphasizes that all decisions and actions occur within a context (Denyer *et al.*, 2008). In the case of LCS, context typically refers to those internal organizational factors or external environmental factors that enable/inhibit the translation of antecedent capabilities into superior logistics service and on into various outcomes. Organizational factors may include a company's strategic orientation, competitive strategies, or design features, while environmental factors may include customer industry, supply chain geography, or environmental uncertainty. Each of these factors creates a context within which logistics activities occur and can serve to either inhibit or enable specific LCS-related mechanisms.

As an example of an environmental factor, research by Rodrigue (2012) highlighted the role that geography plays in LCS. The research looked at global customer supply chains organized around geographies of production, transportation, or consumption. 3PLs differentiated themselves by facilitating operations at critical junctures within these supply chains, with different geographies creating opportunities and barriers for logistical services. Customers' supply chain geography therefore acted as a context that enabled or inhibited a 3PL's ability to translate LCS into a competitive advantage. A 3PL with strong capabilities in facilitating border and customs-related procedures could provide high levels of LCS (service quality, operational flexibility, innovativeness, resource utilization). However, that same 3PL could still struggle to differentiate itself from competitors if their customer's supply chain is primarily organized around a geography of consumption that prioritizes services such as daily store restocking. In this case, as exemplified

in Figure 3, the customer's supply chain geography (context) would inhibit the ability of the 3PL to facilitate effective operations at a critical supply chain juncture (mechanism) and thereby achieve competitive differentiation (outcome). Supply chain researchers have identified numerous potential contexts affecting LCS, often within the framework of contingency theory (Stonebraker and Afifi, 2004). This prior research can serve as an important starting point for middle-range theorizing on why and when these contexts make a difference to the operation of specific mechanisms associated with LCS.

---Insert Figure 3 Here---

Theorizing about mechanism and contexts represents the next step in LCS theory development. To this point, researchers have focused largely on correlating the attributes of LCS with outcomes based on general theoretical logic. The time has come for researchers to develop and test detailed narratives that provide a deep understanding of the causal processes linking these correlated antecedents and outcomes (Christensen and Raynor, 2003). Middle-range theorizing suggests new ways of looking at relationships that may seem almost "common sense" at this point in the logistics discipline's knowledge production. An established relationship between LCS and firm profitability (Vickery *et al.*, 2003; Green Jr *et al.*, 2008), for example, provides fodder for middle-range theorizing, by posing questions such as: If LCS boosts profits for an "average" company, why does LCS *not boost profits* for other companies? And, more relevantly for managers, when will LCS boost profits *for their company*? To provide guidance on these questions, middle-range theorizing must offer a detailed account of underlying mechanisms and the contexts that enable these mechanisms to operate successfully.

Human and Behavioral Factors

Maintaining relationships with partners, customers, and employees is critical for long-term logistics success (Knemeyer and Murphy, 2004). As a result, understanding the impact that human and behavioral factors have on logistics operations at both the individual and group level has become increasingly important for managers (Schorsch *et al.*, 2017). Middle-range theorizing that addresses questions of why and when effective decision-making and action occur among individuals and groups would substantially expand understanding of LCS in this area.

At an individual level, talent management continues to gain recognition as a critical, but largely unexplored, mechanism for translating logistics capabilities into superior service (Gammelgaard and Larson, 2001; Myers *et al.*, 2004). But despite researchers having suggested some broad requirements in terms of knowledge, skills, and abilities (KSA), there is little direction as to when certain skill sets are most salient or how organizations should manage their talent pipeline (Murphy and Poist, 2007; Derwik *et al.*, 2016). Researchers must begin filling in these “white spaces” through middle-range theorizing based on available frameworks. Keller and Ozment (2009), for example, provide an integrated model of for recruiting, developing, supervising, and retaining high quality logistics personnel based on an extensive literature review. Researchers must test this, and similar, models. Working on the basic premise that talent management represents a critical mechanism for translating organizational capabilities into superior logistics service, researchers should build a contextual understanding of specific steps companies must take to ensure they have the right employees to succeed.

At a group level, behavioral norms create the social context within which logistics decision-making and action occur. Organizational psychology has produced a rich stream of literature on the impact of workplace behaviors on individual and group dynamics, which scholars have begun to apply to supply chain phenomena (Ketchen and Giunipero, 2004; Cousins *et al.*,

2006; Esper *et al.*, 2015). Researchers must accelerate this work. LCS initiatives, by their very nature, engage groups of people with various skills and organizational responsibilities and involve processes that are ongoing and evolving. The success or failure of LCS initiatives may well depend on the interpersonal and group contexts in which they are undertaken. Digging more deeply into how social contexts enable or inhibit LCS would provide vital insight into the norms organizations should foster to maximize logistics success.

Time-Based Competition & Time Pressure

Time-based competition has long been suggested as a potential mechanism for translating LCS into customer value (Stalk, 1990). Researchers have explored some of the basic means through which companies can enhance logistical speed (Gunasekaran *et al.*, 2008; Richey *et al.*, 2012), but there remains a lack of evidence on how companies should go about creating specific types of time-based logistical value for customers and when such time-based strategies would be most salient. To fill this gap, middle-range theorizing must explore how and why logistical speed supports customer needs with regard to factors such as product lifecycle, inventory requirements, and demand volatility. Potential trade-offs must also be considered. Blackburn (2012), for instance, quantifies the limits to time-based competition in make-to-stock supply chains for functional products, and suggests ways for companies to consider the trade-off between reduced production costs and longer lead times. This type of detailed exploration of the costs and benefits of time-based competition provides valuable insight for managers operating under identified conditions.

Approached somewhat differently, research also suggests that time pressure has important relational consequences (Thomas, 2008). For instance, evidence suggests that time pressure erodes knowledge sharing in collaborative relationships, particularly when service providers begin to

adopt risk averse strategies to cope. A firm's ability to develop creative risk sharing solutions may therefore be most salient for customers when collaborative relationships come under strain from time constraints (Thomas *et al.*, 2010; Thomas *et al.*, 2011). Middle-range theorizing enables researchers to build on these types of results by prompting questions that probe thresholds and specific interventions. For instance, at what level of time pressure (when) do customers begin valuing risk sharing over other aspects of a relationship, such as product or service availability? Are there mechanisms for mitigating time pressure, such as improving order cycle times, that could help suppliers meet customer needs while managing risk? Research that addresses such questions would significantly deepen managerial understanding of what might work for whom, when, as pertains to effects of time pressure on LCS.

Supply Chain Complexity

Managers face the challenges of supply chain complexity every day (Simafore, 2011). Christopher (2016), for example, identifies eight types of supply chain complexity related to networks, internal/external processes, range of products and/or services, product design, customers, suppliers, organizational design, and information. Still, little is known about managing the innumerable linkages across the chain that go into creating customer value (Handfield *et al.*, 2013). Middle-range theorizing that addresses mechanisms and contexts can be used to start developing actionable, evidence-based guidance on a range of pressing topics related to complexity. As a start, researchers must test the extent to which complexity acts as a contextual factor that impacts the salience of LCS efforts in well-established areas of service quality, operational flexibility, innovativeness, and resource utilization. Doing so requires searching for clues in literature, such as evidence from Wallenburg (2009) that proactive customer engagement by logistics providers has greater salience for those customers that buy more complex logistical services. Researchers

must also consider potential mechanisms. For instance, initiatives aimed at reducing complexity could be viewed as mechanisms for achieving goals related to efficiency, effectiveness, or differentiation (Christopher, 2016). But which types of initiatives should be undertaken? And when would those initiatives be most effective? Again, researchers must search for clues in the literature, such as recent work on modular logistical services (Lin and Pekkarinen, 2011), to begin answering the *whys* and *whens* implied by such questions.

One example of the potential for middle-range theorizing to fruitfully incorporate issues of complexity lies in the realm of reverse logistics (Bernon *et al.*, 2011; Genchev *et al.*, 2011). Reverse flows have numerous characteristics that distinguish them from traditional supply chain flows while also being subject to contextual factors that impact the salience of reverse logistical services (Autry *et al.*, 2001). The result is added complexity for managers seeking to balance customer demands with other business goals (Mollenkopf *et al.*, 2011). LCS research must explore how managers can deal with this added complexity, as reverse logistics are often a critical determinant in logistical success (Jayaraman and Luo, 2007; Wang *et al.*, 2017). Middle-range research is needed to provide granular insights into these issues, as well as a host of other issues at the intersection of LCS and complexity, including how companies view customer risk, how companies incorporate big data analytics, and even how companies train employees to make decisions under complex, equivocal conditions.

Digitization & the Technological Environment

The lack of explanatory power offered by recent logistics research is most evident in areas affected by rapid digitization and technological change. From automated analytics that drive additive manufacturing processes to continuous replenishment based on an internet of things, the pace and scope of digital and technological change challenges many longstanding ideas about LCS. Indeed,

the emergence of a logistics ecosystem, built on integrated technologies and fueled by digital information flows, is already giving customers and providers unprecedented visibility into dynamic market signals, revolutionizing logistics planning and execution (Transvoyant, 2017). These changes are forcing firms to rethink traditional notions of logistics service quality, operational flexibility, innovativeness, and resource efficiency. Research employing general theoretical frames to correlate traditional attributes of logistics management with customer outcomes will inevitably miss the deeper shifts in how companies achieve LCS in the context of the current digital revolution.

Digitization means leveraging information capturing and processing capabilities to redefine an organization's value creation process and the human-technology interactions that underlie that process (Cecere, 2017). Academic coverage of digitization in logistics and supply chain management has focused largely on technical issues related to process engineering and information technology (e.g., Brettel *et al.*, 2014). Practitioner outlets, meanwhile, continue to raise questions about the potential strategic implications of disruptive digital change (e.g., CSCMP's Supply Chain Quarterly, 2017). For the most part, though, neither the academic nor practitioner literature has advanced substantive narratives about the specific steps companies need to make in order to succeed in a digital environment.

Still, the importance of digitization has led to a considerable accumulation of white papers, case studies, consultative research projects, and industry reporting that provide valuable supply chain-specific observations of practice. These observations should serve as the grounding for middle-range theorizing on the possible impacts of digitization on LCS. Logistics researchers can begin making sense of these observations by applying existing digitization frameworks to explore in detail *why* and *when* specific digital practices may enhance LCS. For example, Siemens (2017)

identifies six dimensions of digitization (see Table 2) that logistics researchers can use to delve into the details of how companies can best utilize rapidly evolving technologies to provide tailored LCS solutions in a digital environment.

The dimensions identified in Table 2, coupled with existing clues from the literature and supply chain-specific observations of practice, can serve to guide theorizing on a range of LCS topics. For example, how does increased digitization affect logistics consumer and service segmentation and the impact of segmentation decisions on dimensions of performance (Ngai *et al.*, 2009)? How will crowdsourcing and sharing economy solutions impact the relationship between transportation mode, cost structures, and delivery service (Mladenow *et al.*, 2016)? How will 3D printing/additive manufacturing alter the relationship between form, time and place value fulfillment and segmented LCS strategy and design (Sasson and Johnson, 2016)? When does information quality about a product and/or a process become more valuable to a customer than form, time and place value (Kärkkäinen and Holmström, 2002)? The implications emerging from this shift are endless, as are the potential streams of impactful research.

Additional Considerations on Data Collection & Analysis

Some additional remarks with regard to data collection and analysis are offered here to guide researchers as they begin to explore the opportunities outlined above. Middle-range theorizing tends to incorporate more complex, non-linear relationships, which has implications for data collection and analysis. Data must allow researchers to adjudicate among various context-mechanism permutations and their outcomes (Pawson and Tilley, 1997). Although there seems to be no restriction on the type of data required – process, longitudinal, case study, and survey data have all been identified as appropriate – one qualification may be that data should be, if not empirical themselves, at least deeply rooted in empirical realities (Eisenhardt, 1989; Langley,

1999; Brodie *et al.*, 2011). Regardless of data source, the literature suggests three main ways to collect and analyze data so as to yield insights into context-mechanism-outcome combinations. The first is to collect and analyze only data related to the restricted set of phenomena under investigation; the second is to develop taxonomies of individuals, groups, or organizations; the third is to combine the first two approaches by testing specific propositions for subgroups (Pinder and Moore, 1979).

Thinking more specifically about the kind of empirical study using survey data that dominates supply chain logistics research, two suggestions could be offered. First, if the research is designed in the tradition of (frequentist) null hypothesis testing, context-mechanism-outcome combinations might be fruitfully modeled in terms of mediation and moderation effects. Advances in conditional process analysis allow for robust – yet easily employable – analysis of these types of relationships, as well as more complex relationships such as moderated mediation (Hayes, 2013). Researchers might therefore consider using conditional process analysis in testing multiple context-mechanism-outcome combinations and comparing results. Second, given that middle-range theorizing is focused on the likelihood that some action will result in a specified outcome under a set of conditions, Bayesian reasoning in statistical analysis might be highly relevant. Bayesian reasoning focuses attention on the probability of an event given previous belief about the likelihood of that event. Bayesian reasoning therefore seems to fit well with a middle-range approach that theorizes from prior empirical evidence, while focusing attention on the likelihood of deviations from observed regularities (Howson and Urbach, 2006). Bayesian reasoning also highlights the process of updating beliefs about the likelihood of an outcome in light of additional evidence, which fits well with middle-range theorizing's goal of continually refining our understanding of empirical relationships.

Finally, inductive research is also fully compatible with middle-range theorizing. Indeed, perhaps the most well-known inductive method in supply chain logistics, grounded theory, specifically aims to generate theories at the middle range (Glaser and Strauss, 1967; Bourgeois, 1979). Flint *et al.* (2005), for example, undertook inductive research that developed a middle-range theory around LCS innovation (LCS-I). This research has been central to the ongoing development of a middle-range theory linking LCS-I to customer and market performance (Wagner, 2008; Grawe, 2009; Wallenburg, 2009).

Conclusion

Middle-range theorizing offers an exciting opportunity to revitalize research in the area of LCS. By emphasizing the details of how logistics value is actually created in a given context, middle-range theorizing promotes a wide range of research aims. Where evidence is limited, middle-range theorizing drives basic research, such as grounded theory development, that is rooted in engagement with practice. Where evidence is abundant, middle-range theorizing drives synthesizing research – such as meta-analyses, systematic literature reviews, or Delphi surveys – that identifies established relationships. Where empirical regularities have been clearly established, middle-range research drives theory testing and extension that deepens understanding of known relationships. And finally, middle-range theorizing also drives methodological research, such as construct development research that seeks to ensure LCS variables are measured as they manifest in a supply chain logistics context. Over time, middle-range theorizing should result in an established framework of widely accepted concepts and relationships related to LCS, reducing the need for subsequent researchers to reiterate what is known, and freeing them instead to push into the boundaries of what is unknown.

Most importantly, though, by unpacking why and when empirical regularities occur, middle-range theorizing has the potential to drive a substantial increase in practical knowledge on LCS. From pick-and-pack automation to the Uber-ization of last mile delivery, companies are under intense pressure to deliver high levels of LCS while responding to disruptive changes that affect the people, processes, and technologies that create customers value. Any real-world effort to improve performance through LCS requires an understanding of what actually has to change in order for that improvement to occur as well as the contextual factors likely impacting the change process. This is precisely the kind of understanding middle-range theorizing seeks to generate. By focusing on why and when questions middle-range theorizing engages with the practical realities that interest managers and students (Lambert and Enz, 2015). Moreover, research that is deeply embedded in the specifics of supply chain logistics should improve scholars' ability to interact with practitioners when disseminating knowledge, soliciting feedback, and thinking about future work (Mentzer and Schumann, 2006). Ultimately, middle-range theorizing should produce relevant research in the best traditions of the discipline, that is research that "accurately and confidently describes the world around us, explains how key relationships work, prescribes appropriate strategy and behavior, and sets the stage for further inquiry" (Fawcett and Waller, 2011, p. 5).

Figure 1. A realist approach to middle-range theorizing

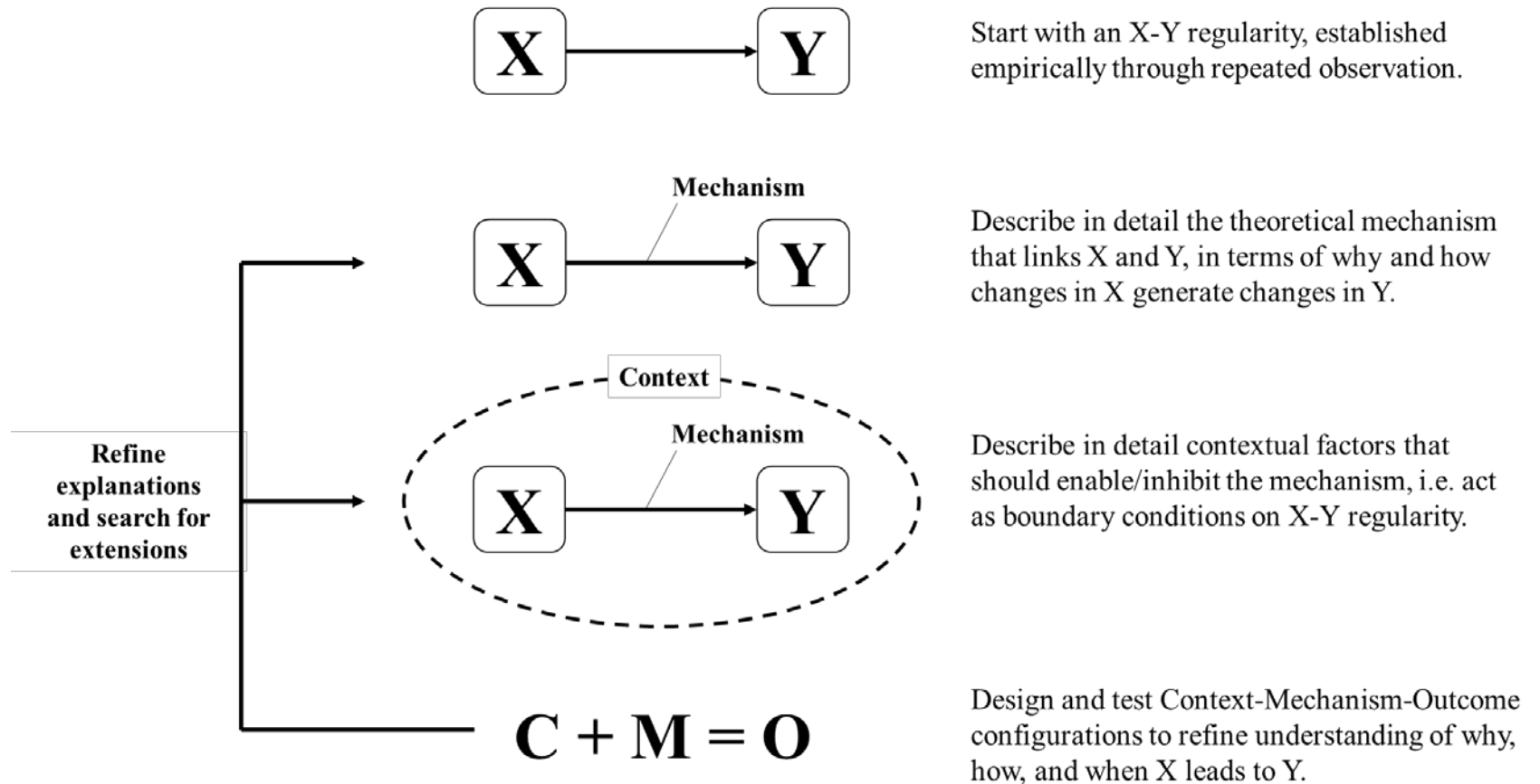


Figure 2. Middle-range theoretical framework for logistics customer service

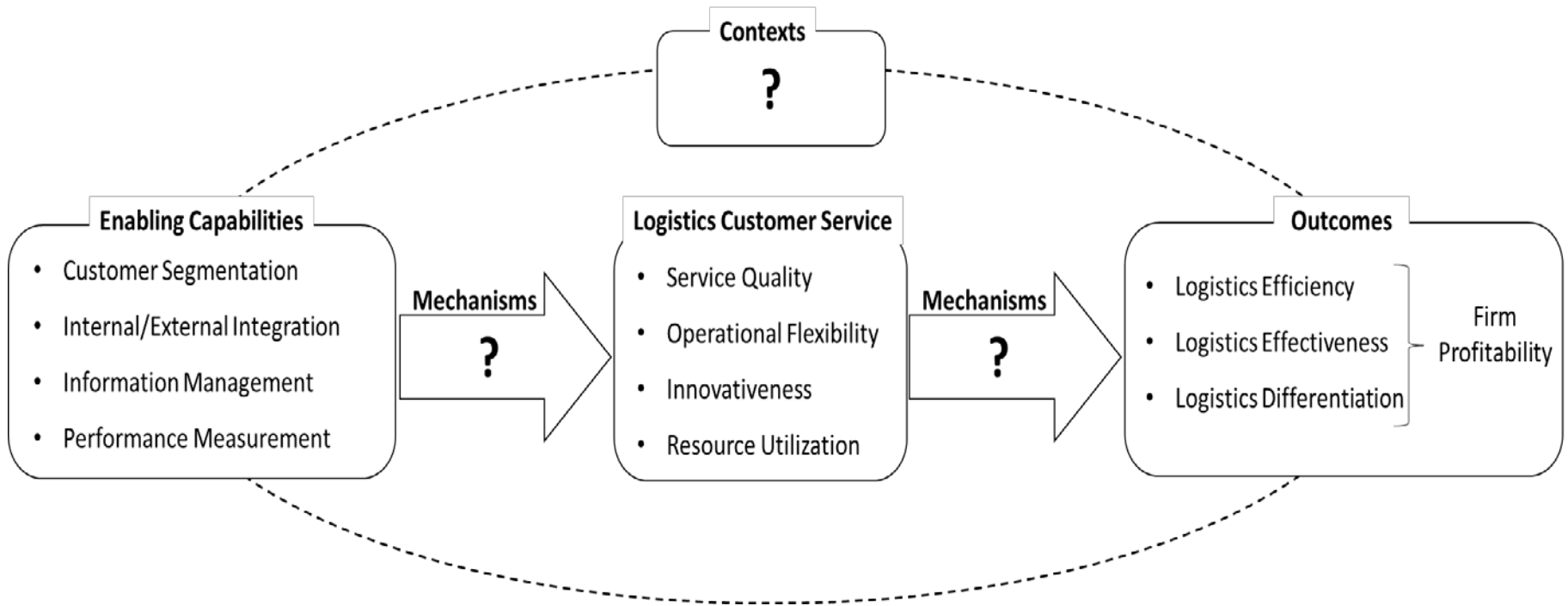


Figure 3. Example of middle-range theorizing

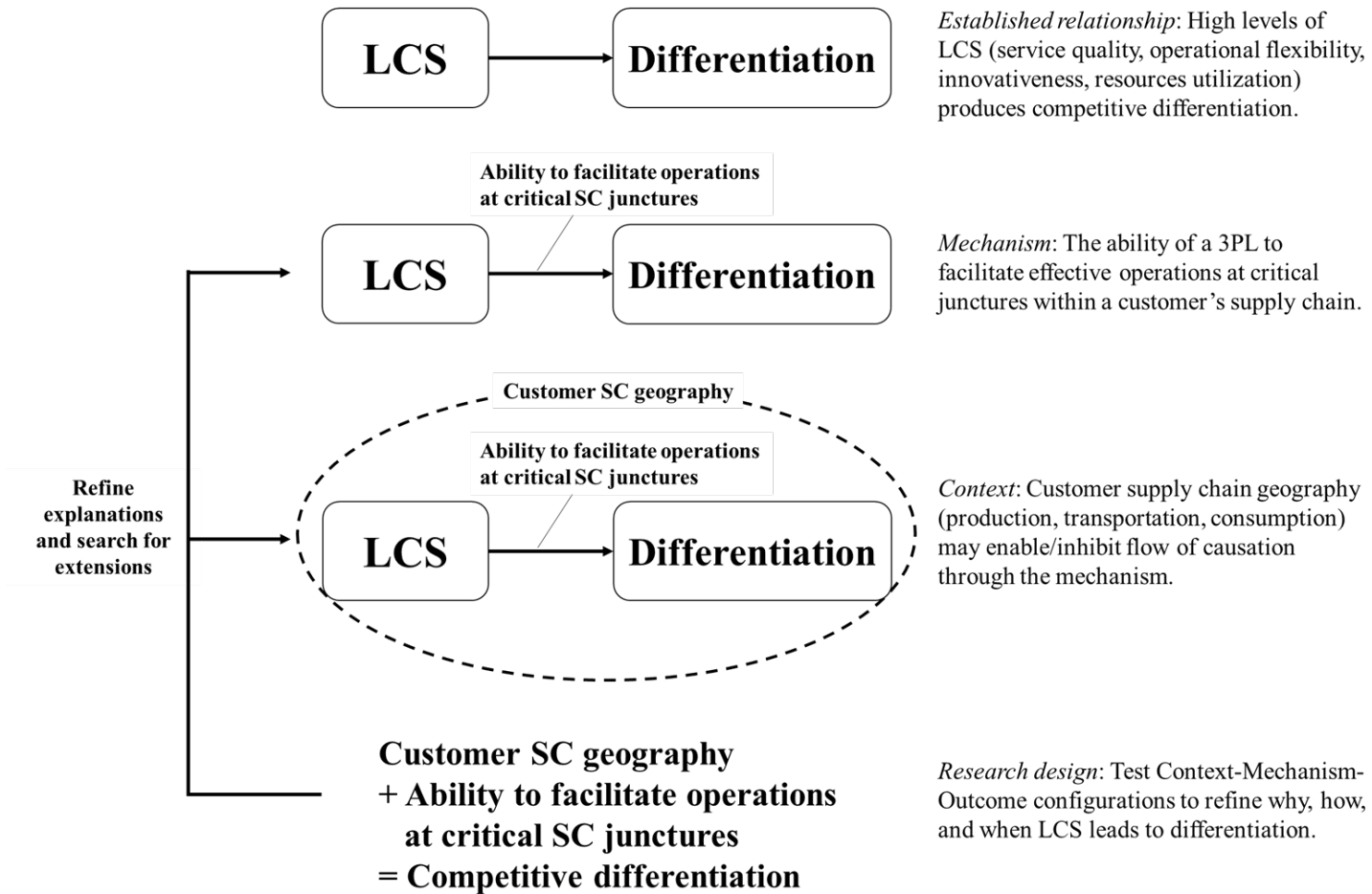


Table I. Characteristic features of middle-range theorizing

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- Consolidates empirical regularities into theoretical propositions that reflect the established body of evidence in a discipline, typical around “core” tenets of that discipline
 - Focuses on why constructs are related and under what conditions linkages are expected to produce outcomes
 - Defines constructs in terms of their potential for change, describes in detail causal mechanisms linking constructs, and specifies contexts or boundary conditions that enable (or inhibit) outcomes
 - Incorporates a level of detail that restricts analysis to a discipline-specific subset of phenomena operating within a given context
 - Makes predictions that are specifically relevant to resolving theoretical and practical problems within the focal discipline
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Based on Stank et al. (2017)

Table II. Dimensions of digitization

<i>Data intensity</i>	data strategy, data collection, storage and analysis, data-driven decision-making, data mapping, machine learning, artificial intelligence
<i>Connectivity</i>	sensor usage in production and distribution, and networking of equipment and plants, internet of things
<i>Adaptability</i>	automation and robotics in design, conversion and delivery, drones, 3D printing, automated/self-guided vehicles, digital twins and digital thread
<i>Integration</i>	enterprise and supply chain data integration, information control towers, social networks
<i>Security</i>	cyber security and risk management, encryption, natural language capability, blockchain and hyperledgers
<i>People</i>	leadership, skills and training, virtual and augmented reality, wearables

Adapted from Siemens (2017)

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