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# Configuring the Last-Mile in Business-to-Consumer E-Retailing

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**SUMMARY**

Fulfillment strategies that offer consumers a consistent shopping experience across different channels and devices through a variety of last-mile delivery options have emerged as a powerful engine for growth in the retail sector. To thrive in this new environment, retailers need to (re)configure their last-mile supply networks to achieve better alignment between delivery responsiveness, product variety, and convenience. This article reviews multiple case studies of leading retailers across geographical regions, maps these retailers' network configurations, and conducts consumer surveys to examine how retailers operate their last-mile distribution to cope with omnichannel demands. This study develops a typology consisting of four ideal forms of last-mile supply networks differentiated by the speed of delivery responsiveness and level of product variety. It proposes a set of prescriptive guidelines for retailers to undertake reconfiguration of their last-mile distribution.

**KEYWORDS:** business-to-consumer, competitive strategy, electronic commerce, logistics, retailing

The retail sector has undergone a dramatic transformation over the past four decades, transforming from a purely brick-and-mortar retail environment to an arena where online retailers play an increasingly significant role.[1] Until the 1990s, brick-and-mortar retailers were the main players in the sector; the late 1990s saw the emergence of pure-play online retailers, such as Pets.com and Webvan, which appeared to somewhat threaten the long-standing success and domination of these brick-and-mortar retailers. However, these threats were short-lived, as pure-play

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online retailers could not match the operational scalability and efficiency of their brick-and-mortar counterparts once these retailers developed click-and-mortar hybrid operations via the introduction of online channels. Consequently, the click-and-mortar retailers continued to enjoy market leadership after the dot-com boom for much of the first decade of the twenty-first century.

In recent years, pure-play online retailers have become a more dominant force in the market. Companies like Amazon.com and the online grocer Ocado have studied the failures of the pioneering pure-play retailers to devise new strategies for penetrating the retail sector.[2] In fact, the last decade has witnessed a resurgence of the pure-play idea, which offers consumers a wide product assortment with low-priced or free direct postcode delivery. Correspondingly, click-and-mortar retailers have sought to integrate their physical store and online fulfillment operations as a way to counter threats by their pure-play counterparts. As traditional companies negotiate this evolving retail landscape, they must address the notion that traditional "distribution center (DC)-to-store" replenishment is fundamentally incompatible with the online "DC-to-end-consumer" delivery approach. The former relies on full truckload delivery and bulk packing to fixed store locations, which allows retailers to obtain economies of scale, while the latter involves high volume of singles packing and unit delivery to the end-consumers, often with nonfixed locations, which allows retailers to be more responsive and able to customize to specific consumers' requirements.

Given these conflicting realities, modern last-mile delivery is especially challenging. Specifically, in this hybrid retail landscape, retailers face challenges such as small purchase quantities, erratic purchase frequencies, delivery window constraints, and problems stemming from consumers not being at home to receive orders.[3] Retailers attempt to offset these challenges through omnichannel retailing, which is the integration of online and offline fulfillment and delivery operations. Retailers adopt omnichannel retailing because it offers consumers a consistent shopping experience across different channels and devices served by a variety of last-mile delivery options.[4] Although this model is beneficial for consumers, it has a significant downside for retailers. To accomplish this integration effort and achieve omnichannel capabilities, retailers often jeopardize operational efficiencies in areas such as order picking and order delivery, which ultimately loses them business and revenue.[5] In fact, long-standing brick-and-mortar companies that failed to maintain operational efficiency and successfully adapt to consumers' increasing expectations of an omnichannel experience have been forced out of business. For example, the 116-year-old menswear brand Austin Reed declared bankruptcy in June 2016; as a result of filing bankruptcy, a total of 120 stores were closed and 1,000 jobs were eliminated. These losses occurred because Austin Reed failed to adjust its product assortments and leverage its online and offline channels in a manner that effectively delivered products to its consumers while keeping operational costs under control. As Jamie Merrick at e-commerce software firm Demandware stated,

> Store closures are an unfortunate and sad reality for the likes of Austin Reed that have failed to stay relevant and get product offerings right. To appeal to the next

generation, the products need to be pertinent, stock readily available, and offerings competitively priced with a unified retail experience in-store and online.[6]

Likewise, the 88-year-old department store British Home Stores (BHS) lost 164 stores and about 11,000 employees over the same period due to years of underinvestment and failing to adapt its retail operations to the changing trends.[7] For example, BHS did not offer shoppers the opportunity to buy products online and pick them up in-store despite the increasing adoption of this service by competing retailers. More recently, the former leading U.S. sporting-goods retailer Sports Authority filed for bankruptcy and closed all U.S. stores as consumers shifted online to search and purchase the same products.[8] These are but a few of the several collapses prompted by omnichannel approaches in the retail sector, highlighting the importance of aligning marketing efforts with the operational distribution activities.

To help companies respond to these industry challenges, previous studies have considered the role of technology in the retail landscape. These studies argue that advanced technologies on digital devices merge touch-and-feel information in the physical world with online content[9] and suggest that retailers need to use technologies to compete in new and innovative ways. One such way proposed by Bell et al.[10] is the employment of showrooms and buy-online-pick-up-in-store (BOPS) delivery option to provision information and products to the consumers. Likewise, Gao and Su extend our understanding of BOPS operations by examining the impact of the BOPS[11] initiative on store operations. There are also studies that examine the benefits derived from using crowdsourced logistics[12] for last-mile delivery.

While these studies provide insights on how retailers can leverage new technologies and alternative last-mile delivery innovations to adapt to changing retail trends, none of them provides guidance on how to configure the last-mile delivery segment, which is ultimately responsible for getting products to the end-consumers. The last-mile is critical to retailers—it is the portion of the downstream supply chain that directly connects retailers with the end-consumer and is often the most expensive segment of a supply chain.[13] Therefore, to best meet omnichannel retail challenges, retailers should establish effective last-mile supply networks (LMSNs) that align their marketing efforts with operational distribution activities to achieve success in the broader e-retailing environment.
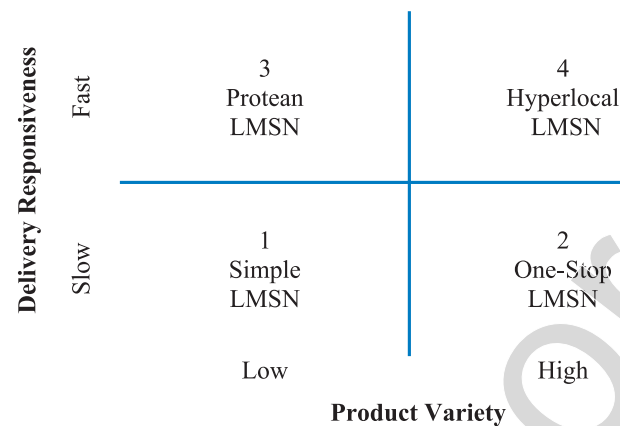
Our article contributes to the literature by considering how LMSNs can be best configured. This research, presented in the form of a typology comprising four ideal types of LMSN, evaluates last-mile service options based on a retailer's value proposition (in terms of *product variety* and *delivery responsiveness*). Our research relies on a set of primary and secondary case studies collected through exclusive access to leading retailers in the United Kingdom, the United States, Brazil, India, and China. These case studies represent a diverse set of exemplars spanning different retail formats and product types that reveal industry best practices. Based on the data from these studies, we argue the traditional silo management approach for the design of a last-mile distribution network structure, the architecture of network flow of order and information, relationship management with suppliers (including third-party

logistics [3PL] providers), and formulation of service value propositions can be less effective than other LMSN approaches. Because these last-mile elements interact within the broader e-retailing system driven by e-commerce, a last-mile system (or configuration) approach could be more beneficial to retailers than a silo-based approach. To illustrate the benefits of last-mile configuration approaches, we elaborate on the characteristics of each LMSN form premised in these four dimensions (network structure, network flow, relationship governance, and service architecture) and demonstrate how retailers can develop their LMSNs to adapt to the rapidly changing nature of the e-retailing environment. Last, we synthesize the LMSN forms into a prescription framework to help retailers navigate the e-retailing labyrinth and highlight key implications for supply chain and logistics practices.

## Research Method

Given the limited study of LMSNs from a network configuration perspective, we used a multiple, in-depth case study approach to unpack LMSN configurations.[14] The case method allowed us to study the phenomenon in its natural setting, enabling meaningful and relevant theory to be generated from the understanding gained by observing actual practices.[15] We examined LMSNs based on the four configuration dimensions (network structure, network flow, relationship governance, and service architecture) proposed previously by Lim et al.[16] and the interdependency relationships established by Lim and Srai.[17] These approaches allow us to systematically examine and compare retailers' LMSN configurations. We used a mixed-method design—incorporating multiple data sources, including interviews, mapping, site visits, surveys, and archival records—to study LMSN configurations. Using multiple data sources allowed us to triangulate the data to enhance construct validity and minimize bias during our analysis. To gain insights into the evolutions of LMSNs adopted by our case companies over time, which would otherwise be impossible to undertake in a *posterior* longitudinal study, we employed retrospective analysis techniques commonly used in the management literature to study evolutionary issues, such as firm strategy[18] and strategic organizational change.[19] Through the mixed-method approach, we were able to examine the configurations of LMSN from different perspectives to help us develop the prescriptive framework proposed in our study.

We conducted our academic research on LMSN distribution within the omnichannel context by studying practices of the following leading pure-play online and hybrid (both online and offline presence) retailers: Ocado, Tesco, Amazon UK, Alliance Boots, and Argos (U.K.); Amazon, Adidas, and Walmart (U.S.); B2W Digital (Brazil); Flipkart and Snapdeal (India); and Jingdong, Yihaodian, and Suning Commerce Group (China). We adopted a theoretical sampling strategy[20] when selecting our cases to include polar cases spanning different retail formats, product types, product variety, and delivery responsiveness, to increase overall confidence levels in our findings and conclusions.[21]

**FIGURE 1.** A typology of LMSN distribution configurations.



|  | Low | High |
|---|---|---|
| Fast | 3 Protean LMSN | 4 Hyperlocal LMSN |
| Slow | 1 Simple LMSN | 2 One-Stop LMSN |

Delivery Responsiveness

**Product Variety**

Data collection involved three stages: mapping cases, interviewing retail managers, and collecting data. In the first stage, the LMSN of each case was mapped and evaluated. We started by deconstructing each retailer's omnichannel operation into sub-networks (categories 1 to 4)—each an LMSN based on the speed of delivery responsiveness and product variety range (see Figure 1)—and consolidating the associated enabling systems and processes. In most cases, mapping was a relatively straightforward exercise. For example, Tesco runs the Tesco Grocery and Tesco Direct business units. Each unit is allocated with idiosyncratic resources as well as pooled resources that are shared across business units for its operations. By mapping the retailer's LMSN structures, we observed that the grocery business unit (Tesco Grocery) operates two LMSNs, while the marketplace business unit (Tesco Direct) operates one LMSN. Consequently, Tesco has footprints in Category 1 and 3 to support its grocery business and in Category 2 for its marketplace.

The second stage involved 54 interviews with managers in various positions within the chosen retail firms, as well as managers in the firms' representative vendors and 3PL providers; these interviews were conducted between January 2015 and December 2016. We used a semistructured interview protocol, which was tied to the configuration constructs. Each interview lasted between 45 minutes and two hours, and all interviews were tape-recorded and transcribed verbatim. We made visits to and took tours of the facilities when possible so that we could observe operations first-hand and interview all relevant informants.

In the third stage, we collected consumer survey responses and archival data from secondary sources, such as company documents and press releases, to corroborate the primary data. The consumer experience survey was implemented for our case retailers and consumers based in the United Kingdom[22] in April 2016, and actual retailer and service names were used. The survey included 14 items for consumer

satisfaction and four items for consumer convenience. The items were adapted from Thirumalai and Sinha,[23] and new items were added to reflect the omnichannel context. We engaged Clickworker (a crowdsourcing solution provider) to administer the survey for 500 random consumers based in the United Kingdom. Although all responded, only 299 met our criteria of having shopped online at least once across the five U.K.-based retailers (i.e., Ocado, Tesco, Amazon U.K., Alliance Boots, and Argos) within six months prior to taking the survey. After filtering incomplete responses, 77 fully completed, usable responses remained, giving us a response rate of 15.4%.[24] The responses from the survey allowed us to further examine and compare the LMSNs from the end-consumer perspective, enabling data triangulation to increase the completeness of our analysis and to minimize bias. Obtaining these survey responses was also useful for confirming the validity of our analyses and ensuring that we made "apple-to-apple" case comparisons.

We focused on identifying common patterns between the LMSN configurations via within- and cross-case analyses. External validity was achieved by using a replication logic to conduct and analyze each case. We carefully compared the results of the LMSNs along the four dimensions (network structure, network flow, relationship governance, and service architecture), and we used these dimensions to trace the retailers' transformation journeys. We then identified theoretical relationships among the four dimensions. This analytical process was not conducted in a linear manner. We continuously iterated between the coded links among these four dimensions and their underlying variables and the literature until we obtained a "clear grasp of the emerging theoretical relationship."[25] In addition, we used an interview protocol to ensure procedures were consistent across all cases, thus increasing reliability. Last, via email, we provided informants with draft case reports, which allowed informants to review our findings and provide additional data to improve the reliability of our interpretations.

## Introduction to the "SHOP" Typology

Four LMSN forms determine our SHOP model: **S**imple LMSN, **H**yperlocal LMSN, **O**ne-Stop LMSN, and **P**rotean LMSN. Simple LMSN is characterized by slow *delivery responsiveness* and low *product variety*, Hyperlocal LMSN offers fast *delivery responsiveness* and high *product variety*, One-Stop LMSN maintains slow *delivery responsiveness* and high *product variety*, and Protean LMSN provides fast *delivery responsiveness* and low *product variety*. *Delivery responsiveness* is a function of how far in advance customers must place their orders in order to receive them prior to the time they are needed. A detailed summary description of the SHOP typology is provided in Table 1. As Table 1 shows, these four forms offer various characteristics of LMSN elements.[26]

### Simple LMSNs

Simple LMSNs are defined by slow *delivery responsiveness* and low *product variety*. They aim to create high cost efficiencies in product order fulfillment (typically through the use of highly automated DCs and well-integrated

**TABLE I.** Characteristics of the SHOP Model.

| Configuration Dimension | Variable | Simple LMSN | One-Stop LMSN | Protean LMSN | Hyperlocal LMSN |
|---|---|---|---|---|---|
| Network Structure | Centralization | High | High | Low | Low |
| | Vertical Integration | High | Low | Moderate - High | Low - Moderate |
| | Horizontal Integration | Low | High | Low - Moderate | High |
| | Geographic Dispersion | Moderate | High | Low – High | Low |
| Network Flow | Flow Integration | High | Low - Moderate | High | Low - Moderate |
| | Flow Coordination | Low | High | Low | High |
| Relationship Governance | Interdependence | Low | Moderate | High | Low-Moderate |
| | Governance Mechanism | Hierarchical | Market and Intermediate | Hierarchical and Intermediate | Market |
| Service Architecture | Service Uniqueness | High | Low | Moderate - High | Moderate |
| | Service Modularity | Low | High | Low - Moderate | High |
| Core Logistics Capability | | Low Total Cost Distribution | Delivery Reliability | Responsiveness to Target Market(s) | Delivery Speed |
| Logistics Capability Maturity Profile | | (radar chart: FX, DS, DR, RTM, LC) | (radar chart: FX, DS, DR, RTM, LC) | (radar chart: FX, DS, DR, RTM, LC) | (radar chart: FX, DS, DR, RTM, LC) |
| Delivery Responsiveness | | Slow | | | Fast |

Note: LMSN = last-mile supply network; FX = flexibility; DS = delivery speed; DR = delivery reliability; RTM = responsiveness to target market(s); LC = low total cost distribution.

processes) and seek to provide convenience to consumers through the scheduling of well-suited home delivery windows. In fact, their service architecture is focused on delivering unique "end-to-end" services to consumers. In addition, their core derived logistics capabilities strive to provide low distribution costs. Their network structure is characterized by high levels of inventory aggregation and centralization of logistics infrastructure; it is a simple network structure that promotes visibility and incorporates a hub-and-spoke distribution mechanism to provide moderate coverage. Simple LMSNs also engage only a limited number of suppliers to retain network simplicity.

In our study, pure-play online grocer Ocado is one of several retailers attempting to develop and implement this type of LMSN. The majority of Ocado's distribution activities occur in-house; Ocado fulfills online orders through its four in-house customer fulfillment centers. This centralization approach enables Ocado to efficiently run its last-mile delivery operations while maintaining high consistency in service levels. Moreover, by keeping the number of suppliers manageable, Ocado significantly reduces stock-out rates, a benefit gained from developing better relationships with its suppliers. Through its Simple LMSN processes, Ocado delivers to approximately 70% of postcodes in the United Kingdom within a one-hour window and provides consumers access to almost real-time information regarding the statuses of their shipments.

### One-Stop LMSNs

One-Stop LMSNs are characterized by slow *delivery responsiveness* and high *product variety*. These retailers typically focus on pooling inventory, sharing resources, and seeking tighter collaboration and involvement with partners to better cope with uncertainties and disruptions as well as to provide consumers with a multitude of product-service choices. In this type of LMSN, the core logistics capabilities are delivery flexibility and delivery reliability. The network structure is defined by moderate to high levels of inventory aggregation and centralization of logistics infrastructure. One-Stop LMSNs typically stock a core product range and source the remaining products from suppliers (including third-party sellers) to extend their product range. These retailers adopt a complex network structure comprising hub-and-spoke distribution and dropshipping mechanisms to provide wide coverage. Due to the various moving parts in these LMSNs, flow integration is limited and success is premised on the ability of retailers to coordinate actions. One-Stop LMSN service architecture comprises highly modularized and standardized elements to facilitate outsourcing and network adaptation.

In our study, Tesco Direct and Amazon illustrate companies that implement this LMSN configuration. They use a One-Stop LMSN approach to fulfill orders across a wide variety of product categories. This strategy allows these companies to use a combination of a platform strategy (to create multiplicities in product source), 3PL providers, and dropshipping to extend product range and delivery service coverage. It also allows them to provide dispersed pick-up facilities to coordinate order collection and returns. Both Tesco Direct and Amazon have

effectively leveraged the multisided platform to maintain high product availability while reducing inventory ownership by collaborating with third-party sellers.

### Protean LMSNs

Protean LMSNs are distinguished by their fast *delivery responsiveness* and low *product variety*. The aim of retailers that employ these LMSNs is to provide responsive deliveries; Protean LMSNs have an ability to handle small and frequent orders via carefully curated product portfolios. These retailers also tend to be highly responsive in meeting consumer demands. In some cases, they will leverage their established physical store footprints to fulfill orders and provide pick-up and returns services, while in others, they will develop close relationships with partners who own different stores to extend their service coverage. The core derived logistics capabilities of Protean LMSNs aim to provide high responsiveness to their target markets. Their network structure is characterized by low levels of inventory aggregation, that is, in a Protean LMSN structure, stocks are typically stored and fulfilled from local inventory points, resulting in highly decentralized network structures. Similarly, Protean LMSNs use stores as points of differentiation. For these reasons, protean LMSNs rely on collaborative relationship building with select suppliers to cope with the demand uncertainties that result from the dispersion of inventory points. Their service architecture focuses on delivering moderate to high levels of unique services through the orchestration of cross-channel flows and the proper management of multiple points of interaction, reception, and returns.

Among the retailers in our study that have embraced this type of LMSN is Argos, a leading High Street digital retailer. Through a unique hub-and-spoke stores approach, Argos offers a consistent portfolio of approximately 50,000 stock-keeping units (SKUs) across over 800 stores, with additional concept stores in Sainsbury's locations. In addition, Argos delivers approximately 30,000 SKUs to consumers within the same day. A combination of technologies, including an in-store voice putaway system and a centralized order management system, ensures Argos has a single view of stock to maintain a 99.99% stock accuracy level.

### Hyperlocal LMSNs

Hyperlocal LMSNs offer fast *delivery responsiveness* and high *product variety*. Their core derived logistics capabilities aim to provide fast delivery to consumers through the use of networked eco-systems of actors connected via platforms or marketplaces. Retailers in these LMSNs leverage crowdsourcing to provide localized fulfillment of products stocked locally. Therefore, similar to Protean LMSNs, Hyperlocal LMSNs employ a highly decentralized network structure. Due to the short lead-time for delivery, such networks typically rely on direct point-to-point distribution mechanisms. Moreover, the use of heterogeneous system vendors results in limited flow integration within a Hyperlocal LMSN, and flow coordination is supported through the use of a platform-based portal. In these LMSNs, service architecture is focused on delivering on-demand
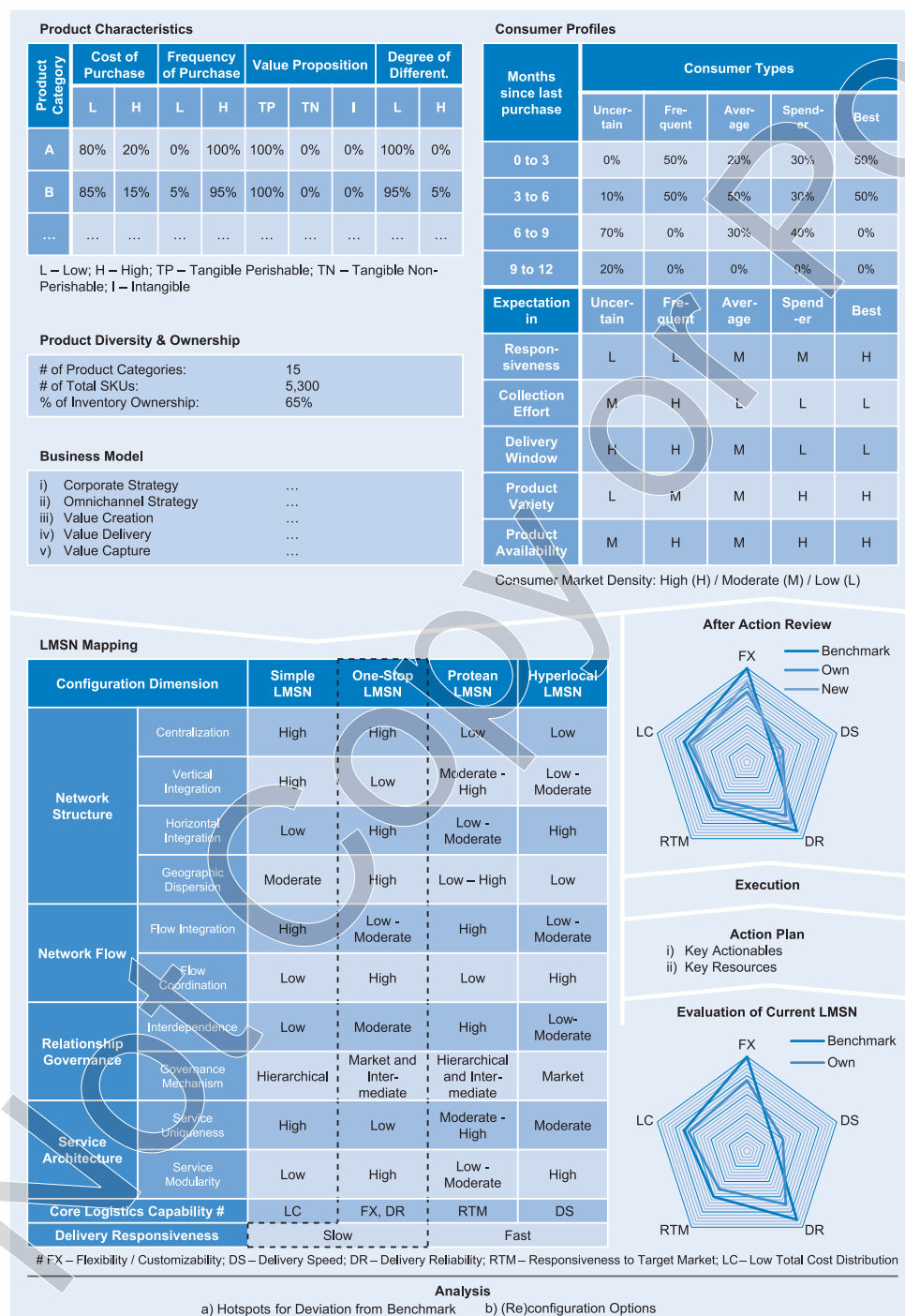
**FIGURE 2.** An updated typology of LMSN distribution configurations.
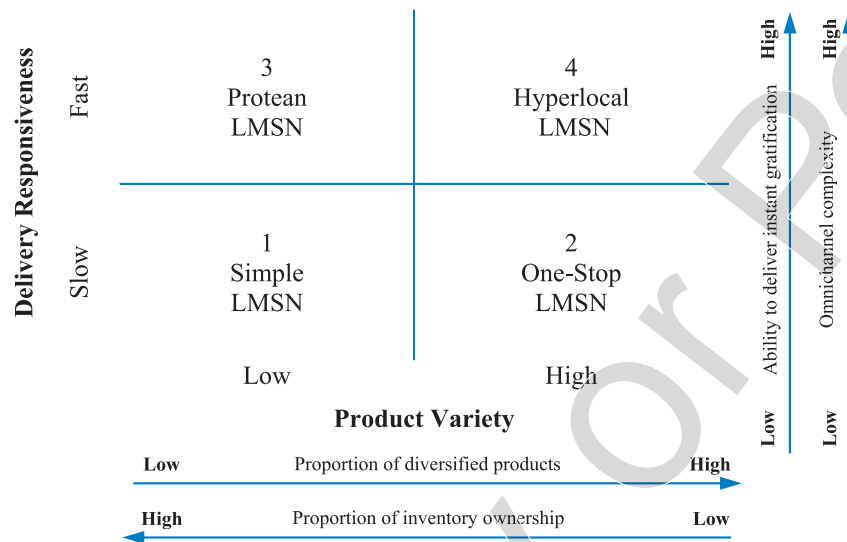


service propositions and is based on highly modularized product-service architectures that can be deconstructed into various distribution functions for ease of outsourcing.

Our study looks at two retailers who use the Hyperlocal LMSN on-demand delivery model: Amazon and Snapdeal. These companies offer consumers immediate deliveries from local fulfillment points through their Prime Now and Snapdeal Instant services. They both leverage crowdsourced logistics, employing independent contractors to collect orders fulfilled by local merchants for delivery to end-consumers. Both the independent contractors and the merchants have access to the retailer's portal for all coordination activities, including receiving fulfillment instructions and updating delivery statuses.

### LMSN Distribution Configurations

As the previous discussion illustrates, these four SHOP models are differentiated along a firm's *strategic priorities* in terms of *delivery responsiveness* (slow or fast) and *product variety* (low or high). The relationship between these four models is illustrated in Figure 2. As depicted in Figure 2, the proportion of diversified products offered by retailers increases, while inventory ownership decreases, as retailers move along the horizontal axis between low and high *product variety*. On the vertical axis, retailers moving from slow to fast *delivery responsiveness* exhibit greater omnichannel complexity in their operations and greater ability to serve customers with higher immediacy. *Delivery responsiveness* is a function of how far in advance customers must place their orders to receive them prior to the time they are needed.

**FIGURE 3.** The LMSN configuration canvas (an example).

**Product Characteristics**

| Product Category | Cost of Purchase | | Frequency of Purchase | | Value Proposition | | | Degree of Different. | |
|---|---|---|---|---|---|---|---|---|---|
| | L | H | L | H | TP | TN | I | L | H |
| A | 80% | 20% | 0% | 100% | 100% | 0% | 0% | 100% | 0% |
| B | 85% | 15% | 5% | 95% | 100% | 0% | 0% | 95% | 5% |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |

L — Low; H — High; TP — Tangible Perishable; TN — Tangible Non-Perishable; I — Intangible

**Product Diversity & Ownership**

| | |
|---|---|
| # of Product Categories: | 15 |
| # of Total SKUs: | 5,300 |
| % of Inventory Ownership: | 65% |

**Business Model**

i) Corporate Strategy … 
ii) Omnichannel Strategy … 
iii) Value Creation … 
iv) Value Delivery … 
v) Value Capture … 

**Consumer Profiles**

| Months since last purchase | Consumer Types | | | | |
|---|---|---|---|---|---|
| | Uncer-tain | Fre-quent | Aver-age | Spend-er | Best |
| 0 to 3 | 0% | 50% | 20% | 30% | 50% |
| 3 to 6 | 10% | 50% | 50% | 30% | 50% |
| 6 to 9 | 70% | 0% | 30% | 40% | 0% |
| 9 to 12 | 20% | 0% | 0% | 0% | 0% |

| Expectation in | Uncer-tain | Fre-quent | Aver-age | Spend-er | Best |
|---|---|---|---|---|---|
| Respon-siveness | L | L | M | M | H |
| Collection Effort | M | H | L | L | L |
| Delivery Window | H | H | M | L | L |
| Product Variety | L | M | M | H | H |
| Product Availability | M | H | M | H | H |

Consumer Market Density: High (H) / Moderate (M) / Low (L)

**LMSN Mapping**

| Configuration Dimension | | Simple LMSN | One-Stop LMSN | Protean LMSN | Hyperlocal LMSN |
|---|---|---|---|---|---|
| Network Structure | Centralization | High | High | Low | Low |
| | Vertical Integration | High | Low | Moderate - High | Low - Moderate |
| | Horizontal Integration | Low | High | Low - Moderate | High |
| | Geographic Dispersion | Moderate | High | Low – High | Low |
| Network Flow | Flow Integration | High | Low - Moderate | High | Low - Moderate |
| | Flow Coordination | Low | High | Low | High |
| Relationship Governance | Interdependence | Low | Moderate | High | Low-Moderate |
| | Governance Mechanism | Hierarchical | Market and Inter-mediate | Hierarchical and Inter-mediate | Market |
| Service Architecture | Service Uniqueness | High | Low | Moderate - High | Moderate |
| | Service Modularity | Low | High | Low - Moderate | High |
| Core Logistics Capability # | | LC | FX, DR | RTM | DS |
| Delivery Responsiveness | | Slow | | Fast | |

\# FX — Flexibility / Customizability; DS — Delivery Speed; DR — Delivery Reliability; RTM — Responsiveness to Target Market; LC — Low Total Cost Distribution

**After Action Review**

FX, DS, DR, RTM, LC
Benchmark / Own / New

**Execution**

**Action Plan**
i) Key Actionables
ii) Key Resources

**Evaluation of Current LMSN**

FX, DS, DR, RTM, LC
Benchmark / Own

**Analysis**
a) Hotspots for Deviation from Benchmark    b) (Re)configuration Options

# A Prescription for Mastering the Last Mile

We compiled the data in our study to determine a prescriptive path for industry practitioners to consider when planning to evolve and transform their LMSNs to enhance their competitive advantage. Our study offers a *six-step* procedure, in conjunction with an *LMSN configuration canvas* (see Figure

3), to exploit the utility of the SHOP framework; these data inform managers of the existing LMSN capabilities and options of their organizations. In each step of the procedure, we identify suggested foci. We emphasize that the suggested steps and foci are by no means restrictive or exhaustive; users do not have to follow these steps in a mechanistic manner. Instead, each firm should consider its own idiosyncrasies, operational priorities, and organizational constraints when determining how to use the framework. Given the unique characteristics of each firm, we provide a generic configuration canvas template in the appendix. The template offers a tool for firms to facilitate discussions regarding the reconfiguration of their LMSNs.

In the following, we present an anonymized case example, Omnichannel Co., to illustrate how the framework might be used at each step of the procedure. Omnichannel Co. is a leading health and beauty retailer with more than 2,000 physical stores in the United Kingdom. It offers a variety of delivery options, including standard, next-day, and Sunday postcode delivery via partnerships established with 3PL providers, as well as BOPS. Because the retailer implemented a pilot program to reconfigure its LMSN and evaluate the feasibility of offering consumers a same-day delivery service, we were able to directly assess the utility of the proposed framework. The framework has benefited from refinements following a real-world application.

We apply the SHOP framework to Omnichannel Co. via a six-step approach:

- *Step 1a*: Construct a product portfolio matrix
  - *Objective*: Understand your company's key product attributes. To meet this objective, firms should analyze their product categorization. Analysis could consider the following topics:
    - cost of purchase
    - frequency of purchase
    - value proposition (perishability and tangibility)
    - degree of differentiation
    - product diversity (number of product categories, SKU size)
    - percentage of inventory ownership (percentage of inventory ownership)
  - *Example*: Omnichannel Co.'s product assortment is characterized by the following:
    - 80% of products have high cost of purchase due to high product differentiation
    - 95% of products have low-moderate frequency of purchase
    - 90% of products are tangible and nonperishables with a small proposition of consumer-packaged products and supplements (e.g., vitamins)
    - high product diversity (approximately 50,000 SKUs)
    - 90% inventory ownership with the remaining 10% fulfilled via dropshipping from partner suppliers

- *Step 1b*: Understand target consumer profiles
    - ○ *Objective*: Understand your company's key consumer types, their value, and their expectations. To meet this objective, firms should categorize consumer profiles using a segmentation approach like the customer value matrix with five segments, commonly used in the marketing literature: *Best, Spender, Average, Frequent*, and *Uncertain*.[27] Moreover, firms should identify desired targets for *delivery responsiveness, order collection effort, length of delivery window, product variety*, and *product availability*. These attributes determine LMSN type; understanding these attributes will help firms deliver on expectation, contingent on consumer market density.
    - ○ *Example*: Omnichannel Co. has a captured consumer profile portfolio of 20% Best, 20% Spender, 30% Average, 25% Frequent, and 5% Uncertain. This type of profile shows that most of the retailer's consumers are loyal consumers; this knowledge helped the firm decide to offer personalized beauty consultation to consumers and to recommend in-house products that cannot be purchased elsewhere. When satisfied, consumers rarely switch to other cosmetic products due to routine usage. Maintaining high product availability is critical for satisfying loyal customers. Omnichannel Co. puts less emphasis on product variety and more emphasis on selling appropriate products that suit customer needs. Given the retailer's highly differentiated products, consumers typically only expect moderate delivery service.

- *Step 1c*: Review business model
    - ○ *Objective*: Understand whether your company's business model (value creation, delivery, and capture) is aligned with the product types (captured in Step 1a) and consumer profiles (captured in Step 1b) to maximize consumer satisfaction. To meet this objective, firms should review corporate/omnichannel strategy, and the associated value creation (e.g., unique products/services), value delivery (e.g., cost structure and sales/distribution channels), and value capture (e.g., revenue streams) foci to ensure strategic alignment with firm's product portfolio and consumer profiles.
    - ○ *Example*: Omnichannel Co.'s omnichannel strategy is to ensure its customers are able to shop with the retailer whenever, however, and wherever suits them best. To offer this availability, the retailer constantly exploits technological advancements to create and deliver new value to the customers. For example, the retailer employs in-store ordering via iPads to help customers order from its full range of products in any store for delivery the next day to the same store, next day to a different store, or next day to other postcodes. Value capture is mainly derived from highly priced store-brand and exclusive products and coupled with personalized beauty consultancy that are only available at Omnichannel Co.'s stores. The target customers are middle- to high-income segments. Overall, Omnichannel Co.'s business model exhibits strategic fit with its product portfolio and consumer profiles.

- *Step 2*: Evaluate mapped LMSNs
  - *Objective 2a*: Understand your company's current LMSN setup. To meet this objective, firms should deconstruct existing delivery operations into subnetworks and map them onto the SHOP typology.
  - *Example*: When Omnichannel Co. mapped its retail operations and compared them with the SHOP typology, the retailer discovered its LMSN corresponded to the descriptions in Quadrant 1 (Simple LMSN) and Quadrant 2 (One-Stop LMSN).
  - *Objective 2b*: Understand where and to what extent your company's LMSN(s) deviate from the industry-leading/ideal benchmark. To meet this objective, firms should evaluate their mapped LMSNs against ideal types or the performance of market leaders.
  - *Example*: When Omnichannel Co. compared its LMSN practices with those of leading firms and with performance standards in the health and beauty industry, the company realized it was trailing behind market-leading performance standards in flexibility and cost of delivery.

- *Step 3*: Conduct hotspot analysis
  - *Objective*: Understand to what extent the deviation of your company's LMSN(s) from the benchmark affect operational performance. Identify root causes of suboptimal performance and corresponding areas for improvement. To meet this objective, firms should check for the degree of deviation from the benchmarked models (industry-leading or ideal), identify root causes of the variations, and locate potential disconnectedness between the adopted LMSN(s) against product attributes, consumer expectations, and business model.
  - *Example*: Omnichannel Co. evaluated that it significantly lagged in flexibility and cost of delivery; analysis of this deviation found this discrepancy is primarily due to Omnichannel Co.'s legacy store systems that are also heterogeneous among stores, hence not ideally suited to its omnichannel needs. As a result, although some online consumers are expecting same-day delivery service as a delivery option, Omnichannel Co. was unable to offer this service as the stores were not capable of fulfilling online orders. Same-day delivery requires the retailer to fulfill orders using in-store inventory and information to be shared between the online and offline channels. Analysis also revealed the company's high reliance on 3PL providers for the majority of its last-mile delivery service meant Omnichannel Co. had little control over delivery costs. The retailer's current practice requires consumers to pay for the costs associated with home deliveries and Omnichannel Co. did not yet have an effective way to absorb these costs as part of its business model.

- *Step 4*: Conduct LMSN (re)configuration and options analysis
  - *Objective*: Understand the costs and the benefits of various options to reconfigure your company's LMSN. To meet this objective, firms should use the information collected from previous steps (Step 1 to 3) to analyze possible (re)configuration options while prioritizing organizational needs.

Firms could consider developing the maturity of their existing LMSNs or establishing a presence in a new quadrant in the SHOP typology.

- ○ *Example*: Omnichannel Co. discussed its priority to increase the delivery speed to match industry standards. Reconfiguring its LMSN to achieve this new priority will entail equipping local stores with online capabilities so online ordering information can be piped to the stores for fulfillment and subsequently transferred to local carriers for the last-mile delivery. This reconfiguration would establish Omnichannel Co.'s LMSN in Quadrant 3 (Protean LMSN).

- • *Step 5*: Develop an action plan
  - ○ *Objective*: Formulate an action plan, implementation timeline, and determine targets to evaluate success of intervention. To meet this objective, firms should craft immediate (and mid-term, if applicable) action items, and the requisite resources to implement the decision(s) determined in *Step 4*. Firms could exploit potential opportunities in:
    - • complementary resources and capabilities
    - • relationships with suppliers and 3PL providers
    - • information systems for enhanced cross-channel visibility
    - • crowdsourcing and the sharing economy (e.g., multisided platforms)
    - • existing and new capabilities in the eco-system
    - • agile implementation
  - ○ *Example*: Omnichannel Co. created an action plan to evaluate the feasibility of introducing same-day delivery service. It conducted a six-month trial program by equipping five stores in the London market to offer same-day delivery service for selected products. Product inventory information was available in real-time through its online channel, and pricing was consistent in both its online and offline channels. The retailer employed a mobile application with loyalty membership to track customers' purchase behaviors to target promotions. The trial program is considered successful if there is a 30% take-up rate for same-day delivery service. To provision same-day delivery, the retailer leveraged its sister network used for delivery of prescriptions to deliver orders from stores to customers' homes. This approach allowed complementary resources and capabilities to be shared. In addition, it increased fleet utilization.

- • *Step 6*: Conduct an after action review
  - ○ *Objective*: Evaluate the effectiveness of the implemented intervention, making adjustments to the action plan as appropriate, and continuously watch for changes in the market environment and the emergence of new market opportunities. To meet this objective, firms should consider evaluations that address:
    - • outcomes against set goals
    - • post-implementation project effectiveness
    - • reconciling the business model in an iterative cycle
  - ○ *Example*: Despite some adoptions by existing customers, Omnichannel Co. could not derive sufficient volume to enable the new service to be economically sustained. The take-up rate was only approximately 12%. As such, the

plan to establish a country-wide, same-day delivery service was withheld. The management will evaluate consumers' delivery needs on a yearly basis and also will constantly assess other improvement opportunities.

## LMSN Configuration Scenario-Play Exercise

In addition to our anonymized case example Omnichannel Co., in May 2018, we conducted a scenario-play exercise where a group of supply chain managers discussed two cases—one operating in a developed market and the other in an emerging market—to assess LMSN configuration and evaluate reconfiguration options. In the following, the two companies are anonymized as Sportswear, Inc. and ECom Co., respectively. Both retailers plan to reconfigure their LMSN structure in 2019 following outcomes obtained from the exercise. We focus our discussion on the network structure given that both cases approach the reconfiguration exercise primarily from a structural change perspective. However, as noted in the earlier section, a structural change inherently drives changes in the other configuration dimensions (i.e., network flow, relationship governance, and service architecture). Benefits derived from the reconfiguration exercise are reported in the following.

### Sportswear, Inc.—Reconfiguring toward a Highly Responsive Ship-from-Store Delivery Strategy

*Description.* Sportswear, Inc. is a global sportswear and fashion company that sells through multiple channels, including a network of more than 200 brick-and-mortar stores in the United States, third-party retail distributors, and online (including in-app). The retailer carries an assortment of approximately 25,000 SKUs in 15 product categories and owns 100% of its inventory. About 50% of Sportswear, Inc.'s total sales revenues is derived from 15% of a particular consumer category. Most of the company's consumers are relatively loyal due to a strong brand image and identification with key marketing partners, such as leading sports teams.

*Current LMSN and Assessment.* Sportswear, Inc.'s current LMSN configuration is best described as a Simple LMSN. The retailer mainly relies on 3PL providers (e.g., FedEx and UPS) to offer limited delivery options (e.g., standard ground and two-day shipping). Online orders are fulfilled from a single DC for the whole United States. Through the facilitated exercise, managers identified that the retailer is significantly lagging in all capability dimensions (i.e., flexibility, speed, reliability, and responsiveness to target market), except for cost. The root cause for these deficiencies is the company's highly centralized network design and its over-reliance on 3PL providers' delivery services with little control over the last-mile operations. The management team has prioritized delivery speed to match or exceed current industry standards.

*Key Design Considerations and Desired Configuration of LMSN.* The team seeks to offer online consumers fast delivery options, such as same-day and on-demand

delivery within a few hours from an order placement. These services shall be offered in large and well-developed urban markets to attract sufficient demand and ensure economic viability. To enable such services, Sportswear, Inc. is willing to embrace a paradigm shift in their distribution network design, moving from a DC fulfillment approach to a ship-from-store design, incorporating decentralization of inventories, a BOPS initiative, and crowdsourced delivery operations. Thus, the envisioned LMSN configuration exhibits a Protean LMSN. Through the scenario-play exercise, the major expected benefits from the reconfiguration implementation are stronger brand perception derived from a superior e-commerce experience for the consumers, higher consumer satisfaction and retention due to fast and reliable delivery services, and an increase in sales revenues for the online channel induced by higher perceived value from the associated delivery services.

*Forward Plan.* Sportswear, Inc. plans to implement a pilot program of the new Protean LMSN configuration in late 2019. The retailer expects to face some major challenges in the management of highly decentralized inventories and third-party integration efforts (e.g., sharing timely information with 3PL providers and crowd-sourced couriers). These challenges are reliant on the establishment of appropriate information technology systems to equip stores with ship-from-store capabilities to receive consumer orders from the online channel. Changes would also have to be made regarding store inventory allocation and manpower allocation for online order picking.

Overall, the results from the exercise helped define the required changes to the retailer's distribution network footprint, such as determining the number, type, and location of ship-from-store enabled stores in the pilot market. The results will also be incorporated into a simulation of delivery performance in terms of delivery speed, costs, and reliability of the new LMSN configuration. Moreover, the exercise provided the Sportswear, Inc. management team with a structured, consistent, scalable, and replicable approach to redefining its e-commerce strategy and determining its associated target LSMN configuration. As a Sportswear, Inc. e-commerce manager stated,

> The framework proved to be extremely helpful in defining a clear and realistic benchmark, taking into account the service offerings not only of direct industry competitors, but also those of market leaders from other, related industries, such as Amazon, Walmart, or non-sportswear fashion brands.

### ECom Co.—Reconfiguring toward a Diversified Delivery Service Offering

*Description.* ECom Co. is a leading pure-play online retailer in a major Latin American market. It sells a wide variety of nonperishable product categories, ranging from electronics to homeware, and carries an assortment of more than 5.3 million SKUs. The retailer is part of a retail conglomerate that also controls a dense network of more than 1,300 brick-and-mortar retail establishments

throughout the market. However, ECom Co. considers itself as an independent, online-only company serving more than 15 million active online customers and does not leverage the physical presence of its sister companies yet. Responding to changes in the retail sector, the retailer is gradually transforming itself into an e-commerce marketplace, reducing its inventory ownership. Third-party vendors are now responsible for approximately 4.9 million SKUs out of ECom Co.'s product portfolio.

*Current LMSN and Assessment.* The shopping profiles of ECom Co.'s consumers vary significantly, making it challenging to have one LMSN configuration to satisfy the demands of all consumers. However, a majority of ECom Co.'s consumers are variety-seeking, making ECom Co.'s current LMSN configuration best described as a One-stop LMSN. The retailer mainly relies on its own logistics arm, handling approximately 75% of the company's order volume. The remaining 25% is handled by 3PL providers. The current suite of delivery options offered to consumers is limited to two-day or slower shipping options. Online orders are fulfilled from four DCs that service the entire market. ECom Co. uses a multitiered distribution approach with a number of satellite distribution facilities in major urban markets of the country to allow for deconsolidation of loads and transshipment to more efficient urban delivery vehicles. These satellites typically do not hold inventories. Through the facilitated exercise, ECom Co.'s management team determined that it is critical for the company to innovate to stay on top of quickly evolving customer preferences and service requests by vendors. It recognized that it needs to particularly improve along the dimensions of speed and flexibility, while maintaining its traditionally strong performance along cost and reliability. The exercise also helped managers realize that the root cause for these deficiencies is the company's lack of tools and "know-how" to manage multiple distribution pipelines for shipments of varying priority based on a common network infrastructure. The management team has prioritized delivery speed and flexibility to match current industry standards in more developed and mature markets.

*Key Design Considerations and Desired Configuration of LMSN.* Driven by increasing customer expectations for faster delivery speed, timeliness, and flexibility in light of competition from other online retailers such as Amazon, the management team seeks to offer consumers same-day delivery services with tighter delivery time windows. To enable these services, the retailer needs to improve its upstream product flows from third-party vendors. This goal is aligned with the company's desire to gradually transform its retail business into an e-commerce marketplace. Moreover, ECom Co. needs to establish a denser network of local distribution facilities in urban markets. While its inventories will remain relatively centralized in the current network of DCs, more options for local transshipment closer to the end-customer need to be created. Further, vendors need to be enabled to inject shipments at local

distribution facilities through "drop-off" models or first-mile pick-up models offered by ECom Co. To establish a sufficiently dense network of such facilities, ECom Co. needs to consider incorporating the retail establishments of its sister companies into its LMSN design in order to leverage complementary resources. The envisioned LMSN configuration exhibits the development of a Protean LMSN and a Hyperlocal LMSN. Through the scenario-play exercise, managers identified the major expected benefits from the reconfiguration implementation to be a stronger value proposition for third-party vendors to rely on ECom Co.'s services as an e-commerce marketplace and logistics service provider, a higher level of consumer satisfaction and retention due to faster and more flexible delivery options, and a reduction in unit cost due to higher consolidation and coordination of shipments within the company's distribution system.

*Forward Plan.* ECom Co. plans to implement a pilot study to test its reconfigured LSMN design in its largest urban market starting in 2019, prior to a country-wide roll-out. The retailer expects to face some major challenges in the planning and operation of a last-mile distribution network that accommodates multiple parallel pipelines for shipments of varying priority and integrates the company's existing last-mile delivery operations with more sophisticated first-mile pick-up and drop-off services offered to third-party e-commerce vendors.

Overall, the results from the exercise informed the retailer's decisions about how to reconfigure its distribution network footprint. ECom Co. will use the insights from this exercise in a simulation of delivery performance and resource requirements of new LMSN configurations. Specifically, our findings will help the company determine objectives for the number, type, and locations of local satellite distribution facilities to serve as transshipment points for last-mile deliveries and injection points for third-party shipments into the network for any urban market. As one of the ECom Co. supply chain managers stated,

> The framework proved helpful in defining the scope of a quantitative network optimization study, building on state-of-the art operations research methods to determine how the company's revised LSMN configuration would affect the optimal facility footprint, delivery fleet composition, and governance of ECom Co.'s last-mile and first-mile logistics operations. Moreover, it helped triggering discussions regarding how the company could leverage the physical retail presence of our sister companies to support the new distribution approach in major urban markets.

## Beyond SHOP: Surviving in the Omnichannel World

The development of our LMSN SHOP typology responded to retailers' desire for a tool to be successful in the new omnichannel economy.

Retailers can use the typology to map their existing LMSNs and assess their performance. Moreover, the SHOP model provides decision support regarding:

- facility and inventory locations related to network structure;
- types of information systems (or features) necessary to be equipped for retail and last-mile delivery operations based on operational capability requirements;
- types of information systems (or features) needed to organize information and product flows;
- choice of partners with whom to build relationships;
- expectations about already-established partnerships; and
- assessment of existing competitive advantages based on service uniqueness and flexibility based on service modularity, which are both derived from service architecture decomposition.

The LMSN configuration canvas shown in Figure 3 provides a prescription for retailers to configure and evolve their LMSNs in order to enhance consumer experiences. The research also helps managers balance resources across different LMSN configurations at a time when they are under pressure to innovate and keep pace with rising consumer expectations. They can achieve this balance through enhanced product-channel-consumer alignment rather than "one-size-fits-all" solutions that often result in poor delivery economics and bottlenecks when demand exceeds capacity (e.g., during Black Friday sales). Our study shows that pure-play online retailers should try to exploit their potential economies of scale by offering a wide product assortment with a centralized inventory management strategy and by focusing on increasing delivery responsiveness. On the other hand, click-and-mortar retailers should ideally focus on product-service differentiation through a personalized store experience and by offering customers a suite of convenient delivery options.

This research extends the practitioner-oriented literature regarding the omnichannel phenomenon by providing retailers guidance on how they can configure their last-mile delivery services. Our research underscores the notion that the best retailers will win the omnichannel revolution by evolving their LMSNs across the permeable boundaries of *delivery responsiveness* and *product variety*. LMSN evolution can be achieved by establishing a presence across multiple categories in our typology as well as further developing more mature capabilities in each category to offer the right combination of experiences for today's increasingly demanding omnichannel consumers.

## APPENDIX. Template for LMSN Configuration Canvas.

### The Last-mile Supply Network Configuration Canvas 1.0

| Designed for: | Designed by: | Date/Ver.: |
|---|---|---|

**Product Characteristics**

What are our key product characteristics in terms of perishability, tangibility, frequency of purchase, cost of purchase, value proposition, degree of differentiation?

**Product Diversity & Ownership**

How many product categories and SKUs do we have?
What proportion of the inventory are owned by us?

**Business Model**

What is our corporate/omnichannel strategy?
What is our source of value creation, value delivery, and value capture?

**Consumer Profiles**

Who are our most important customers?
What do they expect in terms of degree of responsiveness,
order collection effort, delivery window, product variety, product availability, etc.?
Level of market density?

Consumer Market Density: High (H) / Moderate (M) / Low (L)

### LMSN Mapping

| Configuration Dimension | | LMSN I | LMSN II | LMSN III | LMSN IV |
|---|---|---|---|---|---|
| Network Structure | Centralization | | | | |
| | Vertical Integration | | | | |
| | Horizontal Integration | | | | |
| | Geographic Dispersion | | | | |
| Network Flow | Flow Integration | | | | |
| | Flow Coordination | | | | |
| Relationship Governance | Interdependence | | | | |
| | Governance Mechanism[1] | | | | |
| Service Architecture | Service Uniqueness | | | | |
| | Service Modularity | | | | |
| Core Logistics Capability[2] | | | | | |
| Delivery Responsiveness[3] | | | | | |

[1] Governance mechanism – Market; Intermediate; Hierarchy
[2] FX – Flexibility / Customizability; DS – Delivery Speed; DR – Delivery Reliability;
RTM – Responsiveness to Target Market; LC – Low Total Cost Distribution
[3] Delivery responsiveness – Slow; Moderate; Fast
Rating – 1 (Low), 2 (Low-Moderate), 3 (Moderate), 4 (Moderate-High), and 5 (High)
Note: Compare results with ideal or industry-leading forms

**Analysis** (e.g. reasons for deviation from benchmark, (re)configuration options)

Strengths? Where are we lacking?
Which improvement areas to prioritize?

**After Action Review**

Observations:
Performance targets met?

FX
LC    DS
RTM    DR

**Execution**

**Action Plan** (e.g. key actionables, resources)
What is needed?
Timeline?

**Evaluation of Current LMSN**

Observations:

FX
LC    DS
RTM    DR

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