Research Project

on

Last mile design in e-commerce

Bachelors of Business Administration

(Logistics and SCM 5th Sem)

(Established under Galgotias University Uttar Pradesh Act No. 14 of 2011)

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BBA 6th sem

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Certificate

This is to certify that Shoubhik Dutta (18SLAM1010001), final year student of BBA Logistics and supply chain management of Galgotias University has made his conceptual project on the topic “Last mile logistics design in e-commerce” under the guidance of Prof. Ashok Kumar Sharma (H.O.D Logistics and supply chain management) in October 2020.

Signature

Declaration

I hereby declare that the work done on the conceptual project made on the topic of “Last mile logistics design in e-commerce ”is solely done by me. No part of it is taken from any other source and is my original work.

Shoubhik Dutta

Acknowledgement

I would like to express my special thanks of gratitude to Prof. Ashok Kumar Sharma as well as Prof. Avdhesh Kumar Yadav who gave me the golden opportunity to do this wonderful project on the topic “Last mile logistics design in e-commerce” which also helped me growing my knowledge and I came to know about so many new things.

I am really thankful to them.

Secondly I would also like to thank my parents and friends who helped me a lot in finishing this project within the limited time.

Thanks again to all who helped me.

Shoubhik Dutta

Abstract

The purpose of this project is to go through the different research paper who had worked on the last mile design. Since it is one of the major part of the supply chain that needs to be worked on, it is very crucial to know the ways to reduce the cost and increase the customer satisfaction. The major sector where this plays a very important role is the e commerce. In this we will talk about the different variable that affect the last mile of the logistics.

Introduction

Last mile has become very prominent part of the logistics and it takes a very high cost for any company. As well as it is a very crucial part also as it directly affects the mind of customer. Since the customer connects it with the convenience and the comfort, many companies like amazon, Instacart, drop-off are the one who had started same day delivery or on demand delivery and many other features. But later on they just have to stop those services due to high amount of the cost involved in it. It has now become the demand of the customer and at the same time it is the a very crucial point for the companies to save money by providing effective and efficient last mile design.

Last-mile delivery has become a critical source for market differentiation, motivating retailers to invest in a myriad of consumer delivery innovations, such as buy-online-pickup-in-store, autonomous delivery solutions, lockers, and free delivery upon minimum purchase levels. In 2016, e-retail accounted for 8.7% of all retail sales worldwide and was estimated to be worth 1.86 trillion U.S. dollars. Forecasts predict an increase of up to 15.5% by 2021. Internet has connected all over the world and in the same way it has also connected the retail businesses. Not only it has been connected it has become very important to sell the goods online. This is because the market is expanding to include e-retailors that has created an entirely new system goods. From market perspective the first wave of ecommerce challenges hits e-retailors who operate in this newly forming space as well as postal and logistic service providers who have to cope with the continuously growing volumes of goods being delivered and returned. Thus to improve the performance and increase the customer demands the last mile actors are seeking new delivery service solutions.

Recent surveys shows fact that despite the significant LML innovation and experiment, the extent knowledge on element structure and associated designed variable has been limited.

Define LML

The term last mile originated in the telecommunication industry and refers to the final leg of a network. LML denotes the last segment of delivery process which is often regarded as the most expensive, least efficient aspect of supply chain and with the most pressing environmental concerns. For last mile delivery there has been many terminologies used but the definition that introduce the concept of an order penetration point as a way of preparing the origin of the last mile is the best. The order penetration point refers to the inventory location where a fulfilment process is activated by a consumer order.

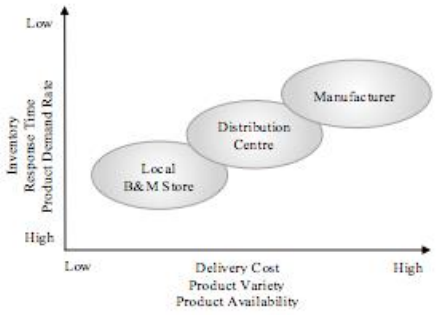
Last mile logistics is the last stretch of business to consumer parcel delivery service. It takes place from the order penetration point to the final consignee preferred destination point.

Review of LML distribution structures

Distribution structure involves linear movement of a product from source to the consumers. It can be differentiated on 3 basic:

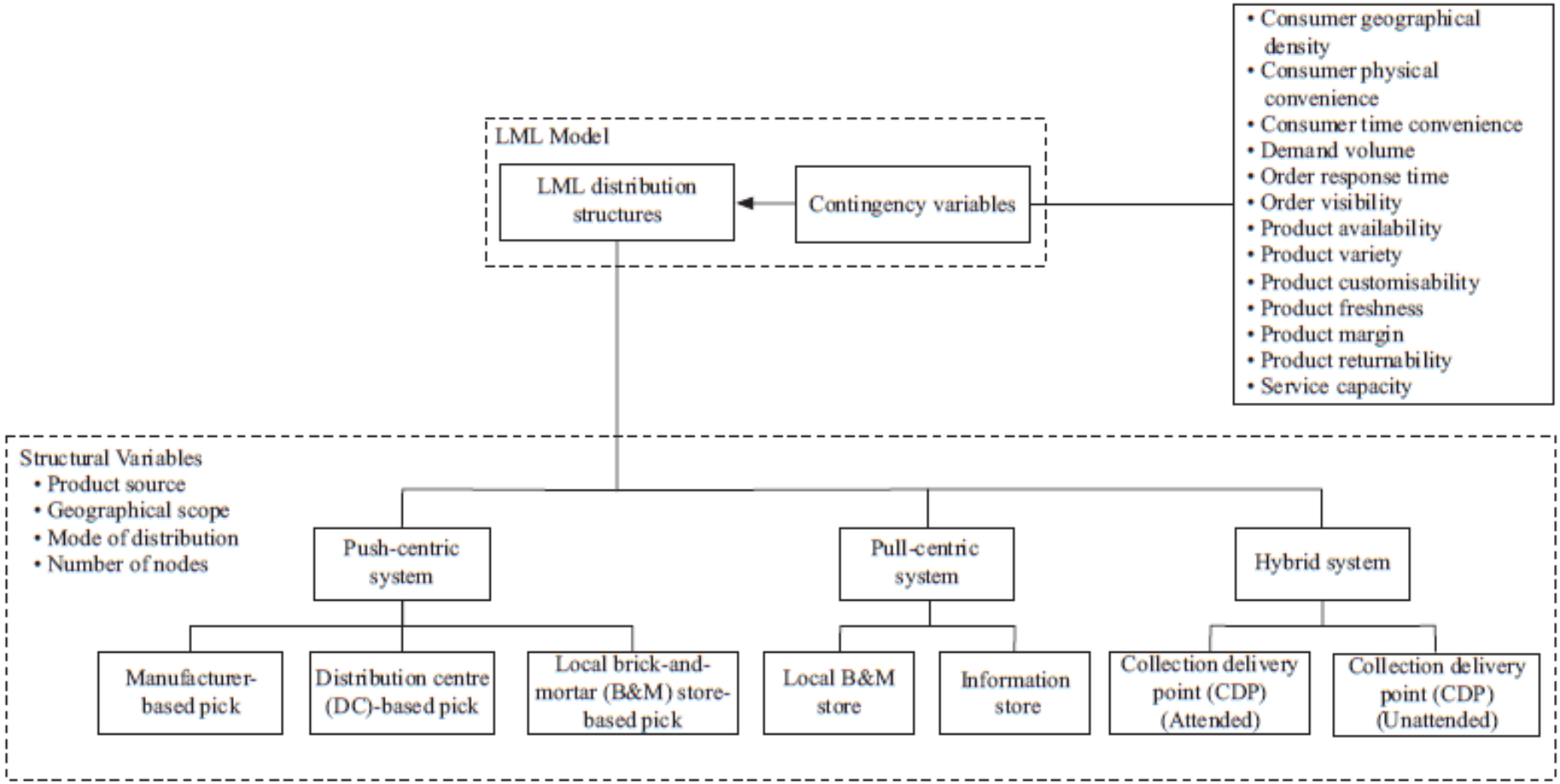
1. Push: product sent to consumers postcode by someone other than the consumer.
2. Pull: product fetched from product source by the consumers.
3. Hybrid: product sent to an immediate site from which the product is fetched by the consumer.

Push centric system



This study found that the push-centric system is the most commonly adopted distribution form. It typically comprises a number of intermediate stages (n-tier) between the source and destination in order to create distribution efficiencies. The literature classifies three
picking variants according to fulfilment location: manufacturer-based
(or “drop-shipping”), DC-based, or local B&M store-based . The destination can either be consumers’ homes or, increasingly, their

workplaces. The mode of delivery can be in-sourced (using retailer's own vehicle fleet), outsourced to a third-party logistics provider (3PL), or crowd-sourced using independent contractors. When selecting a distribution channel, retailers need to trade-off between fulfilment
capabilities, inventory levels, product availability and variety, transportation cost, and responsiveness. The nearer the picking site is to the consumer segment, the more responsive is the channel. However, this responsiveness comes at the expense of lower-level inventory aggregation and higher risks associated with stock-outs.


LML Model
LML distribution structures
Contingency variables
• Consumer geographical density
• Consumer physical convenience
• Consumer time convenience
• Demand volume
• Order response time
• Order visibility
• Product availability
• Product variety
• Product customisability
• Product freshness
• Product margin
• Product returnability
• Service capacity
Structural Variables
• Product source
• Geographical scope
• Mode of distribution
• Number of nodes
Push-centric system
Pull-centric system
Hybrid system
Manufacturer-based pick
Distribution centre (DC)-based pick
Local brick-and-mortar (B&M) store-based pick
Local B&M store
Information store
Collection delivery point (CDP) (Attended)
Collection delivery point (CDP) (Unattended)

Pull-centric system: consumer self-help

The literature also discussed two variants of the pull-centric system. Both variants require consumers to participate (or self-help) throughout the transaction process, from order fulfilment to order transportation. The first variant represents the traditional way of

shopping at a local B&M store, with consumers performing the last-mile "delivery". The second "information store" variant adopts a concept known as "dematerialisation", substituting information flow for material flow. This variant recognises that material or physical flows are typically more expensive than information flows due to the costs of (un)loading, handling, warehousing, shipping, and product returns. This study found that despite the popularity of online shopping, there are still occasions where consumers favour traditional offline shopping. Perceived or actual difficulties with inspecting non-digital products, the product returns process, or slow and expensive shipping can deter consumers from online shopping. This study also demonstrates other benefits of a pull-centric system, including lower capital investments and possible carry-over effects into in-store sales.

Hybrid system: n-tier to consumer self-help location

The rich literature here mainly compared different modes of reception. Variants typically entailed a part-push and part-pull configuration. For instance, the problem associated with responses within attended home delivery (AHD) can be mitigated by delivering the product to a CDP for consumers to pick up. The literature discussed two CDP variants: CDP-A and CDP-U. It found that retailers establish CDP-A through developing new infrastructure development, through utilising existing facilities, or establishing partnerships with a third party. Other terminologies associated with CDP-A include "click-and-collect", "pickup centre", "click-and-mortar", and "buy-online-pickup-in-store". The literature showed that retailers establish CDP-U (or unattended reception) through independent RBs equipped with a docking mechanism, or shared RBs, whose locations range from private homes to public sites (e.g. petrol kiosks and train stations) accessible by multiple users (McLeod et al., 2006). These CDP-A and CDP-U strategies are commonly adopted by multi/omnichannel retailers to exploit their existing store networks, to provide convenience to consumers through ancillary delivery services, and to expedite returns handling. Moreover, the research showed that integrating online technologies with physical infrastructures enables

retailers to achieve synergies in cost savings, improved brand differentiation, enhanced consumer trust, and market extension. Studies have also investigated the cost advantage and operational efficiencies of using CDP-U over AHD and CDP-A. CDP-U reduces home delivery costs by up to 60 per cent, primarily by exploiting time window benefit.

Critical design variables associated with LML systems

The literature survey also revealed that there is a set of design variables associated with LML systems, and that different permutations of these variables correspond to different LML structures. An initial grouping of the design variables suggests that they are in relation to either merchant-oriented (e.g., response time), customer/market-oriented (e.g., market density), or merchandise-oriented (e.g., freshness). Accordingly, these variables are introduced in these three groups, and would be discussed in detail with their connections to the different LML structures.

Merchant-oriented design variables

Order visibility

Order visibility is the easiest to provide if a LML model can be simplified as merely two connected nodes, with the one being a node of merchandise source, and the other being a node of merchandise
destination. For instance, the LML model featured with distributor source and third-party logistics (3PL) delivery can be simplified as a 2-node network comprising a distributor (the node of merchandise
source) and a customer home (the node merchandise destination), and therefore can provide high order visibility. This is because, in order to provide visibility, one has to integrate the information systems of all the 'nodes' involved in a LML network; a 2-node LML network is the easiest to integrate, and a multiple-node network should provide lower order visibility. In addition, for the LML models featured with customer pickup, high visibility must be strived for, owing to the fact that the pickup process will not be operational unless advance customer notification is properly given.

Reliability

3PL delivery is subjected to certain external conditions such as strikes, seasonal mailing bottlenecks, whilst self-delivery is not. As a result, those LML models whose merchandise is delivered by merchants’

own fleet can provide higher reliability level than those LML models whose merchandise is delivered by a 3PL.

Response time

The companies targeting the customers who value short response time can achieve the goal by reducing unnecessary transportation time and by localising their operations with the merchandise sourced closer to customer homes. As a result, the LML models with their merchandise closely sourced can provide shorter response time than those with their merchandise remotely sourced. In addition, if a LML system is considered as a network formed by 'nodes' and 'ties', respectively representing the steps of 'processing' and 'transporting', the more 'nodes' there are in a LML network, the longer the response time is likely to be, since movement discontinues at the nodes when processing takes place. In the “in-transit merge” model, merchandise coming from different manufacturers is temporarily held at distribution centre for final assembly. This arrangement will lead to longer response time in comparison with, for example, that of the “drop shipping” model whose merchandise is delivered directly from manufacturers to customers.

Returnability

The point from which merchandise is sourced should be the one at which the merchandise is to be processed for return. Relating to this, if a merchandise sourcing point is far from its customer, the returned merchandise will be transported for long distance to be processed; the return operation thus becomes expensive and high returnability becomes difficult to provide. As mentioned in the previous section from a customer's point of view, a manufacturer is usually further away than a distributor, and a distributor is usually further away than a retailer. Therefore the returnability provided by a LML model with the merchandise sourced from a manufacturer should be lower than that provided by a LML model with merchandise sourced from a distributor. By extension, the returnability provided by a LML model with the merchandise sourced from a distributor should be lower than that provided by LML models with merchandise sourced from a retailer. In addition, a LML model with its merchandise delivered by the merchant's own fleet can provide higher returnability than one that is outsourced, in that the customers can return unsatisfactory merchandise directly to the fleet making deliveries. Likewise, a LML model with an element of customer pick up can provide higher returnability than one without, as the returns can potentially be handled at the pickup sites, which are usually located in proximity from customer homes.

Merchandise-oriented design variables

Variety and availability

In general, a manufacturer holds inventory of greater variety and quantity than a distributor does, since the former occupies a more central position in the LML network and is responsible for a wider range of customers; so does a distributor when compared with a retailer. Therefore, a manufacturer, a distributor and a retailer provide merchandise variety and availability in a descending order. Moreover, the LML models featured with 3PL delivery can provide greater variety than others, given the fact that a 3PL is a specialist carrier and is highly equipped to carry more different kinds of merchandise.

Margin

The LML models with central merchandise sourcing point, such as ''in-transit merge'' model and ''drop shipping'' model, are appropriate for merchandise of high value. This is because, the benefits from inventory aggregation are high, and the customers are willing to tolerate longer response time. By comparison, those LML models with local merchandise sourcing point are compatible with merchandise that can generate higher revenue and offset the lower aggregation benefits. Such merchandise can either be of high margin and low demand volume, or of low margin and high demand volume. In other words, these LML models can accommodate the merchandise of both high and low margin, depending upon the revenue level the merchandise can generate. In addition, in terms of means of delivery, those LML models with a customer pickup element are more suitable for higher margin merchandise due to the extra cost incurred in a pickup facilitation process, e.g., carrying bulky merchandise from warehouse to pickup lane.

Freshness

Merchandise freshness level is influenced by the duration from the moment merchandise is fully manufactured to the moment when the merchandise arrives at customer homes. It can be twofold:

(1) shipping distance between manufacturer and customer home; and (2) shipping 'directness' as to whether merchandise is shipped to customer home directly, or through one or more 'stops' for additional processing. Obviously, the longer the shipping distance is, or the greater the shipping directness is, the higher the freshness level would be, and vice versa. Firstly, related to

(1) shipping distance, those LML models in connection with the manufacturers (regardless of whether the manufacturers are within or beyond the defined LML boundary) that are locally based can provide higher freshness level than those LML models in connection with the manufacturers that are remotely based. Secondly, related to (2) shipping 'directness', those LML models that 'stop' less often en route, e.g., ''drop shipping'' model which 'stop' nowhere, can provide higher freshness level than those LML models which 'stop' more often en route, e.g., ''in-transit merge'' model which 'stops' at distributor for
the purpose of merchandise merging.

Customer/market-oriented design variables

Availability of time
Those LML models (i.e., pull-centric or hybrid) with a customer pickup element are suitable for customers with high availability of time, as extra time must be spent on picking up orders. Whereas LML models with direct delivery (i.e., push-centric) are better suited for customers with low availability of time.

Customer convenience
Customer convenience is normally excellent for LML models featured with direct delivery (to customer homes), since almost no physical effort is required from the customers. By comparison, LML models
featured with customer pickup worsen customer experience, as it is essential for the customers to physically travel to the pickup sites.

Demand Volume
High demand merchandise should be sourced locally and closer to customer homes, so as to avoid unnecessary transportation cost and to achieve shorter response time. On the contrary, low demand merchandise should normally be stored centrally, in order to offer large geographical coverage and to gain benefit through aggregation. Exceptionally, it is possible for low demand but high margin merchandise to be sourced locally, since the benefit gained through the high margin may offset the loss incurred through the localised storage structure.

Market Density
Market density is closely related to means of delivery, and the key lies in fleet usage efficiency. When market density is high, merchant's own fleet can be efficiently utilised. On the other hand, when market density is low, 3PL can be shared by multiple merchandise types or companies to maintain fleet usage

efficiency. Accordingly, Those LML models whose merchandise is directly delivered to customer homes, i.e., by merchant's own fleet, correspond to 'high' market density; whilst those LML models whose merchandise is indirectly delivered to customer homes (i.e., by 3PL) correspond to 'low' market density.

Development of LML design framework

This section addresses the second and third research questions by developing a framework that contributes to LML design practice. The development process is governed by contingency theory, in which "fit" is a central concept. The contingency theory maintains that structural, contextual, and environmental variables should fit with one another to produce organisational effectiveness. The management literature conceptualises fit as profile deviation in terms of the degree of consistency across multiple dimensions of organisational design and context. The probability of organisational effectiveness increases as the fit between the different types of variables increases. In this paper, the environmental and contextual variables are jointly branded as contingency variables since the object was to examine how these variables impact the structural form of LML distribution. We developed the LML design framework in two steps. First, we synthesised a set of LML structural and contingency variables and established the relationship between these through a review of the LML literature. Second, we reformulated the descriptive (i.e. science-mode) knowledge obtained via the first step into prescriptive (i.e. design-mode) knowledge. We adopted the contingency perspective in combination with approach to inform knowledge reformulation.

Last mile delivery had broadly been divided into the following two major sectors:

1.) E-Commerce

2.) Consumer Retail

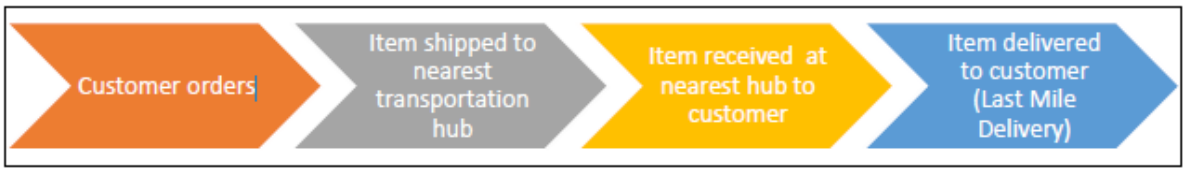


Figure 1 – The Order – Delivery Cycle

SECTOR-WISE CHALLENGES

E-Commerce

E-commerce is one of the major sector involving the role of logistics, particularly in last mile. Experts believe the share of last mile in E-commerce delivery comes around to be 45%(Figure 2), which is more than the hauling, collecting & sorting

Pilot Surveys

189 E-customers and 20 LSPs were contacted for a survey to identify the various problems faced by them in the Last Mile.

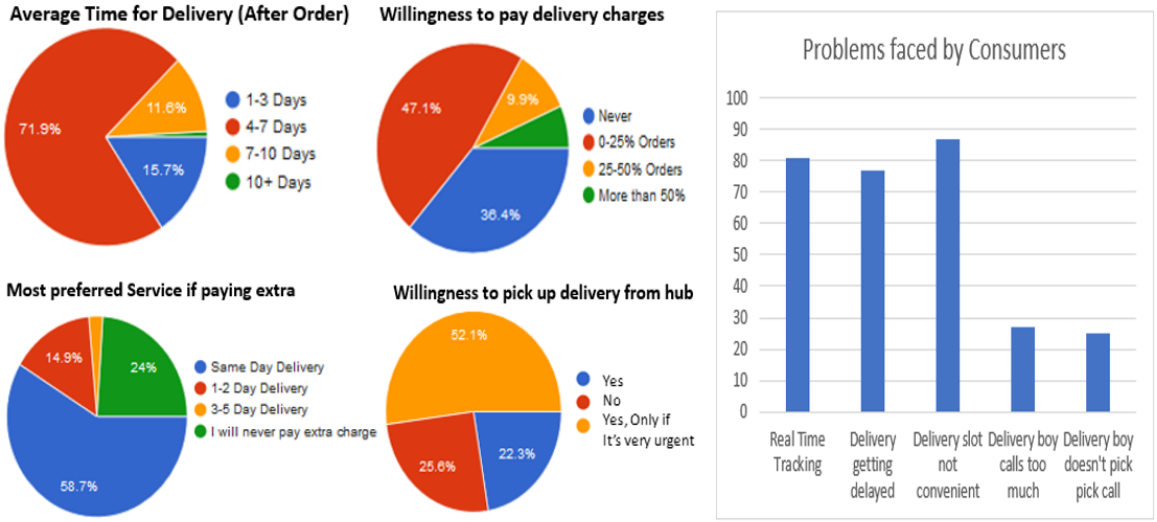


Figure 3 – Consumer Survey Results

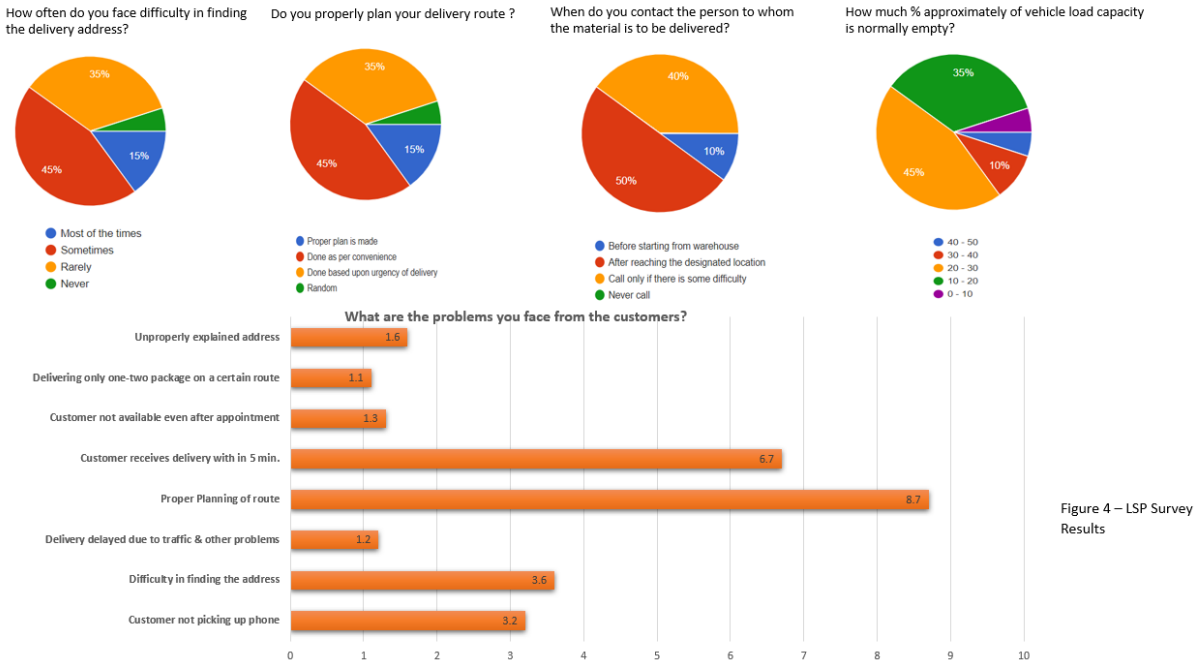


Figure 4 – LSP Survey Results

Major Challenges:

Figure 5 : Last Mile Delivery Challenges

a.) No Real Time Visibility & Customer Friction

Problem

Customers want **full, real-time visibility** of their orders including the exact time of delivery. Presently status shows *out for delivery* but has not real time feed which 42.32% of the respondents highlighted as a problem. For 26.4%, to and fro calls to delivery person were problematic.

Current State

Real time visibility is available for trains and even cabs, but not for parcels.

Differentiating Solution

Usage of GPS enabled vehicles, real time tracking (on maps) can be provided. Uber revolutionized taxi services by providing real-time location of the cab.

b.) Missed Delivery

Problem

As per reports [2], for every 100 deliveries, the delivery person makes 140-150 visits. These gets increased in case of small towns and rural areas. Reasons for this can be rescheduling or receiver not available, etc. This significantly add to the

costs. 41.2% of the respondents said that their deliveries got delayed and 44.97% reported the delivery slot to be not as per their convenience.

Current State
If delivery is missed, reattempt is done.

Differentiating Solutions:

i) Digital Lockers

A digital locker at a locations like local market a colony or *kirana* stores, will allow the customers to pick up the parcel as per their convenience. A barcode can be used to unlock the locker and get theparcel in a safe and secure manner [3][4]. This will not only help in reducing the rescheduling costs but will also offer flexibility to customers.

ii) Premium Scheduled Deliveries

76.5% of respondents are ready to pay extra charges if the delivery slot is as per their convenience. So either LSPs can schedule delivery with the desired time slot or by taking prior appointment with customers.

iii) Delivery Partners

An LSP service provider (like Doorman in USA) can pick-up deliveries for the customer from various places and then deliver to the customer on desired time-slot.

c.) Address Issues & Customer Nuances

Problem
Median area covered by a pin-code in India is 90 sq.-km which may contain up to a million households. Additionally there are house numbers and landmarks which are either inaccurate or confusing. Finding the address is time consuming and frequent calling to customers for directions often irritates them.

Current State

The LSPs have to rely on help from nearby people or calling the customer to get the address which results in waste of time.

Differentiating Solution

The customer can share the live location and hence be tracked using GPS thus reducing the need for frequent calling. This will enhance consumer satisfaction. [3]

d.) Challenge #4 – Low Volume Density & Incorrect Orders

Problem

This challenge can be presented in three different scenarios

i i) A typical route having very less volume of deliveries, especially in case of rural & suburbs

ii ii) Delivery vehicle going partially empty

iii iii) Consignment bookings being taken by LSP but not being delivered to consignee due to no delivery location

Status Enquiry made on Oct 06,2018 at 14:38:52

Consignment Details

Way No.	SRT13424888	View	Ref./Folio No		
Origin	Surat		Destination	Surat	

Delivery Details

01/09/2018	09:15	Surat	Despatched to Surat-Abhilasha	ISRT904110
01/09/2018	08:53	Mumbai-Vile Parle	Received at Surat	MVPL8497894
31/08/2018	21:30	Mumbai-Vile Parle	Despatched to Surat	MVPL8558137
29/08/2018	17:38	Raipur	Despatched to Mumbai-Vile Parle	MRPR200387
29/08/2018	16:11	Raipur	No Service Area - Area : Raipur	DRPR251451
25/08/2018	12:39	Raipur	Received at Raipur	MKUR311803148
24/08/2018	17:00	Mumbai-Kurla	Despatched to Raipur	MKUR311803148
24/08/2018	12:39	Mumbai-Kurla	Received at Mumbai-Kurla-KAMANI-OPERATION OFC	IKUR97931667
23/08/2018	23:13	Surat	Despatched to Mumbai-Kurla	MSRT70235724

Current State

There is huge dealignment and mismanagement in these cases. There are many instances of such cases still happening.

Differentiating Solution

Crowdsourcing is the solution to most of these problems. And this domain is scarcely explored in India. It can be done in two ways:

Collaborator or Service Provider.

By being a collaborator like Cargomatic, a firm can connect shippers with carrier companies who have extra space in their vehicles thus delivering their vehicle through them. This service will help increase profits to the transportation companies through lower last mile costs and complete space utilization.[6]

By being a service provider, a firm can contact the major e-commerce players, courier agencies and retailers for deliveries in the areas which are either refused or not feasible to deliver due to low density. In such crowdsourcing model, there is potential for firms to drop packages for each other if they're heading in the same direction, coordinating using an app. This model overcomes practical infrastructure challenges but aggregates high frequency and supports low value horizontal categories like groceries, food delivery, general merchandise, etc.[7] The advantage of this model is its flexibility in supply, especially in covering peaks and troughs, the multipurpose use of certain assets such as cars, as well as the low investment requirements for parcel companies.[9] This will help in collaborative cost reduction, proper scheduling and avoid the chance of multiple delivery attempts thus giving last mile optimization.[5]

Delivery Location	Type	Product	Cost/order	Constraint
Intracity	Same Day Delivery	Grocery	₹65-₹75	Upto 15kgs and 8km
Intracity	Same Day Delivery	Pharmaceuticals	₹50-₹60	NA
Intracity	Same Day Delivery	Food & Beverages	₹40-₹50	Upto 4 kms
			₹ 10	Additional km
Intracity	Same Day Delivery	ECommerce shipments	₹29-₹45	Upto 10kgs
Intracity	Same Day Delivery	Others	₹29-₹45	Upto 10kgs
Intercity	Metro -Metro	Grocery, Food & Beverage	₹ 3,045	Upto 100 kgs
Intercity	Non-Metro - Metro/Non-Metro	Grocery, Food & Beverage	₹ 3,550	Upto 100 kgs
Intercity	Metro -Metro	Ecommerce and Others	₹ 75	Upto 500 gms
Intercity	Non-Metro - Metro/Non-Metro	Ecommerce and Others	₹ 85	Upto 500 gms

CONCLUSION

This paper has conducted a comprehensive literature review on LML definitions, structures and the associated design variables, based upon which a more synthesised LML definition is proposed, and the variances of LML structures against the LML design variables mapped. From the perspective of theoretical contribution, the literature analysis has identified three system dynamics viz. push-centric, pull-centric and hybrid system based on the level of vendor and customer effort, and three clusters of
design variables namely, merchant-oriented, merchandise-oriented, and customer-oriented. A LML design guideline is then proposed following the review, culminating with four future research opportunities. An extension of this review can include return channel as well as consolidation schemes relevant in the LML context.

The logistics sector as whole is expected to grow tremendously in the near future, with e-commerce logistics leading the way. And so will the customer expectations change. The one who will be able to satisfy the changing needs would lead the Logistics Industry.

Currently the scope lies for improvement in present structure including proactive route planning, to develop realistic delivery timelines and select the most efficient driving route before parcel meets the road. Cost reduction at every step and greater consumer satisfaction with more autonomy to them will be the differentiator. The LSP which will explore the scarcely explored avenues and adapt to the changing needs will survive.

The Internet of Things, will enable parcels, vehicles, and collection points to be digitally tagged and tracked. Transportation Management Systems, Analytics, Artificial Intelligence and Blockchain are few technologies which would play a major role in Future Solutions for Last Mile.

Bibliography

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Final

THANK YOU