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A Strategic Model to Improve the Last Mile Delivery Performance in E-commerce Parcel Delivery

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Abstract

Last mile logistics is the most time consuming and expensive stage of the delivery process. Facing the competitiveness of E-commerce with the rapidly fluctuating consumer demand is one of the biggest challenges faced by most of the companies. Further, Last mile delivery performance became the most crucial factor of the relationship between E-commerce retailer and end customer, as it can either establish or break the bond, which directly affects on the reordering decision of the customer. At present, customers have plenty of online buying options to switch up. Therefore, retailers exert pressure on Last mile service providers to optimize their performance. The challenge lies in the reaction of last mile services providers when meeting the requirements of increased parcel demand. Thus, maintaining cost efficiency and high quality of the service are essential for Last mile services providers to succeed in online business. Unfortunately, most of the Last mile strategies fail because of not conducting proper studies on the expectations of key parties; retailers, last mile service providers and customers. This scrutiny focuses on eliminating the inefficiencies in Last mile delivery by identifying the factors that should be considered when implementing a Last mile strategy by analyzing the strengths and weaknesses of current practices through qualitative and quantitative analysis, using key parties engaged in last mile delivery in Sri Lanka. Thematic analysis and regression analysis are used as the main methodologies to identify the relationships within the variables. The strategic model presented by the current scrutiny as the final output can be used

by the Last mile logistics service providers when implementing their Last mile strategies to meet retailer and customer expectations in a cost effective manner.

Keywords: Last mile logistics, E-commerce, Delivery performance

Introduction

1) Last mile delivery

Last mile (LM) is a term used in supply chain management and transportation planning to describe the movement of people and goods from a transportation hub to a final destination in the home [Wikipedia]. When it comes to rural areas, the cost per parcel is high. The key parties engaged in last mile logistics are retailers, LM service provider and customer. Sometimes, the retailer himself does the Last mile delivery while some retailers outsourced that step to 3PL party.

2) E commerce

E commerce refers to the activity of buying or selling of products on online or over the internet. Domestic E-commerce sites have gained a significant growth within the last few years. A wide range of consumer products can be purchased through ecommerce sites including groceries, household items, apparel and electronics.

The current growth and popularity of E-commerce has affected everyday lives of many consumers by providing a wider range of choices, more available information and ease of purchasing. In 2016, global parcels and express volumes increased by about 7.8 percent, compared to the previous year [Statista 2018].Number of parcels distributed worldwide from 2014 to 2016, by sector is 8.95bn and most preferred parcel delivery method is home delivery. **[**Statista 2018]

Due to the growth of online purchasing and delivery markets, and with the rapid increase in order numbers, the retailers are under pressure to manage their stock and to provide efficient delivery in terms of speed, price, service and quality. When it comes to customer satisfaction, delivery has the power to make or break the relationship. The “Last mile” is a logistic concept that involves adapted processes to ensure final delivery is comfortable for customers and efficient. Last mile delivery is the most expensive and time-consuming part of the shipping process. The “Last mile” delivery which accounts for 30% of total E-logistics cost has become one of the bottlenecks of E-commerce. [Wang et al., 2014]. As a share of the total cost of shipping, Last mile delivery costs are substantial, comprising 53% overall [Honeywell, 2016]. With the expected growth of Internet transactions in the future, numbers of companies are trying to expand their presence in the online market through establishment of more virtual stores. However, such initiatives may face many challenges without a thorough understanding of their target markets, as well as adequate knowledge to attract and to retain these consumers.

This paper focuses on proposing a strategic model by balancing the expectations of all key parties engaged in Last mile delivery process. The proposed model can be used by Last mile services providers as a reference, which will cover all the essential aspects in the strategy formulation.

Methodology

The current study proceeded following steps as shown in Figure 1, in order to derive the final strategic model.

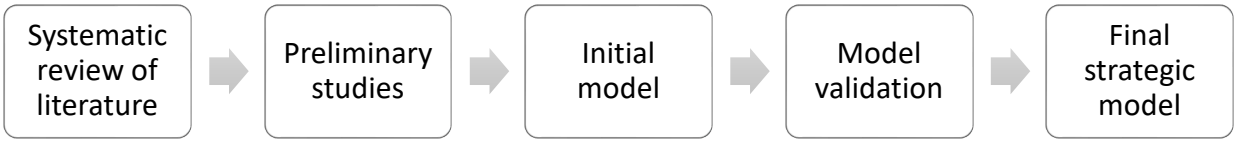

Figure 1 - Methodology

This study started with a systematic review of literature which is based on the content analysis as the approach to gather the state of knowledge in Last mile logistics, performance optimization and e commerce. As the initial step 35 articles were selected relevant to the major areas of study. Among them, 24 articles were selected for further study on their relevance with titles and abstracts by screening the content. The selected articles were scrutinized deeply to eliminate the irrelevant articles from the study. After a deep comprehensive study, 18 articles were identified as relevant articles for the research area and selected for the analysis. Most of the factors and relationships presented through the proposed model are derived based on the literature review.

Secondly, a comprehensive preliminary study has been conducted with one of the leading Last mile services provider in Sri Lanka to understand the current processes and concerns to get a deep understanding about the research domain. Based on the findings of literature review and preliminary study, an initial model has been developed. The data collection and analysis are designed based on the above stated initial model. The collected data are analyzed using both qualitative and quantitatively to arrive at decisions.

The strategic model proposed in the current study, aims at balancing the expectations of all key parties associated with Last mile delivery; E-commerce customer, Last mile service provider and online retailer. Stratified random sampling has been used as the sampling method to select samples from each party and to make sure that every segment is taken in to consideration. The collected data are analyzed using thematic analysis and regression analysis in order to drive conclusions.

The model is validated using several Leading last mile service providing companies which are adopting best practices.

Literature review

The literature review has been conducted under 3 main sub areas as i) Last mile delivery, ii) Behavioral patterns of key parties engaged in Last mile delivery and iii) Factors affecting for the performance of last mile delivery.

1) Last mile delivery

It has been defined that the delivery processes from the moment the parcel is shipped (from the last distribution center) to the moment it is received at customer's home or a collection station. This whole delivery operation is called the Last mile delivery.[Gevaers et al., 2014]. The "Last mile" is a logistic concept that involves adapted processes to ensure final delivery is comfortable for customers and efficient.

Based upon the synthesized analysis, Lim et al., 2015 proposed the following working definition: Last-mile logistics is the last stretch of a business-to-consumer (B2C) parcel. It takes place from the order penetration point (fulfillment centre) to the final consignee's preferred destination point (e.g., home or cluster/collection point), for reception of goods. This definition is more explanatory than the definitions given by Gevaers et al., in their studies. Further, it identifies 3 types of Last-mile distribution structures; (1) push centric - merchandise 'sent' to customer homes by someone other than the customer; (2) pull centric – merchandise 'fetched' from the source of merchandise by the customer; (3) hybrid – merchandise 'sent' to some intermediate site from which the merchandise is 'fetched' by the customer. These 3 types of Last mile distribution structures presented through this research provide comprehensive guidance for future research in Last mile domain.

When considering the affects of infrastructure developments on the Last mile delivery performance, population growth and spatial spread of cities, separately or in isolation from each other are considered by land-use planners as crucial factors. By extension, Last-mile logistics characteristics are neglected by policy makers in the policy-making process [Ewedairo and Chhetri, 2016].Urban freight plays a central role in seamless operations of Last mile delivery, which should take into account when the provisions of urban and land-use planning. The constantly changing transportation systems should be considered while planning Last mile delivery.

2) Behavioral patterns of key parties engaged in Last mile delivery

The main parties engaged in Last mile logistics are Customers, Last mile service providers and Retailers. Based on the behavior of these 3 parties, the effectiveness of last mile delivery differs. So, it is important to understand the various behavior patterns of each of these parties to implement a LM strategy.

An application matrix linking the variables and the structures has been proposed by Lim et al., 2015. According to this model, the critical design variables associated with Last mile logistics systems can be categorized as customer/market-oriented, merchant-oriented or merchandise-oriented. The merchant-oriented design variables are order visibility, reliability, response time and returnability. Merchandise-oriented design variables are variety and availability, margin and freshness. Finally, the customer/market-oriented design variables can be identified as availability of time, customer convenience, demand volume, market density. As this study focused on all key parties

engaged in Last mile logistics, it is very useful for someone to identify variables affecting for Last mile logistics and use them productively in various works.

The view points of consumer and carriers are different about the last mile expectations. .For consumers, the main issues are deliveries that are not on-time, consumers who are not at home or forced to stay at home when delivering, high delivery charge and long delivery time. From the view of carriers, they demanded additional cost for repeated delivery; 12% of delivery has to be done a second time (UK, 2010) and non-deliverables (around 2%) [Visser et al., 2014]

An integrated framework has been offered by Hwang and Jeong, 2014 which is comprehensive enough to understand how variables fit together, and also it provides enough details to investigate sub-domains of online purchase behavior. In this study, a relationship between the use of technology and online purchases has been investigated through mechanisms related to assurance and trust.

Most of the researches are conducted separately to study the behavior and expectations of each parties involved in Last mile logistics. The findings of such researches are described below.

Consumer behavior

A major factor contributing to the success of E-commerce is the speed at which customers receive their orders [Turban et al., 2015], as it directly influences customer satisfaction [Senapati et al., 2012].Customers tend to demand faster deliveries and more delivery schedule reliability [Hülsmann and Windt, 2007]. Also, the customers of E-retailers are demanding same-day deliveries hence, shorter delivery times must be provided in order to receive greater customer satisfaction [Senapati et al., 2012].

The three elements of customer satisfaction are delivery convenience, speed of delivery and delivery reliability [Meuter et al., 2000,]. Delivery speed can be defined as “the time between order taking and customer delivery” [Morash et al., 1996]. Literature shows that for some customer groups, satisfaction can be increased by offering faster deliveries, but other groups do not value speed of deliveries as much [Brusch and Stüber, 2013]. Delivery reliability is defined as “the ability to meet exactly quoted or anticipated delivery dates and quantities” [Morash et al., 1996]. Reliability is also considered as an important factor for customer satisfaction as late arrivals of orders are a significant cause of customer dissatisfaction [Ramanathan, 2010]. It has been mentioned that the delivery reliability is important for customer satisfaction and determines the quality of the delivery [Wang and Xiao, 2015].

To increase effectiveness, the E-commerce strategies should further expand to include aspects of the interpersonal influence of family members related to consumers [Hwang et al., 2014]. Further, it points out that the product variety and customer service are two dominant variables that can also be utilized by companies for success. Hence, expanded product offerings and high quality customer service will help to satisfy customers by meeting their needs and extend their shopping experiences.

Last mile services provider behavior

The most of the researches address LMSP behavior by conducting case studies to evaluate various Last mile delivery modes.

Different Last mile logistics solutions, currently practicing in China have been evaluated by Ding, 2013 referring a case study of SF Express, China. Some of the findings can be adapted to various contexts with few adaptations. Intelligent locker and the pick-up delivery solution can solve Last mile logistics problems by different ways, especially with specific limitations in diverse markets. These delivery alternatives are highly possible to be adopted and generalized by different logistics service providers, if not concerned about the cost or density of orders.

The competitive three "Last mile" delivery modes; attended home delivery (AHD), reception box (RB) and collection-and-delivery points (CDPs) have been evaluated by Wang et al., 2014 in different scenarios, especially in high population density scenario in China. It has been done as an academic study of "Last mile" delivery, which put forward the cost structure of each mode, then reveals the variation tendency of cost, along with the change of order quantity, and further analyzes the competitiveness of each mode in different scenarios. It could provide some theoretical guidance for E-logistic providers.

Retailer behavior

By conducting explorative interviews with grocery retail and logistics experts, a strategic planning framework for grocery retailers has been provided by Hübner et al., 2015. Additionally, it reviews key literature on last mile order fulfillment and retail supply chain management. Last mile design variables identified to develop the model are delivery mode, time, area, returns. This research touches on the fact that the fulfillment and delivery differ by country and a country-by country comparison of individual design choices will help to further investigate drivers.

3) Factors affecting the efficiency of Last mile delivery

When considering why the 'last mile' delivery is so costly and ineffective, it has been found out that the main reasons are: (i) the lack of economies of scale: business-to- consumer deliveries often involve one package per stop, compared with a large number of packages per delivery up to that point, (ii) the difficulty of finding the specific home address of the end consumer, either in large apartment blocks in the city, or in rural areas, where the roads may not have proper signs, and the consumer may live in a remote ranch house or a small community, and (iii) the 'Not at Home Problem', especially when the end consumer needs to sign a receipt confirming delivery, which results high delivery failure and empty trip rates [Deutsch and Golany, 2017]. This is a very worthy finding to be used in the future researches to identify issues in Last mile logistics.

Based on a comprehensive study, it has been suggested that the effectiveness of last mile delivery depends heavily on five key decisions. These decisions include facility location decision: number of distribution centers; inventory decision: inventory in each facility; inventory policy; transportation policy: number of vehicles, route planning, capacity of vehicles and scheduling; and distribution decision [Ewedairo and Chhetri, 2016]. This study can be introduced as a solid study which conducted recently in Last mile logistics area addressing various aspects.

The availability of facilities and light vehicles seem to improve logistics performance [Leonardi et al., 2012]. Quak et al., 2014 reached similar conclusions for Berlin, Germany, with the use of an ex-ante business model tool canvas. With the above findings, it implies that this strategy can be used in different contexts as well.

While neither home delivery nor conventional shopping has an absolute CO2 advantage, on average, the home delivery operation is likely to generate less CO2 than the typical shopping trip. Nevertheless, CO2 emissions per item for intensive/infrequent shopping trips by bus could match online shopping/home delivery [Edwards et al., 2009].

It has been identified that there are 5 innovative factors to concern when implementing Last mile logistics strategies through a literature review. Accordingly, the factors affecting for Last mile logistics are the level of consumer service, security & delivery, geographical area & market density/penetration, Vehicle & technology and the environment [Gevaers et al., 2009]. These factors seem to be used frequently in later researches.

Though various researchers focus on various aspects of Last mile delivery and improving its performance, there is a need of having a proper model that can be easily referred by industry to make sure that the all the essential aspects are covered in their strategy formulation. So the current study is focused on filling that empirical gap.

Results and Discussion

The model (Figure 2) proposed in this research acts as a reference for Last mile services providers in implementing Last mile strategy. The model is developed using the findings of literature review and pilot studies. Basically, it is focusing on facing the challenges proactively with an effective strategy.

In an organization, the strategies drive the operational system which results in the performance. With the emerging competitiveness of E-commerce, the last mile performance became one of the bottlenecks which affects on the reordering decision of customers. Thus, there should be an effective strategy to have an appropriate operational system which decides the way of performing the organization in the industry competitively.

Strategy component of the model refers to the various strategies that should include in the overall strategy of the organization. The business planning, technological and human resources should align to get an operational excellence. Consequently, deciding the effective way to get the operational excellence is based on the capabilities of the company and the competencies of the workforce available. The capabilities of the company can be improved through investments and managers should ensure that they are properly utilized within the organization. Technology aspects provide a good outline to identify what type of technological capabilities should improve to get the competitive advantage. Company should be updated with the available technological trends and should have the capability to adapt them quickly. Human resource (workforce) is the most important strength of an organization. It transforms the static energy to dynamic form which earns revenue. Hence, a company should have a proper human resource management strategy to face the future challenges. The hiring and firing procedures are important to cater the dynamic demand, and it is essential to improve the attitudes and competencies of workers through a proper training policy as they are the only contact point with customers in E-commerce.

Operational system reflects how to align the internal and external factors of the organization in order to meet the customer and retailer expectations in cost effective manner.

Resources utilization is one of the key system indicators which ensure that the available resources are properly operated to meet the overall goals and objectives of the organization. Idling resources are considered as a cost for an organization. Through effective business planning (forecasting), financial and HR strategies, the resources can be utilized effectively and it adds value to the organization.

Service quality aims to improve operations throughout the value chain to deliver products and services that exceed the customer expectations. Therefore, it is considered as a customer indicator. Delivery speed can be defined as "the time between order taking and customer delivery" [Morash et al., 1996]. Further, speed refers to reaching the right hand at the right time at the right place. Security ensures that the parcel is reached to end customer without any damage or misplacement. The delivery method and handling method etc. should be customized according to the product type. Special attention should be paid when delivering fragile goods. On time delivery; delivering at the required time is one of the major aspects that customers expect which is based on the promises with retailer and end customer. 5% of the customers are willing to pay premium for reliable and timed delivery [Honeywell, 2016]. In the terms of service quality, customers have plenty of options to switch up. Therefore, to retain customers, the service quality components should be ensured by effective strategies.

Infrastructure is a fundamental need to operate the business. The number of branches, facilities, number of vehicles etc. is the main business infrastructures that are required for a Last mile company. Leaning the infrastructure to cater the dynamic demand is very important to retain in a competitive business like E-commerce. Information infrastructure refers to the systems available and how it enables the business and individuals to access and make use of data and services. In most cases, these investments become unsuccessful as investors and managers fail to identify where to invest.

Environment impact is another key component of operation system which is typically neglected by the companies in strategy formulation. However, it has currently become a major concern with the emerging green concepts. Customers also trend to select a Last mile service with more green concepts. Hence, focusing on innovative green practices more and more will gain competitive advantage. In scheduling the deliveries, the carbon emission and pollution should be considered and should try to maintain the level as fewer as possible. Further, the type of vehicle used and various components that can be used to minimize the environmental pollution should be taken to consideration in planning an effective strategy. Traffic congestion is another environment impact of Last mile delivery which affects on the general public as well. Congestion occurs when the number of vehicles is on the road at a time exceeds than the average. Accordingly, bad impacts can be minimized by scheduling the deliveries at off peak hours. Hence, only the urgent orders are scheduled in peak hours. On the other hand, it improves the job satisfaction of workers and it minimizes the disappointment occurs while waiting in traffic at peak hours. Likewise, simple actions can finally results important benefits to the organization as well as the entire society. Because a service should ultimately add value and benefit the entire society.

All the parties engaged in entire process should be benefited by a strategy. The key parties engaged in last mile delivery are online retailers, last mile service providers and customers, and the performance refers to achieve the expectations of all parties. The main expectation of last mile services provider is to minimize the cost. Basically, it can be achieved by removing non value adding activities within the entire process and focus more on value adding activities. Adapting lean practices as much as possible can be identified as an effective way of cost reduction. Retailers also expect flexibility in serving their customers as the reordering decision depends on the Last mile conduct.

In service sector customer is considered as the king. Therefore, all the capabilities and strategies should align together to meet customer expectations. Currently, customer has a huge power which decides the conduct of a service. With

the competitiveness of E-commerce, customers have plenty of options to switch up. Therefore, it is very crucial to identify what customers really expect and align the strategies according to them.

The overall message conveyed through the following model (figure 2) is that, the operational system should be aligned properly to meet the expectations of key parties, and that system should depend on the strategies of the organization. Therefore, mangers should focus on implementing an effective strategy after having a proper understanding of the key parties engaged in the Last mile delivery process. The following model provides an overview for that.

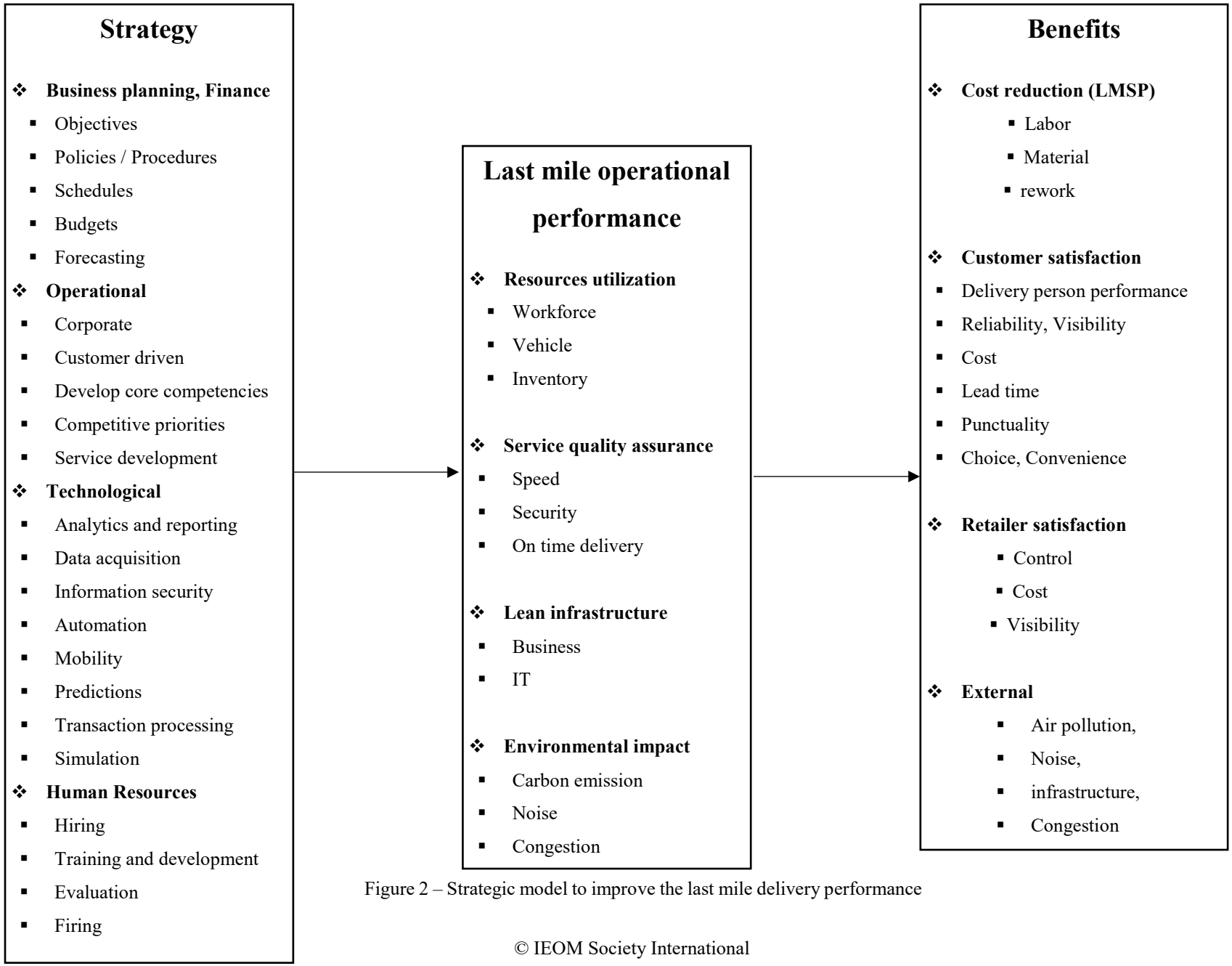

Figure 2 – Strategic model to improve the last mile delivery performance

Conclusions and future works

The strategic model proposed by this research provides an insight to Last mile services providers to plan and implement their strategies to meet customer and retailers expectations in a cost effective manner. Further, this model is developed assuming that the Last mile delivery is done through a 3pl party. Hence, this model can modify in a case where both retailing and delivery are done by the same party. However, making adaptations and taking strategic decision to get competitive advantage might depend on each company. Therefore, each factor should align with the capabilities of the company.

Customer behavior buying patterns change with geographical areas. So, as future works it is proposed that some generic heuristics should be designed for each geographical area. So, those managers can easily refer them to identify how their strategies should align with the expectations of their customers in each region.

Furthermore, with the emerging competitiveness of E-commerce, number of studies are conducted on online shopping environment. These studies can be considered as good motivation for future studies, giving the rising importance of service quality issues in the online shopping environment. Based on this, the need to examine the relationship between the various dimensions of a website interface and purchase behavior is also considered as a research opportunity for the future.

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