



Prioritising customer-focused KPIs for home furniture delivery and assembly service using AHP: A case study of a multinational company in Thailand

Rattikan Jaisankad^{1, 2)}, Suratin Tunyaplin³⁾, Tuangyot Supeekit⁴⁾ and Wirachchaya Chanpuypetch^{*1, 2)}

¹⁾College of Maritime Studies and Management, Chiang Mai University, Samut Sakhon 74000, Thailand

²⁾Graduate School, Chiang Mai University, Chiang Mai 5200, Thailand

³⁾Suwanpisarn Transportation 2010, Co., Ltd., Bangkok 10520, Thailand

⁴⁾Department of Industrial Engineering, Faculty of Engineering, Mahidol University, Nakhon Pathom 73170, Thailand

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Abstract

Nowadays, e-commerce is growing continuously. This has resulted in a significant demand for last-mile delivery services in various business sections to deliver goods to customer homes. For a retail home furnishings business, the last-mile delivery service for this business is specific and different from other parcels. Since furniture can be large, heavy and may require assembly services. Moreover, it is necessary to make an appointment with the customer to determine the exact date and time of service. Front desk staff, drivers, and assembly workers must communicate with customers directly in several stages of the service. Accordingly, customer dissatisfaction can occur with many service activities. This affects the business performance of the last-mile service provider. Thus, the objective of this article is to identify and prioritise customer-focused key performance indicators (KPIs) of last-mile delivery and assembly services for home furniture products. First, customer-focused performance measures were obtained from a literature review and derived from the Supply Chain Operations Reference (SCOR) model regarding reliability (RL) and responsiveness (RS). These measures were then filtered out to identify the KPIs through in-depth interviews with experts in the field. Next, the set of customer-focused KPIs was applied to a multinational company (MNC) in Thailand that provides home furniture delivery and an assembly service. The weights were evaluated by their customers and the respondents who have sufficient experience in home furniture delivery and assembly service through the pairwise comparison method with the AHP technique. Finally, the priority-ranking list of KPIs was obtained which can be used as a tool to improve service performance and customer satisfaction and lead to specify a business strategy. Furthermore, the MNC can apply this approach to re-evaluate the priority weight of customer-focused KPIs for other countries where the company operates such service.

Keywords: Performance measurement, Last-mile delivery service, Multinational company, Home furniture, Supply chain operations reference model, Analytic hierarchy process

1. Introduction

The last-mile delivery (LMD) business is growing fast and expected to grow faster with increasing online shopping customer demand [1]. In 2020 – 2021, the worldwide LMD market size was worth US\$179.96 billion, with 60% concentrated in the Asia Pacific market [2]. The LMD process plays a vital role in the logistics and supply chain, enabling the satisfaction of the end-customer experience, such as availability, information, and delivery time capability [1, 3]. However, a poorly managed process can negatively affect a service provider with financial and reputational losses if it does not meet customer expectations. These losses will multiply even greater if they are high-value products. Moreover, services for goods that require assembly and installation of goods, such as electrical appliances, kitchen sets, or furniture, are more complex than mere last-mile parcel delivery services.

For a retail home furnishings business, the last-mile service provider confronts a different problem from the last-mile parcel delivery service because of large and heavy furniture and the regular need to assemble and install depending on the customer's requirement [4]. Last-mile delivery for this type of goods therefore requires an appointment, time and place of delivery. Thus, it results in dissatisfaction with the customer service if the customer response was poorly met by delayed delivery. Moreover, products can always be damaged during delivery and unloading. The likelihood of damage to the customer's home from the assembly and installation process is also considerable. This damage affects the reliability of the LMD service provider and may adversely affect the product brand since the staff of the LMD service provider will face-to-face with the customer on the doorstep.

As previously mentioned, the customer-focused performance of last-mile delivery service, including the assembly and installation processes, is a focal point of a retail home furnishings business. The LMD service provider must maintain and improve the level of service performance of all operational activities from receiving orders to providing services at the customer's home as well as after-sales service [5, 6]. In particular, responsiveness and reliability primarily affect customer satisfaction. Hence, to maintain and improve the service efficiency of an LMD service provider, operational activities that are directly related to customer-focused performance

*Corresponding author.

Email address: wirachchaya.c@cmu.ac.th

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indicators including reliability and responsiveness must be given special focus. Faulty service activities that can cause a decrease in customer-focused performance should be prevented in advance. In theory, there are a number of performance indicators in the service process that are both internal-and customer-facing. But in practical terms, service providers cannot measure, control, and monitor the performance levels of all those indicators. Accordingly, identifying key performance indicators (KPIs) is a must for an LMD service provider.

Therefore, this study aims to identify and prioritise customer-focused KPIs for a home furniture LMD and assembly service. Customer-focused KPIs will be identified by considering the business process of the MNC case study which provides an LMD and assembly service for home furniture products in Thailand, Singapore, and Malaysia. From the large number of available theoretical indicators, we filter and evaluate these customer-focused performance measures using the integrative multi-criteria decision analysis (MCDA) technique and the analytic hierarchy process (AHP). AHP is a well-known and effective MCDA method that is frequently applied to develop performance measurement models in various business sectors. Businesses can recognise the level of importance of the KPIs and must focus on controlling and monitoring them. This leads to the formulation of a plan to prevent service failures that can affect customer service satisfaction and decrease service performance.

This article is organised as follows. Section 2 introduces the literature review. Next, the proposed methodology is described in Section 3. Then, in Section 4 the results and discussion are elaborated. Finally, Section 5 presents the research conclusions.

2. Literature review

2.1 The Supply Chain Operations Reference (SCOR) model

The Supply Chain Operations Reference (SCOR) model, also known as a model that references supply chain operations, represents the organisation of business activities related to every process that meets the needs of the customer as well as the payment process. The SCOR framework is comprised of six standard supply chain operation processes including planning, sourcing, making, delivery, returns, and enabling. These processes are linked with performance metrics, best practices as well as the use of technologies that support communication between operators and customers of that process [7]. In previous work, the SCOR model is frequently applied to numerous manufacturing and services industrial sectors, such as the automotive industry [7], healthcare [6], as well as LMD services [4]. It is a common language that is easy to understand and used to create standard supply chain processes [7].

In the context of last-mile delivery service, Tunyaplin and Chanpuypetch [4] adopted the SCOR model to develop the performance measurement framework for home furniture LMD and assembly services. The four process levels of the SCOR model that represent the core processes are associated with planning, sourcing, delivery, and returns. The service provider can look at the management overview linked to both internal-facing (cost and asset) and customer-facing (reliability and responsiveness) performance attributes throughout the supply chain. As can be seen in Tunyaplin and Chanpuypetch [4], the proposed performance measurement framework has not yet been used to specifically focus on customer-oriented regarding reliability (RL) and responsiveness (RS), which are very important for a last-mile delivery service business. Moreover, it also does not clearly show a link back to the processes involved in those KPIs. The SCOR-based business process of home furniture LMD and assembly service (LMDA) integrates all stages of their operations, from order receiving to the doorstep of the customer's home, as shown in Figure 1.

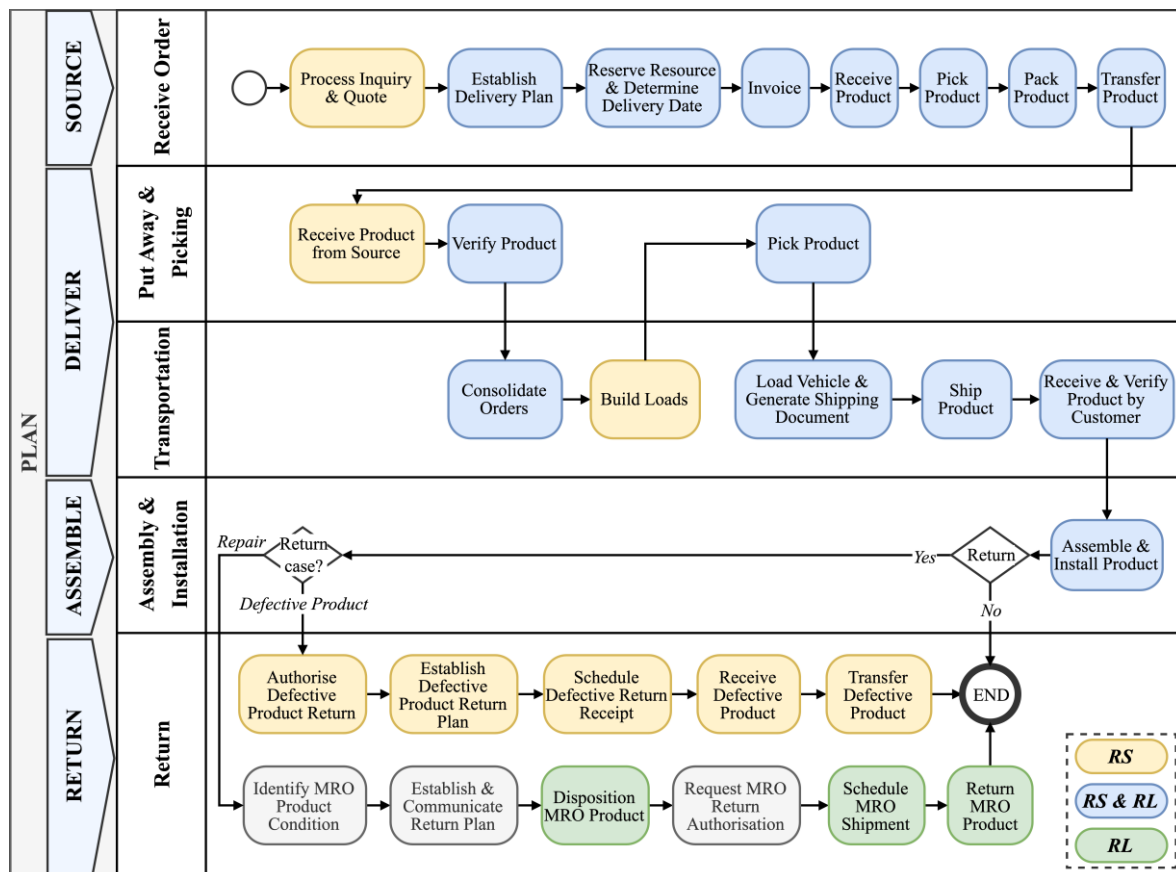


Figure 1 The SCOR-based business process of a home furniture LMDA service

Therefore, this study aims to extend the performance measurement framework developed from past research. Customer-focused performance measures for LMDA service of home furniture products are specifically focused to determine the set of customer-focused KPIs for this service.

2.2 Analytic Hierarchy Process (AHP)

The analytic hierarchy process (AHP) is one of the most widely used MCDA methods [8]. AHP is a multi-criteria selection approach suitable for dealing with complex systems. AHP provides choices from several alternatives, which provide a comparison of the considered options. Thomas L. Saaty first proposed the AHP in the 1970s. The use of AHP is dictated by the subdivision of the problem into a hierarchical shape, the rational analysis of the situation by breaking it into sections, and also techniques to address complicated problems with many outcomes that influence decision-making.

The AHP can be used to analyse different social, political, economic, and technological problems. It uses both qualitative and quantitative variables. The possibility of connecting information that is based on prior knowledge to produce decisions or that is acquired from the application of other tools is the essential principle underlying the analysis. The AHP method is becoming more popular in logistics and supply chain problems. This approach supports a decision maker to select the most appropriate third-party logistics service provider based on crucial criteria, including quality and reliability [9].

Milosevic et al. [10] prioritised metrics concerned with logistics planning to transform a smart city using AHP. Local government can consider the proposed rank of criteria to develop a suitable action plan. To enable the delivery of online orders, Amchang et al. [11] developed an AHP-based decision-making framework to analyse locational preferences for last-mile delivery centres (LMDC) in urban logistics networks. Experts in the logistics sector, particularly those in Thailand express delivery enterprises, have prioritised a list of variables for LMDC placement depending on referrals. In addition, they have integrated AHP into other techniques to improve decision-making in logistics supply chain problems. Ma et al. [12] provided an integrated SERVQUAL-AHP-TOPSIS approach to evaluate the quality of service (QoS) of the city express industry to identify the service quality of delivery service. The QoS criteria system was first established using SERVQUAL-based dimensions. The AHP method was then used to calculate the relative weights of the criteria. Finally, the two stages are then incorporated into the TOPSIS steps to assess the customer service of the expedited solution.

The performance measurement can be very helpful to conduct a valuation of the LMDA service of home furniture products. They serve as the foundation for identifying effective or inefficient service. The proper directions for improving the organisation can be determined by considering numerically key performance indicators (KPIs) that can be measured. However, in the LMDA process for home furniture products, there are many different performance metrics. Due to the high management cost and the difficulty in the performance follow-up an entrepreneur is unable to operate their business with the goal of simultaneously achieving PMs. Hence, a prioritising study of PMs to determine the key performance indicators (KPIs) of the customer satisfaction process with the AHP technique has been widely used in logistics and supply chains.

3. Methodology

3.1 Determining the customer-focused performance metrics (PMs)

First, we understood the business process of LMDA service for home furniture products through the previous study [4], as shown in Figure 1. Based on the SCOR-based business process from the previous work, the customer-focused PMs were then specifically determined by retrieving the metrics that link to all activities under the processes of planning, sourcing, delivery, and returns. At this stage, we can attain a large number of customer-focused PMs regarding RL and RS aspects. Additionally, to increase the specificity of a third-party logistics (3PL) in last-mile delivery, the 7 "Rights" of Logistics (7Rs) that are defined by The Chartered Institute of Logistics and Transport UK were included. The 7Rs consist of Right product, Right quantity, Right conviction, Right customer, Right place, Right time, and Right cost [13]. Moreover, relevant academic research was also considered to determine the PMs of LMDA service for home furniture products.

3.2 Identifying the customer-focused KPIs

Next, a long list of customer-focused PMs attained from the previous stage was filtered out to identify them as the KPIs by experts in the field. The eight experts were selected and invited by ease of convenience and ability to contact them. They include both Thai and MNC entrepreneurs with experience in the business of logistics services related to transportation, assembly, and installation activities for more than 5 to 30 years. Their positions include managing director, manager, as well as business consultant in the logistics and transportation field. For data collection, a questionnaire was used with several Yes/No questions in combination with in-depth interviews to evaluate the importance of each PM. 'Yes' answers, indicate that the experts are of the opinion that a certain PM is important for the business, while a 'No' answer is the reverse. The evaluated score is then calculated as the percentage of agreement with 'Yes' answers. The PMs were then sorted from the initial evaluation by experts including helpful suggestions. The top-ranking PMs can be taken into account as a set of customer-focused KPIs.

3.3 Prioritising the weights of customer-focused KPIs using AHP

From the previous step, we can recognise the initial priority rank of the customer-focused PMs. However, we cannot know the difference in priority of those PMs. Thus, to more effectively identify KPIs, the AHP technique was applied to allocate weight to the top-ranking PMs that were determined by experts in the prior step. According to the AHP approach, this technique is designed to measure the users' perceptions of relative importance through a pair-wise comparison. However, AHP is suitable for evaluating no more than nine criteria. Hence, the top nine PMs with the highest average rating scores were selected as the KPIs. They were arranged to the AHP-based hierarchically structure of the KPIs that were linked to the related process for LMDA services of home furniture products. Then the relative importance of the KPIs is evaluated to allocate weights for each KPI through the pairwise comparison method in the AHP using a nine-point numerical scale, as shown in Table 1.

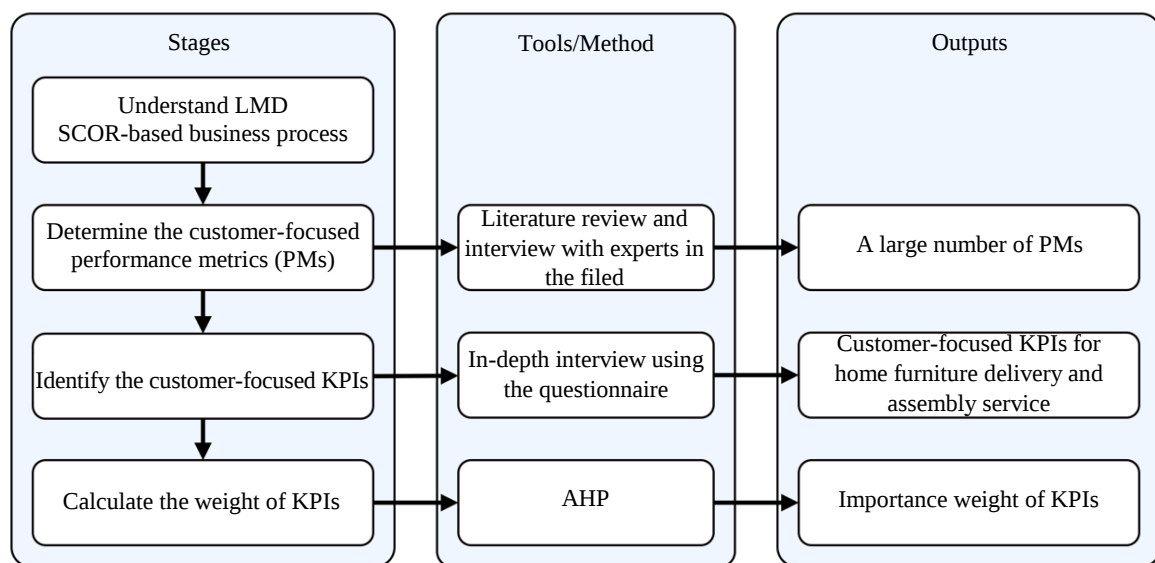
Table 1 Saaty's pairwise comparison nine-point scale [8].

Intensity of importance	Definition
1	Equal importance
3	Moderate importance
5	Strong importance
7	Very strong importance
9	Extreme importance
2, 4, 6, 8	Intermediate values between two adjacent judgements

In the evaluating process, two groups of participants were assigned to evaluate the relative importance of the KPIs. For the first group, the 12 logistics service providers were selected by ease of convenience and ability to contact them. These organisations have experience in providing delivery and assembly services for furniture products in both Thailand and multiple countries. The participants in this group cover both the managerial level and the operational staff. An AHP pair-wise comparison questionnaire was delivered via phone-based interviews. Oral consent to participate in the telephone interview was obtained.

Data was also collected from more than 30 experienced customers who have previously received delivery and assembly services for furniture products. For data collection, we created an online pair-wise comparison questionnaire using Google Forms. This questionnaire, including a consent statement for participation in the research was publicly distributed online. Finally, the relative weights obtained from two groups of participants were taken to average by the geometric mean method. The important weights of the nine customer-focused KPIs for a LMDA service of home furniture products could then be ranked.

As described in this section, the methodological framework is illustrated in Figure 2.

**Figure 2** The methodological framework.

4. Results and discussion

4.1 Customer-focused PMs for a home furniture LMDA service

First, the customer-focused PMs regarding reliability (RL) and responsiveness (RS) were extracted from the SCOR model, relying on the SCOR-based business process of home furniture delivery and assembly service including sourcing, delivery, and returns [4]. To be specific to this business, we pulled out the assembly and installation process as one more core process. Besides, we also gathered more related PMs from literature. A large number of customer-focused PMs related to the home furniture LMDA service can be initially recognised. The researchers then synthesised the duplication of metrics which were derived from various sources to reduce the number of PMs. Consequently, 23 customer-focused PMs can be obtained as shown in Table 2. They come under the customer management dimension of serviceability and delivery.

Table 2 Customer-focused PMs for a home furniture LMDA service.

SCOR-based Business process	Customer-focused PMs	Sources
Source (S)	1) Fill rate; 2) Percentage of faultless invoice; 3) Customer order documentation accuracy; 4) Order fulfilment cycle time	[4, 14-19]
Deliver (D)	5) Order received defect free; 6) Order received damage free; 7) Documentation accuracy; 8) Product data quality; 9) Delivery performance to customer; 10) Perfect condition; 11) Delivery item accuracy; 12) Delivery location accuracy; 13) Delivery quantity accuracy; 14) Orders delivered damage-free conformance; 15) Number of deliveries platforms; 16) Customer commit date	[4, 13-18, 20-24]
Assemble (A)	17) Perfect condition; 18) Faultless installations; 19) Install product cycle time	[4, 15, 25, 26]
Return (R)	20) Identified products returned to service; 21) Shipping schedules that support customer required return by date; 22) Error-free return shipped; 23) Return shipments shipped on time	[4, 17, 18]

Thereafter, these 23 PMs were initially filtered out to reduce the number of PMs for the analysis phase of KPIs identification in the next step. A group interview was conducted with three executives of the case study companies of LMDA service providers which lasted for approximately 1.5 hours via an online meeting application. From discussion and synthesising together during the interview, related PMs were combined. The 13 PMs the executives decided should be used as important indicators have been raised, and the names of the metrics have been adapted to be more appropriate for the LMDA service business.

In the sourcing process, three PMs were concentrated. The PM of 'perfect condition of packaging' is additionally considered. The packaging condition of various components of the received customer's products must be in perfect condition while waiting for loading and delivery. The number of boxes for each customer order must be complete and their condition must not damage the parts inside. For a LMDA service business, the executives combined two PMs including fill rate and order fulfilment cycle time to be a single PM of 'an achievement of products preparation for logistics plan'. A company can arrange a physical set of furniture products of each customer's delivery order to deliver according to the logistics plan and meet the customer's appointment schedule. For the PM of 'delivery order data accuracy', it is associated with the PMs of 'percentage of faultless invoice' and 'customer order documentation accuracy'.

For delivery process, the PMs of 'delivery location accuracy' and 'delivery quantity accuracy' are merged with the PM of 'order delivery in-full to the right place'. This is because one furniture item consists of several parts which are packed in different boxes. Thus, if one of the parts is missing or shipped to the wrong place, the furniture item cannot be assembled at that time. The PM of 'customer commit date' has been adjusted to the term 'on-time delivery' to make it easier to understand for operational staff. Lastly, the relevant PMs related to damage of goods from the delivery process were integrated to the PM of 'damage-free delivery order'. All items (products and packaging) delivered to the customer should be free of damage or not destroyed during shipping. The three PMs can be concentrated for the delivery process of a LMDA service.

Next, for the assembly process the executives agreed to pull this process considering it as the one core process of a LMDA service. Based on the PMs obtained from the review, two PMs were considered including 'perfect condition' and 'faultless installation'. They are combined as 'perfect assembly and installation order'. Besides, the additional two PMs were specifically raised from the executives for LMDA service business, namely 'assembly and installation site damage' and 'staff behaviour'. In the process of assembling and installing, wall piercing is required for some furniture products. Likewise, large and heavy products are difficult to move which can cause damage to the customer's home. Moreover, assembly workers have to perform their tasks inside the customer's home for a period of time. Accordingly, proper behaviour of assembly staff is important to consider.

For the last process, three PMs are concerned with return. For the service time dimension, the PM of 'return shipment on time' is considered. This is because of the need to schedule a prior meeting with the customer. Customer waiting at this stage should not be the same as for the delivery process. Likewise, the return process should not take a long time, especially where a product needs to be replaced and a new item must be shipped back. The PM of 'return processing cycle time' is also included. For the last one, the PM of 'return shipment error' is considered. Errors in both receiving returns and delivering new items back to the customer should not occur.

As described above, the 13 customer-focused PMs for a home furniture LMDA service were obtained through a group interview and discussion. These 13 PMs were then considered as a candidate for use in determining as KPIs using the AHP technique. However, the AHP is not suitable for evaluating more than nine criteria. Therefore, nine PMs were selected by experts in the field through questionnaire responses and in-depth interviews as depicted in Section 3.2. As a result, the score of each PM is expressed as the percentage that the respondents agreed them as is important KPIs. We then presented the percentage of agreement and their sorting scores on the importance of each PM by experts in Table 3 and Figure 3, respectively.

Table 3 Percentage of expert agreement on the importance of each PM.

SCOR-based Business process	PMs	Description	% in agreement
Source (S)	1) Achievement of product preparation for logistics plan	A company can arrange a physical set of furniture products of each customer's delivery order in order to deliver according to the logistics plan and meet the customer's appointment schedule.	87.5
	2) Delivery order data accuracy	Product delivery efficiency is impacted by the accuracy and completeness of the customer's information.	87.5
	3) Perfect condition of packaging	The packaging condition of various components of the received customer's products must be in perfect condition while waiting for loading and delivery.	62.3
Deliver (D)	4) Order delivery in-full to the right place	The customer's products are delivered in all components or boxes of furniture products to the right place.	100
	5) On-time delivery	The customer order shipped on the requested delivery date and time.	100
	6) Damage-free delivery order	All items (products and packaging) delivered to the customer are free of damage and not destroyed during shipping.	87.50
Assemble (A)	7) Perfect assembly and installation order	The customer's products are assembled and installed without errors.	100.00
	8) Assembly and installation product cycle time	The actual time spent working on providing a service for assembly and installation a product.	25.00
	9) Assembly and installation site damage	Damage to the customer's home may be caused by the installation process or the movement of products.	75.00
	10) Staff behaviour	Appropriateness of assembly workers behaviour while working at the customer's home.	75.00
Return (R)	11) Return shipments shipped on time	The customer return order shipped on the requested return date and time.	50.00
	12) Return processing cycle time	The actual time spent working on providing a service to return a product.	25.00
	13) Return shipment error	Errors in the return process from receiving the returned item at the customer's home and return the new item back to the customer as well as communications related to the return process.	87.50

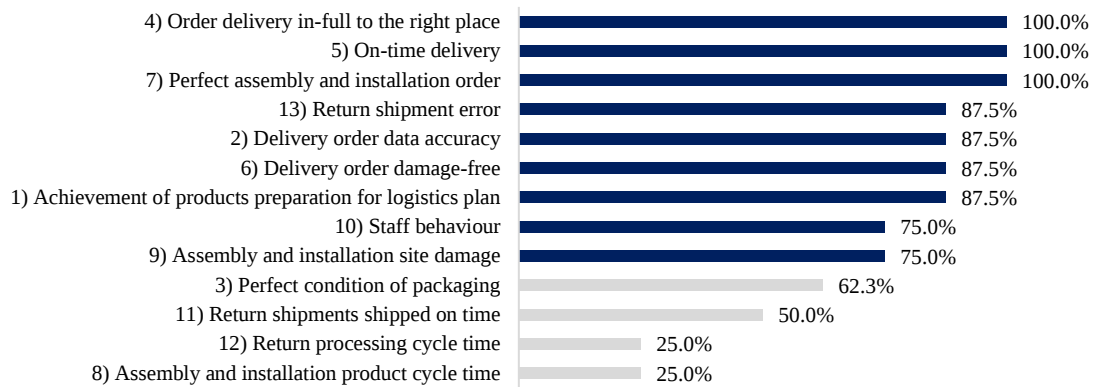


Figure 3 Sorting the percentage of experts' agreement on the importance of each customer-focused PMs for a home furniture LMDA service

As illustrated in Figure 3, all experts agreed on the importance of three PMs relating to the delivery and assembly processes. They include the KPIs of 'order delivery in-full to the right place', 'on-time delivery', and 'perfect assembly and installation order'. There are four PMs related to the second order that have a score of 87.5% each, including the KPIs "Achievement of products preparation for logistics plan", "delivery order data accuracy", and "return shipment error". The last two PMs that experts agree on as important indicators are: 'staff behaviour' and 'assembly and installation site damage'. Subsequently, these nine PMs with the highest scores of agreement on their importance are considered as the initial customer-focused KPIs for a LMDA service of home furniture products for AHP analysis.

4.2 Customer-focused KPIs for a LMD and assembly service of home furniture products

The nine KPIs under the four main processes including sourcing, delivery, assembly, and returns were identified from the previous section. For the source process, two KPIs were identified including 'achievement of products preparation delivery plan' and 'delivery order data accuracy'. Next, there are three KPIs related to the delivery process namely 'order delivery in-full to the right place', 'on-time delivery', and 'damage-free delivery order'. During the assembly process, three KPIs were recognised, which are 'Perfect assembly and installation order', 'assembly and installation site damage' and 'staff behaviour'. Finally, the return process concerns one KPI as 'return shipment error'. The hierarchical structure of the nine customer-focused KPIs for a LMDA service of home furniture products is presented in Figure 4.

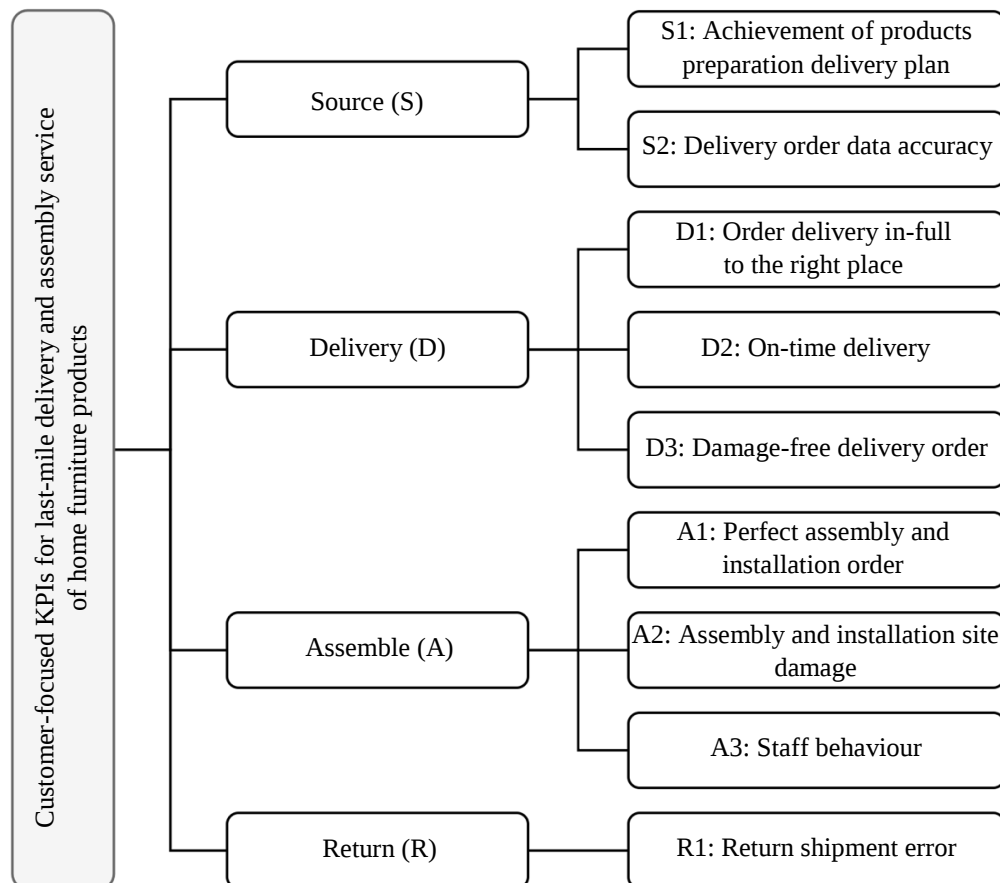


Figure 4 The hierarchical structure of customer-focused KPIs for a LMDA service of home furniture products

The definitions of all KPIs are described in the form of data that a service provider must collect and how they are measured through a calculated formula, as presented in Table 4. These nine customer-focused KPIs will be prioritised using AHP in the following step.

Table 4 The definition of nine customer-focused KPIs for a home furniture LMDA service

SCOR-based business process	Customer-focused KPIs		Definition
Source (S)	S1	Achievement of products preparation for logistics plan	Percentage of orders that a company can arrange a physical set of furniture product items according to the delivery plan. Calculation: $[\text{Total number of orders delivered is according to the plan}] / [\text{Total number of orders according to the delivery plan}] \times 100\%$
	S2	Delivery order data accuracy	Percentage of delivery order with complete and accurate of the customers' information Calculation: $[\text{Total number of delivery orders with accurate customer data}] / [\text{Total number of orders delivered}] \times 100\%$
Deliver (D)	D1	Order delivery in-full to the right place	Percentage of orders for which all components or boxes of the furniture items are received by the customer in the quantities committed at the right place. Calculation: $[\text{Total number of order delivered in full to the right place}] / [\text{Total number of orders delivered}] \times 100\%$
	D2	On-time delivery	Percentage of orders that are shipped on the customer's request date and time. Calculation: $[\text{Total number of order delivered on the requested date and time}] / [\text{Total number of orders delivered}] \times 100\%$
	D3	Damage-free delivery order	Percentage of orders delivered in undamaged stage and accepted by the customer. Calculation: $[\text{Total number of orders delivered in perfect condition}] / [\text{Total number of orders delivered}] \times 100\%$
Assemble (A)	A1	Perfect assembly and installation order	Percentage of orders faultlessly assembled and installed and accepted by the customer. Calculation: $[\text{Total number of orders assembled and installed in perfect condition}] / [\text{Total number of orders assembled and installed}] \times 100\%$
	A2	Assembly and installation site damage	Percentage of orders assembled and installed that have not been complained in a damaged of the customer's home. Calculation: $[\text{Total number of orders assembled and installed without complaint in a damage of the customer's home}] / [\text{Total number of orders assembled and installed}] \times 100\%$
	A3	Staff behaviour	Percentage of orders assembled and installed that have not been complained in inappropriate behaviour of staffs while working at the customer's home. Calculation: $[\text{Total number of orders assembled and installed without complaint in an inappropriate behaviour of staffs while working at the customer's home}] / [\text{Total number of orders assembled and installed}] \times 100\%$
Return (R)	R1	Return shipment error	Percentage of orders returned without errors and accepted by the customer. Calculation: $[\text{Total number of orders returned without errors}] / [\text{Total number of orders returned}] \times 100\%$

4.3 Evaluation of priority weights on KPIs using AHP

In this section, the nine KPIs are prioritised through a Multi-Criteria Decision Analysis (MCDA) method. The Analytic Hierarchy Process (AHP) was applied in this study which is one of the most popular decision-making tools, with the factors evaluated based on the decision-makers experience and knowledge [27].

This analysis aims to identify the weight of KPIs. In the evaluating process, two groups of participants were considered to evaluate the relative importance of KPIs through the pairwise comparison method in the AHP. First, 12 logistics and transport services providers with experience in providing delivery and assembly services for furniture products in both Thailand and multiple countries consented to participate by phone-based interview with the AHP pairwise comparison questionnaire. Second, the pairwise comparison results were collected from customers who previously received delivery and assembly services for furniture products via a public online questionnaire using Google Forms. As an example AHP question, if the KPI of 'D1-Order delivery in-full to the right place' is compared with 'D2-on-time delivery', the respondent has to select which of the two they believe to be more important. Then the 9-point levels (as seen in Table 1) that describe the intensity of your stated importance is determined, i.e. we said, 'D1-Order delivery in-full to the right place' is five times more important than 'D2-on-time delivery'.

After that, the pairwise comparison between any pair of KPIs obtained by each participant were calculated to determine the weight of the importance of each KPI according to the AHP calculation procedure. In the AHP by Saaty [8], to ensure the consistent judgements of respondents, the consistency index (C.I.) and consistency ratio (C.R.) of the pairwise comparison matrix was computed. The degree of C.R. must be less than 0.1 ($CR \leq 0.1$) to accept the calculated weights. In contrast, if the degree of C.R. exceeds 0.1, the comparison result may be unreliable [28]. The respondent must re-evaluate their comparison or abandon the results of that evaluation. As a result, 52 sets of relative weights can be taken from 12 logistics services providers and 40 experienced customer participants. Next, the method of geometric mean was used to calculate average weights. This approach is most useful when values tend to make large fluctuations. As a result, the top-three priority ranking of customer-focused KPIs for LMDA service of home furniture products are 'D1-order delivery in-full to the right place (0.126)', 'A1-perfect assembly and installation order (0.124)', and 'D3- damage-free delivery order (0.120)', respectively. The relative weights of customer-focused KPIs for LMDA service of home furniture products from the AHP method as presented in Figure 5.



Figure 5 The relative weights of KPIs for a LMDA service of home furniture products from AHP.

According to the study results, two core processes including delivery and assembly should be concentrated on since these are the specificity of this service business. For the assembly process, the KPI 'A1-perfect assembly and installation order' is also one of the top three indicators of an organisation's efficiency. Both service providers and customers expect that the products must be perfectly assembled and installed. Customers are very satisfied if their orders do not encounter any faults. Typically, in any delivery service, delivery performance is mainly concerned. For this business, the two most important KPIs of the delivery process consist of 'D1-order delivery in full to the right place' and 'D3- damage-free delivery order'. These KPIs measure the number of orders delivered with the right quantity of the correct products at the right place without damage during shipping. These are the top three performance indicators that an LMDA service provider should seriously maintain and improve to enhance customer satisfaction.

The results of studies this study shows that from the perspective of business owners, and other employees of the company, they want to perform their duties to the best of their abilities. At the same time, the customer needs to receive a perfect, correct, and complete product. Therefore, the six other KPIs are also identified as important customer-focused indicators for this business. Customer satisfaction may weaken if these KPIs are terrible. This set of KPIs can be used to improve service performance and customer satisfaction and specify a business strategy. Implementing such a strategy can help a business become more reliable, and be responsive to customer demands which can result in customer satisfaction and loyalty, thereby returning the focus back to the service and public relations of those customers. Furthermore, the MNC can apply this approach to re-evaluate the priority weight of customer-focused KPIs for other countries where the company provides service.

5. Conclusions

This study aimed to identify and prioritise customer-focused KPIs of LMDA service for home furniture products. A large set of PMs was initially taken from the literature reviews and derived from the Supply Chain Operations Reference (SCOR) model, focusing on reliability (RL) and responsiveness (RS). These attributes are the driving force behind generating satisfied customers through all the processes [4]. There are many performance metrics at every stage; from when an order is received, through product delivery and assembly, to product return if necessary. However, in the real world, there is no business organisation that can collect the data and measure every theoretical performance metric. Thus, the set of customer-focused KPIs for the MNC of a LMDA service for home furniture products was identified through in-depth interviews with experts in the field. Then, the priority-ranking list of the identified nine KPIs can be obtained through the AHP technique.

6. Acknowledgements

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7. Ethical approval

This study was performed in accordance with the declarations of Helsinki. The research design and ethical considerations were reviewed and approved by the Chiang Mai University Research Ethics Committee (Protocol number: CMUREC No.65/077).

8. References

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