

**PROACTIVE CUSTOMER SERVICE OPERATIONS  
DEVELOPMENT FOR AN AUTOMOTIVE TYRE SERVICE  
CENTRE**

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การพัฒนาการปฏิบัติงานบริการลูกค้าเชิงรุกสำหรับศูนย์บริการยางรถยนต์



วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิศวกรรมศาสตรมหาบัณฑิต

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ลิขสิทธิ์ของจุฬาลงกรณ์มหาวิทยาลัย



สุทธิดา วิทยาพิเชฐ : การพัฒนาการปฏิบัติงานบริการลูกค้าเชิงรุกสำหรับศูนย์บริการยางรถยนต์. ( PROACTIVE CUSTOMER SERVICE OPERATIONS DEVELOPMENT FOR AN AUTOMOTIVE TYRE SERVICE CENTRE) อ.ที่ปรึกษาหลัก : ศ. ดร.

ปารเมศ ชูติมา

งานวิจัยครั้งนี้มีวัตถุประสงค์เพื่อสร้างรูปแบบการบริการลูกค้ารูปแบบใหม่ในระบบการจัดการยานพาหนะสำหรับบริษัท A ซึ่งเป็นศูนย์บริการยางรถยนต์ โดยเปลี่ยนการบริหารงานของบริษัทเป็นการจัดการแบบเชิงรุก โดยการพัฒนาความสัมพันธ์กับลูกค้า การวิจัยนี้เน้นเจาะกลุ่มลูกค้าที่เป็นบริษัทเอกชนที่มียานพาหนะขนาดใหญ่จำนวนมากเป็นหลัก เพื่อเพิ่มความเชื่อมั่นในกลุ่มลูกค้าหลักของบริษัท ดังนั้น การออกแบบงานวิจัยนี้ได้ นำ แบบจำลองธุรกิจแบบตีนผ้าใบ (Business Model Canvas: BMC) มาเป็นกรอบความคิดในการทำวิจัยครั้งนี้ และ มีการประยุกต์แนวคิดการบริหารสินค้าคงคลังที่จัดการโดยผู้ส่งมอบ (Vendor Managed Inventory: VMI) มาพัฒนาให้เป็นการบริหารจัดการด้านบริการที่จัดการโดยผู้ส่งมอบ (Vendor Managed Service: VMS) ซึ่งมีการให้บริการทั้งในด้านการตรวจสภาพยางรถยนต์ และการวิเคราะห์ข้อมูล นอกจากนี้ยังมีการรวบรวมข้อมูลด้วยวิธีการสัมภาษณ์ การสนทนากลุ่มและการวิเคราะห์เกณฑ์มาตรฐาน (Benchmarking) เพื่อพัฒนาแบบจำลอง พร้อมทั้งมีการประเมินผลความสามารถของแบบจำลองจากการทดลองกับสถานการณ์จริง โดยมีการวัดประเมินด้วยการจัดทำแผนที่เส้นทางลูกค้า (Customer Journey Mapping: CJM) ผลที่ได้พบว่าบริการรูปแบบใหม่ทำให้ลูกค้าได้เห็นข้อมูลการใช้ยางรถยนต์ชัดเจนขึ้น และทำให้รู้สาเหตุของปัญหาที่เกิดขึ้นจากการใช้งาน ซึ่งลูกค้าสามารถนำข้อมูลเหล่านั้นมาปรับแก้ไขเพื่อเพิ่มผลผลิตการทำงานของลูกค้าให้สูงที่สุด พร้อมทั้งช่วยในการหลีกเลี่ยงการหยุดงานและช่วยลดภาระค่าใช้จ่ายที่ไม่จำเป็น อีกทั้งทำให้ลูกค้ามีความพึงพอใจในการบริการของบริษัทและตัดสินใจกลับมาใช้บริการอีกครั้ง ดังนั้นจะเห็นได้ว่าการบริการรูปแบบใหม่ที่ได้วิจัยนี้มีการปรับปรุงการจัดการของบริษัทให้มีการจัดการเชิงรุกมากขึ้น โดยมีการพัฒนาการจัดการสินค้าคงคลังเพื่อเก็บสต็อกสินค้าตามตารางการกำหนดการบำรุงรักษา และยังมีมีการพัฒนาการบริการเชิงรุกเพื่อให้ลูกค้าไว้วางใจในการบริการของบริษัท พร้อมทั้งเพิ่มความผูกพันกับลูกค้าเพื่อให้ได้รับความเชื่อมั่นจากลูกค้ามากขึ้น แต่อย่างไรก็ตาม ควรมีการพัฒนาการบริการอย่างต่อเนื่องเพื่อเพิ่มความพึงพอใจของลูกค้าในตลาดการแข่งขันที่สูง ดังนั้นการวิจัยเพิ่มเติมควรพิจารณาปรับปรุงรูปแบบการบริการลูกค้าสำหรับการจัดการยานพาหนะโดยสร้างรูปแบบการบริการลูกค้าแบบผสมผสานจากการบริการการจัดการยานพาหนะที่มีอยู่ และนอกจากนี้ ควรมีการสร้างแรงจูงใจในการมีส่วนร่วมของลูกค้าเพื่อเพิ่มความไว้วางใจและความเชื่อมั่นของลูกค้าที่มีต่อบริษัท ทำให้เกิดการบริการที่ยั่งยืนได้ต่อไป

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ลายมือชื่อนิติศ .....  
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Advisor: Prof. Dr. PARAMES CHUTIMA

The purpose of this research is to create new customer service model in fleet management for Company A which is the automotive tyre service centre due to change the company administration to be proactive management by developing relationship with customers. Also, the research focuses on customers in private companies, which are fleets of large vehicles, in order to maximize customer loyalty with the main customer group of company. Therefore, the design of this research used Business Model Canvas (BMC) to be the structure of the research and adapting Vendor Managed Inventory (VMI) concept to develop in the form of Vendor Managed Service (VMS) which provided tyre inspection and data analysis. Also, information gathering was gathered to interview and focus group methods and benchmark analysis to develop the model. Moreover, Customer Journey Mapping (CJM) was used to evaluate the result of model performance from market experiment in real-situation. As a result, the new service model provided demonstrative visible data in tyre utilization and root-cause of problems for customers so these maximized customers' productivity to avoid breakdown and reduce unnecessary cost. Also, it made customer satisfaction in company service and made decision to come back for re-purchasing. In conclusion, the new service model enhanced company management to be more proactive management which helped improve inventory management to hold stock following schedule service maintenance. Moreover, proactive service helped ensure make customer trust in company service and enhanced customer engagement leading to customer loyalty. However, there should be continuous development in order to maximize customer satisfaction in competitive market. Consequently, further research should be considerations in improvement of customer service model for fleet management by creating mixed customer service model from existing fleet management service. Also, there should be motivations of customer engagement due to maximize customer trust and loyalty for sustainable service provision.

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# Chapter 1

## Introduction

### 1.1 Introduction and general background

In Thailand, automotive industry is the one of significant sector in Thai economy and Thailand is one of top leading manufacturer group in South East Asia. As can be seen, the automotive industry includes the production of motorcycles, passenger cars and trucks (light commercial vehicles, buses & coaches and heavy trucks). According to market line data, there was a fluctuation between moderate and strong value growth since 2015 until 2019. Obviously, there was total revenues around 1,416.5 billion THB which consisted 49% of motorcycle, 20.1% of car and 30.8% of truck manufacturing. However, in 2020, there was a big challenge of COVID-19 situation which have affected a lot of countries around the world for a dramatic drop of automotive production. Also, Thailand has been affected by the drop in industry's expected value whereby the forecast value would be around 1,259.2 billion THB or -11.1% of growth rate. [1]

In the same vein, the tyre industry in Thailand is affected from this situation. As is well known, the tyre industry in Thailand is the leading group of tyre production in the world since there are many reasons including the leading raw material production of tyre (rubber), cheap labour cost and geographical advantage position in the ASEAN region. As a result, there are many global players in Thailand tyre market including Michelin, Bridgestone, Continental, Goodyear, Yokohama and etc. so all of these make highly competitive tyre market. In addition, Thailand is the one of leading tyre export group to many counties around the world such as USA, Europe, Australia, Japan and etc.

According to tyre analysis in 2019, there was a slight recession at the middle year of 2019 because of US-China trade war that there was total amount of tyre production around 107,056,965 tyres including 70% of passenger vehicle tyres, 17% of

light commercial vehicle tyres and 13% of heavy truck and bus tyres. [2] After that, the tyre industry faced a huge effect from COVID-19 pandemic since April 2020 so this cause made a dramatically dropping tyre production and affected to be recession and decrease revenue in wide effects.

To similar with Phuket situation, it can be known that Phuket is one of province in southern of Thailand which is a largest island and the total area is around 543 square kilometers which is slightly smaller than Singapore. Also, there are population around 416,582 people in 2019 and a lot of other national people such as Thais, Chinese, Muslims (mostly is Malaysians), Chao Le (people who live across many archipelagoes and Phuket Sea), Europeans and etc. In addition, Phuket is the famous tourism location from Thai people and foreigners around the world which there are more than three million tourists to visit in Phuket and there is growing up every year. Also, Phuket is the significant province of Thailand to make Thailand's revenue in top three provinces. [3]

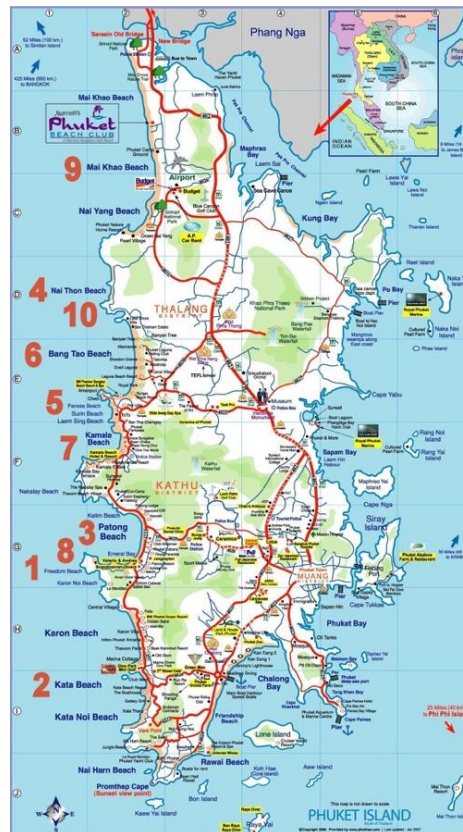


Figure 1.1 Phuket map

Source Available from: <https://www.pinterest.com/pin/162903711510866595/>  
[Accessed 3 November 2020] [4]

Moving on to Phuket economy, it can be known that this area is the famous tourism location so there are a lot of people living including localists, tourists, investors, employees and etc. so there is also a large number of vehicle usage.

**Table 1.1** The number of registered vehicles in Phuket in 2019

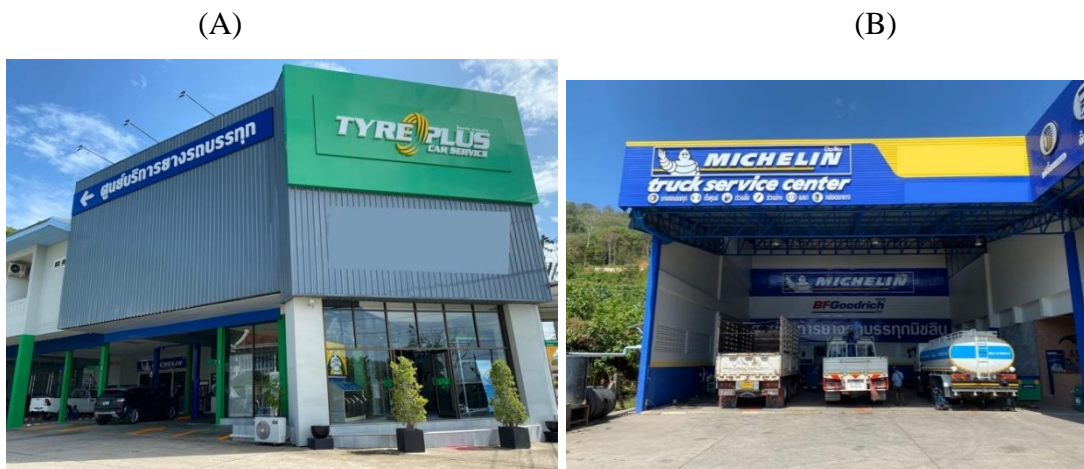
Type of vehicle	Amount
<b>Small vehicle</b>	
Small car (less than 7 passengers)	144,119
Large car (more than 7 passengers)	3,181
<b>Large vehicle</b>	
Truck	47,664
Bus	9,574
<b>Total</b>	<b>204,538</b>

Source Department of Land Transport in Phuket website [5,6]

However, the current situation about COVID-19 is cause of Phuket economy to dramatically drop. Obviously, Gross Provincial Product (GPP) of Phuket in 2019 was around 212,036 million baht, however, GPP in 2020 was at 87,350 million baht which dropped around 58.8%. [7] As a result, all of businesses in Phuket including tourism, hotel & resort, residential real estate, wholesale & retail, general service and etc. is impacted by this current situation and also, Company A is one of business in Phuket which is affected.

Company A is one of the automotive tyre service centers in Phuket and is located in Phuket town in area around 3,200 square meters. Also, Company A has been providing tyre service and being retailer for over 60 years with professional management in knowledges and experiences about tyre products and services. In addition, Company A is separated into two service zones including small vehicle service (cars, light trucks, vans and SUVs: Sport Utility vehicles) and large vehicle service (heavy trucks, trailers, buses and coaches). Furthermore, the company is the Michelin dealer in both of small vehicle and large vehicle services which are Tyreplus car service centre and Michelin truck service centre respectively. Therefore, Company A provides all of automotive tyre products and offers all of service about including changing, repairing, balancing, alignment and fixing suspensions. Additionally, there are provision and service in non-tyre products such as battery, windshield, brake pad, shock, engine oil and other lubricants to service in one stop service of automotive centre. Besides, Company A has partnerships to support from many reputed tyre manufacturers such as Michelin, Bridgestone, Continental and etc. in order to share the tyre knowledge and know-how which are about training technicians, sharing the direction of tyre industry and advising in new innovation about tyre products.





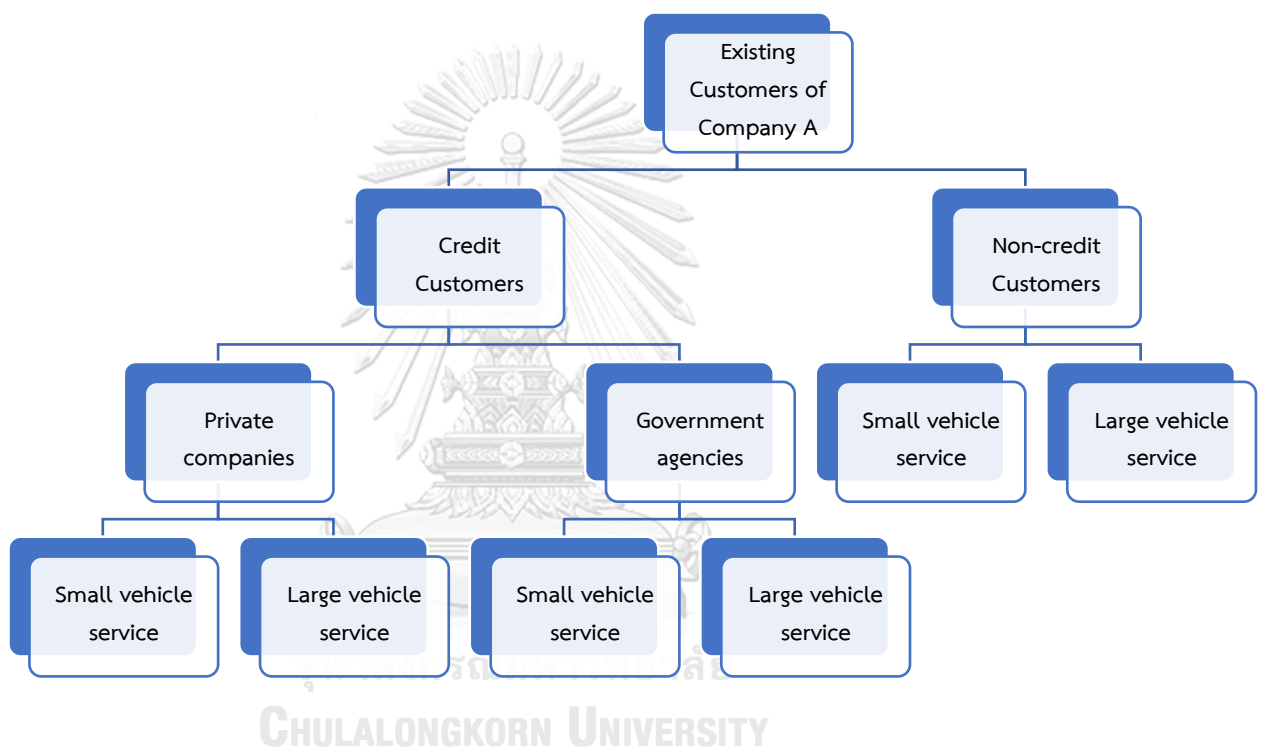
**Figure 1.2** Tyreplus car service for small vehicle service zone (A) and Michelin truck service centre for large vehicle service zone (B)

However, the current situation of Company A is poor operation in reactive management which provides products and services for customers in the centre only that means the current service affects to weaken relationship with customers. Moreover, there are currently a lot of automotive service centers including brand companies (B-Quick, Cockpit and etc.) and local companies so this is a significant factor to easily lose customers to competitors. In addition, COVID-19 situation seriously influences to customers' behavior to be carefully in purchasing products. Therefore, Company A is facing in critical challenges in both of economic recession and a lot of competitors in the market. As a result, the company should create the new business strategy in order to change administrated style to be more proactive and strengthen relationship with customers for maximizing company performance and enhancing sustainable service.

## 1.2 Problem Statement

According to existing customers of Company A, there are separated into two main sectors including credit and non-credit customers. That means, the credit customer sector is customers who have account with the company and the company provides credit and term of credit in payment for this customer sector. So, credit customers of Company A are private companies and government agencies. In contrast, for the non-

credit customer sector there is no account for these customers since they drive in the centre and have to pay at that time. However, both type of customer sectors (credit and non-credit customers) may be further separated into two services which are small vehicle service and large vehicle service. To be clear, small vehicles mean cars, light trucks, vans and SUVs while large vehicles mean heavy trucks, trailers, buses and coaches.



**Figure 1.3** Classification in existing customers of Company A

Then, choosing target customer group is a significant consideration. According to company's finance between January 2019 and June 2020, it can be shown that the revenue of credit customers was 36,634,530 baht or around 56.0% of the total of all revenue while non-credit customers was 28,761,912 baht or approximately 44% as shown in Table. 1.2. As a result, the research would focus on the credit customer group because there was a higher revenue than another group by around 12%. Moreover, currently Company A has been impacted by economy recession because the number of

non-credit customers has been fluctuated so this is one of the reasons that Company A should develop the relationship with credit customers in order to strengthen customer base on long term service.

**Table 1.2** Total revenue in each customer group from January 2019 until June 2020

<b>Revenue of Company A from January 2019 until June 2020</b>			
<b>Credit customers</b>			
Small vehicles in private companies	THB	2,617,751.00	4.00 %
Large vehicles in private companies	THB	29,768,499.00	45.52 %
Small vehicles in government agencies	THB	585,290.00	0.89 %
Large vehicles in government agencies	THB	3,662,990.00	5.60 %
<b>Total of credit customers</b>	<b>THB</b>	<b>36,634,530.00</b>	<b>56.02 %</b>
<b>Non-credit customers</b>			
Small vehicles in general customers	THB	18,080,290.00	27.65 %
Large vehicles in general customers	THB	10,681,622.00	16.33 %
<b>Total of non-credit customers</b>	<b>THB</b>	<b>28,761,912.00</b>	<b>43.98 %</b>
<b>Total of all revenue</b>	<b>THB</b>	<b>65,396,442.00</b>	<b>100.00 %</b>

Source Account of Company A

In addition, the credit customer sector includes private companies and government agencies. However, government agencies are a small market in Phuket area comparing with private companies and also, there are many regulations for trading with government agencies, so, it is difficult to build relationship with them. Furthermore, the customer group of large vehicles in private companies shows a large ratio of all revenue at 45.5% of the total. As a result, this is the largest group of Company A that the company should develop closer relationship with them.

As it is, the target private companies are operating in fleet management which there are belonging a lot of large vehicles in the company. Referring to the experience of Company A, most of this customer group lacks knowledge and time to manage and operate tyre utilization in highly efficient performance of products. So, this is the gap that Company A can offer a service in order to help and manage tyre utilization in high efficiency and effectiveness. Moreover, this solution is able to enhance customer's productivity by minimizing risk and breakdown of work.

To summary, the research of this case study focuses on the large vehicles in private companies which is the credit customer group of Company A because of the largest sector of company revenue. Additionally, development of relationship with this customer group provides to change company's administration to become proactive management since the company is able to know customers' requirements and can reduce customer's pain point to maximize customers' satisfactions. Also, the new customer service in fleet management can strengthen sustainable service provision.

### **1.3 Overall Objective**

This research aims to create new customer service for fleet management to compete in the highly competitive market. Therefore, the overall objective is as follows:

- To initiate company's administration to become proactive management by developing new customer service model which provides fleet management service due to build stronger relationship with customers.

### **1.4 Specific objectives**

This statement is about specific objectives of new service solution which is about fleet management for tyre service as shown:

1. To develop fleet management for tyre service which helps customers in managing and enhancing efficient tyre utilization due to maximize customers' satisfactions in company service.
2. To develop company's administration in more proactive management by applying benefits from relationship between the company and the customers.

### **1.5 Scope of Research**

The research focuses on to develop administration of Company A from reactive management to transform proactive management by creating a new customer service model for fleet management service. Also, this service model provides to strengthen relationship with customers and maximize customer loyalty in order to enhance sustainable service division.

As a result, the scope of research is to study in Company A case study which is one of the automotive tyre service centers in Phuket, South of Thailand in order to develop company management. Also, the research covers to create the new customer service model in fleet management for main customer group of company A which is private companies belonging a lot of large vehicles. In addition, there is information gathering with stakeholders including company A experts, target customers and tyre experts due to build the new service model. Moreover, the boundary of research is covered in a market experiment with existing customer of company to test the model performance in real-situation and there is data collection for one month to analyze and evaluate results for comparing between traditional and new services. Furthermore, the limitation of research is based on company performance in current situation and also, there are external factors to influence for model creation including economic recession and Covid-19 paramedic situation.

## 1.6 Expected Outcomes

As a result of research, there are three main expected outcomes to approach research's achievements which are:

1. The relationship between Company A and customers would be strengthened leading to closer and sustainable service provision.
2. The Company A administration would be transformed into proactive management resulting in further strengthening the company performance.
3. Efficient performance and effective use of existing resources would be enhanced for fleet management service

## **Chapter 2**

### **Literature Review**

For this chapter, it explains about literature reviews that are about fleet management and related methods for the research. To start with fleet management, there are descriptions about definition, methodology and benefits of fleet management, especially, fleet maintenance management. Another section is related methods which there are three significant methods for this research. Firstly, Vendor Managed Inventory (VMI) is explained in the concept of VMI in order to apply and develop for the new customer service. Secondly, Business Model Canvas (BMC) is shown the structure of a business model due to complete all of relevant elements to build the business model. Finally, Customer Journey Mapping (CJM) is a visible customer's perspective in storytelling so CJM reflects customer satisfaction in the new service model.

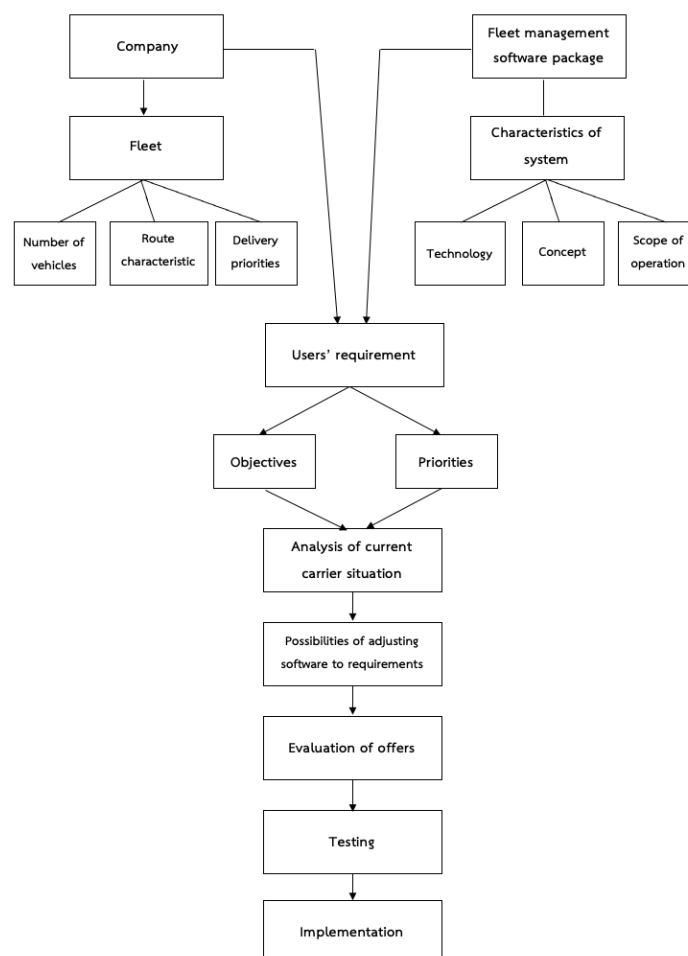
#### **2.1 Fleet management review**

Fleet management is a process which the business uses to manage all fleet and asset information since acquisition until disposal because it enables to reduce operational costs, improve efficiency and ensure operation across in fleet management. Moreover, the fleet management system is suitable for transport companies or other companies belonging the large number of vehicles since the advantages of implementing the fleet management are to improve business operation and save operational cost. So, this section is described a methodology in introducing fleet management and benefits of fleet maintenance management.

##### **2.1.1 Methodology in introducing fleet management**

According to the introduction of fleet management system, it is the operation between company and fleet management software package which the software will support the company operation due to maximize efficiency and effectiveness. So, there are various types of characteristics in fleet management including size of fleet, scope

of operation, method of delivery and type of transported cargo. Similarly, the type of fleet management software package depends on characteristic system which includes technology, concept and scope of operation. Therefore, there is a consideration which chooses characteristic system to match the optimal operation of fleet management. Also, there are divided into three phases of methodology in introducing fleet management. Firstly, it is necessary to clarify clearly the definition in objectives and expectations in introducing fleet management. While, it has to understand possibilities of individual information for technology system because solutions are able to be offered and possibilities of adaptation. Secondly, there are a transition to analyze costs and estimation of equipment suppliers in operation with priorities of the company in fleet management. Finally, there is a testing of solution with a sample vehicle group in order to analyze hidden factors and technical support before implementation. [8]



**Figure 2.1** Procedure of fleet management implementation

Source Methodology of Introduction Fleet Management System [8]



### **2.1.2 Fleet maintenance management**

According to the fleet maintenance management, there is the improvement of maintenance system in one of all advantages and it is a critical importance since there is a relevant between operational cost and schedule-based maintenance programs. Obviously, the well-planned and carefully scheduled maintenance process influence to provide effective and reliable service. [9-12] That means it can increase productivity and reduce maintenance expenditures which minimizes vehicle downtime during operation and optimizes maintenance labor cost and life cycle of parts. [13,14]. Moreover, there are benefits for customers which increase satisfactions in safer and more reliable in the service. [15]

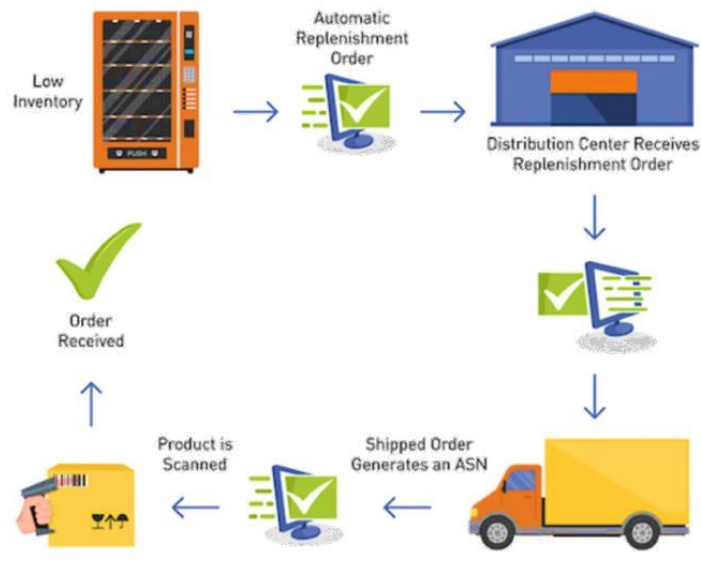
## **2.2 Related methods**

### **2.2.1 Vendor Managed Inventory (VMI)**

Vendor Managed Inventory (VMI) system is one of inventory operational model in supply chain management which the aim is to reduce operational cost for both of suppliers and users (retailers). The system allows suppliers to help their users to manage inventories and make decision in replenishment instead of them. Obviously, this system provides different traditional supply chain management that the traditional supply chain allows to make users' decisions by themselves to fill inventory stock and optimize own profit. In contrast, VMI provides information sharing which suppliers are able to access in demand information and make decision to replenish inventory based on agreed limited amount of volume. [16]

The VMI system provides a lot of benefits in both of suppliers and users. To start with, there is accurate data transfer which the information between suppliers and users is shared in accuracy and effectiveness without distorted demand information so this can reduce telecommunication cost and enhance in high efficiency. [17,18] Secondly, VMI helps reduce in less amount of stock out which can save inventory cost for users and strengthen customer service levels. Lastly, VMI provides in long run

increasing benefits between suppliers and buyers which there is great relationship together. Clearly, buyers can save their operational cost while suppliers can sell their products. [19]



**Figure 2.2** Vendor Managed Inventory process

**Source** Available at: <https://www.ebnonline.com/pathguides-advanced-vendor-managed-inventory-vmi-solution-offers-distributors-complete-visibility-into-suppliers-management-of-inventory/#> [Accessed 10 November 2020]. [20]

### 2.2.2 Business Model Canvas (BMC)

Business Model Canvas (BMC) is one of the strategic managements which utilizes to create a business strategy and describes how the business is able to create, deliver and gain value from customers. Also, BMC is a visual framework to express descriptions in all relationships with related the business including the business infrastructures, offering in value propositions, customers and finances. [21] So, there are nine related blocks in BMC which are;

## 1. Customers

### 1.1. Customer segments

This part is about target customer group who a company wants to reach, and create value so there are different types which depends on the business goal.

### 1.2. Channels

It is a distribution which a company communicates or reaches customers to propose value in order to deliver products or services to customers.

### 1.3. Customer Relationships

Types of relationships are explained how companies can interact with their target customers.

## 2. Offering

### 2.1. Value propositions

Products and services are delivered to target customers in order to meet customers' needs for making their satisfactions.

## 3. Infrastructure

### 3.1. Key activities

There is description the main processes and activities to create value of products and services.

### 3.2. Key resources

This is about the main resources in both of tangible and intangible assets which are related in critical success factors in the business model.

### 3.3. Key partners

This segment is about network of company between partnerships or suppliers who are related to create value and work for the business model.

## 4. Finances

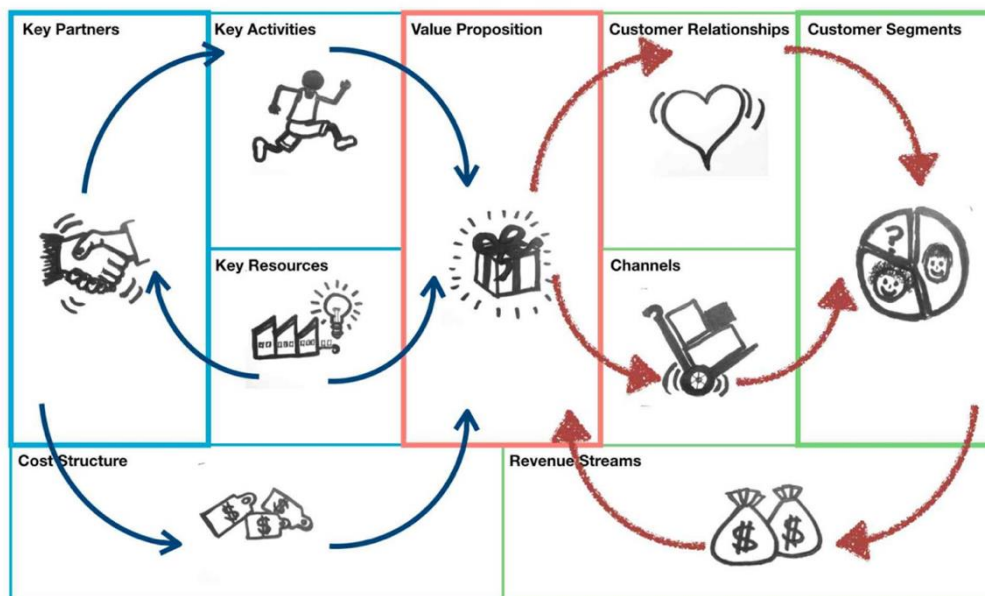
### 4.1. Cost structures

This cost is considered for all of operational cost which is involved the business model.

#### 4.2. Revenue streams

This part is about a way that company can generate income from customer segments and there are several ways. [22,23]

Figure 2.3 shows the interaction between BMC elements which are separated into three main groups. To start with blue block, there are all activities and important resources which influence to deliver product and service and all of them are related with operation cost. While, green group represents all aspects which customers are able to touch with the product and service so they influence to create company revenue. However, the middle block (red block) is value proposition which is the central to connect between company and customers. Also, customers will be received the value proposition from product and service. [24]



**Figure 2.3** Interaction in Business Model Canvas elements

Source Available at: <http://blog.awwapp.com/business-model-business-model-canvas/>

[Accessed 10 November 2020]. [24]

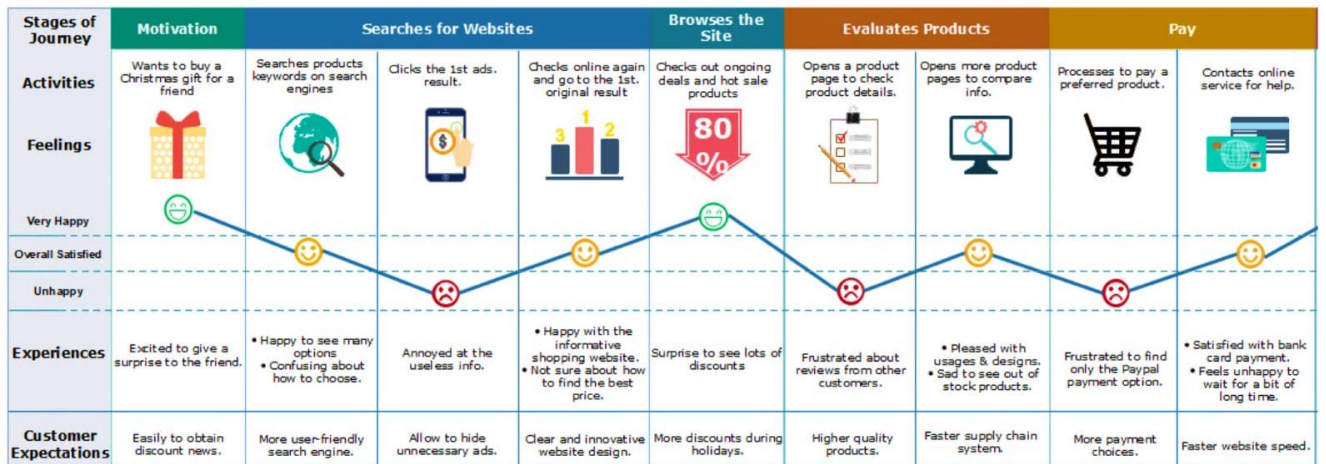
Therefore, BMC is highly helpful to create the new business strategy because BMC enhances the business to focus in launching the new product and service due to

provide profitable business and design business correctly. Also, it is clear and concise to consider in one page of blueprint which concludes in all relative parts, as a result, there is minimizing the risk of failures which can save the company lose profit.

### **2.2.3 Customer Journey Mapping (CJM)**

Customer Journey Mapping (CJM) is a visible storytelling to identify the relationship between a business and a customer over period of time. As it is, the story tells the customers' perspectives and implies their expectations in each activity during receiving service. Additionally, there is a blueprint trace to provide clearly customer journey that describes the part of activity which affects in positive or negative effect to customers. So, this is one of the significant tools for service design because there is showing the part which should be improved or eliminated in order to enhance efficient service performance.

Therefore, the main aim of CJM is to understand in real customer feeling in order to make highly customer's satisfaction so this is beneficial for the business service to create service in responsiveness of customer needs. Also, it makes positive relationship with customers which creates a good memory and experience for customers. Moreover, CJM can support both of business-to-business (B2B) and business-to-customer (B2C), especially, service business in offering the right requirements. [25]



**Figure 2.4** Example for customer journey mapping of online shopping situation

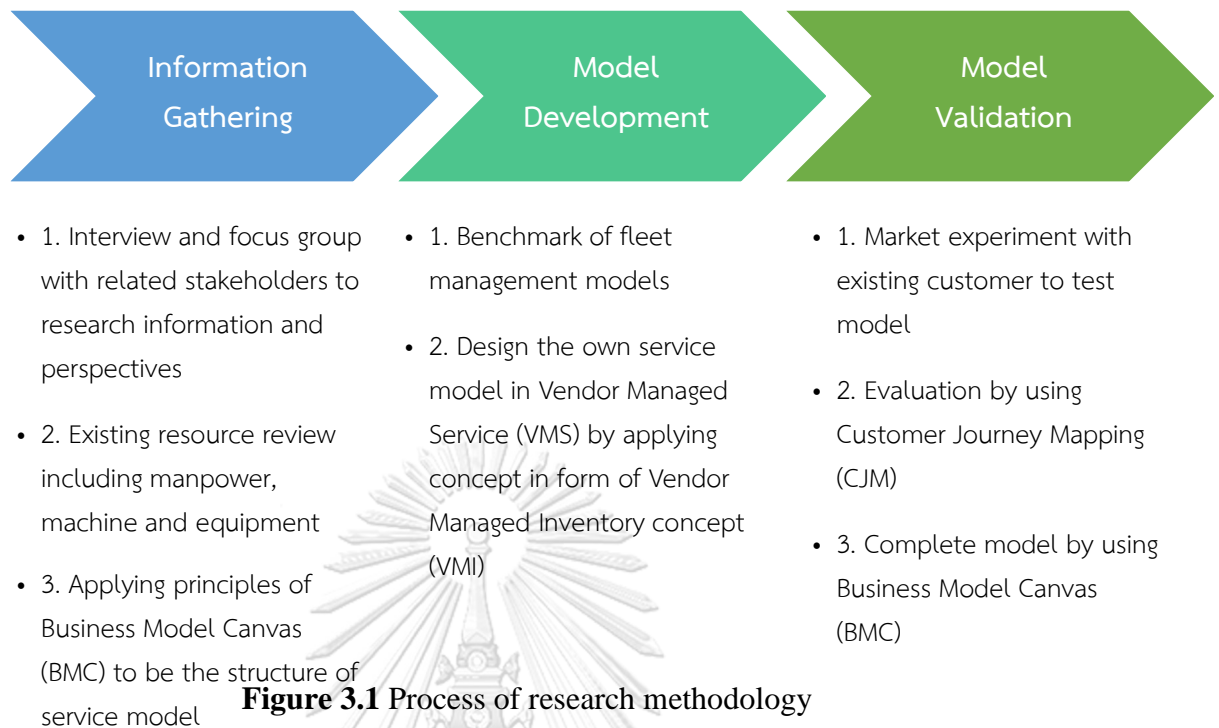
Source Available at: <https://www.edrawsoft.com/8-customer-journey-map-examples-to-inspire-you.html> [Accessed 10 November 2020]. [26]



## **Chapter 3**

### **Research Methodology**

This chapter aims to explain how to achieve the research objective by applying knowledge of fleet management in Chapter 2 section 1 and there are classified in three main parts as seen in Figure 3.1. Obviously, the first part is about information gathering that there are interviews and focus groups to research information and perspectives from stakeholders including Company A' experts, target customers and tyre experts. Also, there is existing resource review in order to gather the information of company's resources. As a result, all of information will be fulfilled within Business Model Canvas (BMC) which is the structure of service model. Another main part is model development that there is improvement of the model by using benchmark of fleet management models from interview of tyre experts. In addition, there is adapting Vendor Managed Inventory (VMI) concept due to design the new service model in form of Vendor Managed Service (VMS). Finally, model validation includes model testing with sample vehicles of target customer, then, there is analysis of Customer Journey Mapping (CJM) to compare between traditional and new services. Also, there is completing BMC with evaluating the model feedback from stakeholders.



### 3.1 Information Gathering

#### 3.1.1 Interview related stakeholders

There are three groups of related stakeholders including company experts, target customers and tyre expert. To start with company experts, there is focus group about their viewpoints in the potential of new service which can make values for the company in term of operation, finance and sustainable service since they clearly know and understand the company performance. Secondly, target customers' interviews are significant since making customers' satisfaction is the goal of research. Hence, there should be clearly understanding in order to respond extremely customer needs. Finally, the interview of tyre experts is interesting which they can share their experiences about tyre industry and give their advices in fleet management service.



Interview of stakeholders:

1. company experts

There is a focus group interview with company experts about perspectives in Company A in term of company performance, challenges and direction of achievement. Also, there are four stakeholders as shown in Table 3.1.

**Table 3.1** Company experts' information

<b>COMPANY EXPERTS</b>			
<b>Stakeholder</b>	<b>Position</b>	<b>Experience</b>	<b>Responsibility in model</b>
1	Company A's owner	<ul style="list-style-type: none"> <li>• Technician for small and large vehicles (8 years)</li> <li>• General Manager in automotive centre (10 years)</li> <li>• Company A's owner (Currently: 17 years)</li> </ul>	<ul style="list-style-type: none"> <li>• To be responsive in overall performance of service model which matches with company A potentiality</li> </ul>
2	Finance Manager of Company A	<ul style="list-style-type: none"> <li>• Accounting officer in company A (5 years)</li> <li>• Finance Manager in company A (Currently: 12 years)</li> </ul>	<ul style="list-style-type: none"> <li>• To be responsive in finance part in term of investment, profit and beneficial value of service model.</li> </ul>
3	Technical Manager of Company A	<ul style="list-style-type: none"> <li>• Technician for small vehicles in Company A (3 years)</li> </ul>	<ul style="list-style-type: none"> <li>• To be responsive in operation of new service which matches with</li> </ul>

<b>COMPANY EXPERTS</b>			
<b>Stakeholder</b>	<b>Position</b>	<b>Experience</b>	<b>Responsibility in model</b>
		<ul style="list-style-type: none"> <li>• Technician for large vehicles in Company A (5 years)</li> <li>• Technician Manager for small and large vehicles in Company A (Currently: 9 year)</li> </ul>	efficiency of existing resources (operators and machines)
4	Sale Manager of Company A	<ul style="list-style-type: none"> <li>• Salesperson for small and large tyre in Company A (10 years)</li> <li>• Sale Manager for small and large tyre in Company A (Currently: 7 years)</li> </ul>	<ul style="list-style-type: none"> <li>• To be responsive in sale products and services so there are knowns in customers' needs and how to provide the service model for making customer satisfactions.</li> </ul>

## 2. Target customers

According to the target customers, there is a classification concept which chooses different kinds of customer businesses in order to understand various requirements and problems in different businesses. There are four business types including construction, bus service, logistic in long distance and, consumer goods in retailer and distributor. Moreover, in the questionnaire, there are three parts including personal information, business information and tyre utilization as shown in Appendices section B.

**Table 3.2** Target customers' information

<b>TARGET CUSTOMERS</b>		
<b>Stakeholder</b>	<b>Position</b>	<b>Experience</b>
5	General Manager of construction company	<ul style="list-style-type: none"> <li>• General Manager (Currently: 3 years)</li> </ul>
6	Bus service company's owner	<ul style="list-style-type: none"> <li>• Automotive mechanic (12 years)</li> <li>• Bus service company's owner (Currently: 10 years)</li> </ul>
7	Logistic company's owner	<ul style="list-style-type: none"> <li>• Logistic company's owner (Currently: 5 years)</li> </ul>
8	Driver and Vehicle manager of consumer goods company	<ul style="list-style-type: none"> <li>• Automotive mechanic (5 years)</li> <li>• Driver and Vehicle manager (3 years)</li> </ul>

### 3. Tyre experts

There are interviews with officers from tyre manufacturing company (Company M) which is the one of top leading tyre manufacturing in the world and there are various technologies and innovative mindset due to complete in the market. Therefore, there will be a lot of advices and experiences about fleet management service.

**Table 3.3** Tyre experts' information

<b>TYRE EXPERTS</b>		
<b>Stakeholder</b>	<b>Position</b>	<b>Experience</b>
9	Senior Account Manager for large tyre in South of Thailand zone and trainee tutor for new comers in Company M	<ul style="list-style-type: none"> <li>• Account Manager for large tyre in Company M (3 years)</li> <li>• Account Manager for large tyre and Trainee Tutor in Company M (3 years)</li> <li>• Account Executive Manager for small and large tyre and Trainee Tutor in Company M (1 year)</li> <li>• Retread Manager for large tyre (1 year)</li> <li>• Senior Account Manager for large tyre and Trainee Tutor in Company M (Currently: 2 years)</li> </ul>
10	Account Manager for large tyre in Central of Thailand zone in Company M	<ul style="list-style-type: none"> <li>• Account Manager for small and large tyre in Company M (1 year)</li> <li>• Account Manager for large tyre in Company M (Currently: 5 years)</li> </ul>

### 3.1.2 Existing resources

According to one of the research expectations, there is enhancing potential of existing resources due to apply the benefit of existing resources in new service design. Thus, there are reviews and learnings about existing resources including operators, machines and equipment because the existing resources are one of the significant considerations for launching the new service since the ability and preparedness of operators and machine influence for achievement.

### **3.1.3 Applying principles of Business Model Canvas (BMC)**

This process is to apply principles of Business Model Canvas (BMC) to be the structure of new service model. Also, there are nine elements of BMC which cover all of relevant elements for business model creation, therefore, results of information gathering are analyzed and fulfilled into BMC in order to be the draft of model.

## **3.2 Model Development**

### **3.2.1 Benchmark of fleet management models**

After there is the draft of service model, the model will be developed due to enhance model performance. This part is a discussion with company experts to study other service operations in fleet management service from tyre experts' interview for learning advantages and disadvantages. Then, there is adapting with the company performance in order to make own fleet management service. Therefore, there are four stakeholders from different departments as same as the focus group to share their opinions and create the model solution.

### **3.2.2 New service model design**

This step is to design the new service model which applies the information from interviews and benchmark analysis to create the new service model. Moreover, there is the support from adapting the knowledge of Vendor Managed Inventory (VMI) from Chapter 2 in section 2 to transform in Vendor Managed Service (VMS). As is well-known, the VMI manages inventory for customers, similarly, VMS will help customers to service in order to reduce customers' pain points and maximize customer satisfaction.

### 3.3 Model Validation

#### 3.3.1 Market experiment

The market experiment is to test the service model with sample of target customer in order to run the service in real-situation for collecting data and analyzing result for customer. Also, the sample of target customer is drinking water company (stakeholder 8' company).

According to information of the sample customer's company, the company is about drinking water manufacturer and distributor for retail and wholesale in Phuket and other nearby provinces in South of Thailand. Also, most of vehicles in company are 6-wheel trucks in order to deliver products to customers and there are 17 trucks in the company. Evidently, tyre management is one of the significant sections which the drinking water company concerns because the main operation of company is about vehicle utilization for product distribution. Consequently, it affects to tyre performance and also, there are several problems and concerns about tyre utilization which are;

##### 1. Efficiency issue

- There are exploded tyres and bulges in sidewall of tyres so these affect to frequency of tyre changing.

##### 2. Productivity issue

- There are accidents during deliver products which make breakdown and waste time for maintenance.

##### 3. Finance issue

- There are unnecessary costs such as vehicle downtime cost, mobile service cost and etc. (Cost)

- The company chooses to use brand of tyre in premium brand which is top group of expensive tyre brand, however, there are still problems during work. (Investment)

Identically, the stakeholder 8's company is reasonable choice in selection of the research testing because stakeholder 8's company is the existing customer of company and there are concerns in company service. Consequently, the new customer service model will minimize customer's pain points and maximize in company service. Also, there will be comparison between traditional service and new service due to maximize customer satisfaction with company service.

In addition, in the market experiment there are five trucks of the sample group which consists 35 sample tyres which 1 truck has 7 tyres including spare tyre. Also, there will be two technicians from Company A to inspect and record the depth of tread tyre, air pressure and physical tyre in every week for one month. Then, there will be using this data to analyze and report to customer about the tyre performance during the month.

### **3.3.2 Evaluation of customer feedback**

After getting result from market experiment, the result will be analyzed the performance of service model by adapting Customer Journey Mapping (CJM). There will be a comparison between traditional and new service to show customer's perspectives and satisfactions. Also, there will be comments from company experts, sample of target customer (stakeholder 8) and tyre experts in order to receive their feedbacks in the service model.

### **3.3.3 Completing the new service model**

This step is summarized the service model by using Business Model Canvas (BMC) to complete the research. Also, BMC expresses the overview of new service including infrastructure, customers, value proposition and finances so all of elements

are significant to create new service model. Besides, there will be company experts to comment about BMC of the model.





## **Chapter 4**

### **Results and Analysis**

This chapter describes the result of research methodology in each process and there are three main sections to similar with the research methodology. First of all, information gathering result is shown all valuable information for the research which collects from interview, focus group and existing resource review. Also, all of information is analyzed and fulfilled into the draft of Business Model Canvas (BMC). Secondly, model development result explains the benchmark of fleet management model analysis in order to adapt and create the new service model. Finally, model validation analysis consists market experiment result, evaluation with Customer Journey Mapping (CJM) and completed BMC. That means, there are results of model efficiency in real-situation, evaluation of the model performance and completing of the new service model.

#### **4.1 Information Gathering Result**

##### **4.1.1 Interview analysis**

This section describes result of interview which there are separately three parts including company experts, target customers and tyre experts. So, all of parts show analysis of perspective in fleet management.

1. Company experts

According to focus group within the company including company owner and head of each department, the interview contents included company performance, current challenges and solutions for developments. Also, all of discussion focused on main customer of company A which is fleets of large vehicles.

Evidently, there is a performance result by explaining with SWOT (Strength-Weakness-Opportunity-Threat) matrix which analyzes internal and external

environments due to approach mission and goal of the company by supporting for decision making. [28] Moreover, there is applying 7-P model of marketing mix to consider organization and effectiveness which includes People & Internal marketing, Price, Product & Service, Promotion, Place, Process and Physical Evidence. While, external consideration is analyzed by using PESTEL (Political-Economy-Social-Technology-Environment-Legal). [29] As a result, there are internal company considerations and external factors to impact company direction as shown in Table 4.1.

**Table 4.1** Overview of company performance with SWOT matrix

Strength	Weakness
1 Having knowledges and experiences about tyre over 60 yesar in administrate team. (People) 2 Cooperating with expert tyre manufacturing company including Michelin, Bridgestone, Continental and etc. (People) 3 Having potential performance of technicians. (People) 4 Managing with family business style (Internal Marketing) Administrate level: To be loyalty with company and high passion in work Employee level: To gain good welfare and taken care like as family 5 Location on main business street in Phuket. (Place) 6 Providing various of tyre products: car, truck and crane tyres. (Product) 7 Providing all of service in both of car and truck service: repair, change, balance, alignment and suspension (Service)	1 Organizational culture (family culture/ second generation is becoming third generation) (Internal Marketing) Family conflict: different concepts between two generations Unstructured governance: governance issues such as internal hierarchies and rules Too more flexible: To loose in employee management 2 Administration in reactive management. (Internal Marketing) 3 Having one brance: To loss opportunity to sell and service customers in wide area (Place) 4 Less marketing in public/ poor communication to promote. (Promotion) 5 Company image (Michelin image) (Physical Evidence) The company has to decorate with Michelin products including sign, colour and etc. To loss opportunity to sell in other brands to other customers who do not prefer in Michelin
7P Model: People&Internal Marketing, Price, Product&Service, Promotion, Place, Process, Physical Evidence	
Opportunity	Threat
1 New alternative service in customer fleet management: Helping customer to manage tyre usage (Social) 2 New alternative service in mobile service at customer place: Night shift (Social) 3 Smart technology in management: data base, cloud, AI and etc. (Technology) 4 Online marketing and E-commerce: Facebook, Line account and Google my Business (Technology) 5 Create sale team in order to approach customers for proactive sale (Social) 6 New service in suspenstion service for truck vehicle : One stop service (Social)	1 Risk of developed investment caused by the instability from the current governance. (Political) 2 Globally economic recession: COVID-19 situation (Economical) 3 Pricing competition due to many brands and many competitors (Economical) 4 Customers' behavior change, there are many choices to check price and choose the service (Social) 5 Online shopping such as Shoppee, Lazada and etc. (Technology) 6 Employment issues: High living cost and lake of efficient employees (Legal)
PESTLE: Political, Economical, Social, Technology, Legal, Environment	

However, the company has still some gaps to be improved in order to be sustainable operation and there are some chances to approach achievement for the company development. Therefore, there is TOWS matrix to analyze and understand strategic choices due to generate advantage opportunities and minimize weakness impacts which expresses the relationship between internal and external factors. [30] Also, there are four sides including Strengths-Opportunities (SO), Weaknesses-Opportunities (WO), Strengths-Threats (ST) and Weaknesses-Treats (WT) to consider.

**Table 4.2** Relation analysis between internal and external factors with TOWS matrix

	Strength	Weakness
	S1. High knowledges and experience over 60 years S2. Reputed tyre manufacturer partnerships S3. Potential performance of technicians S4. Family business style: loyalty and good care like as family S5. Location on main business street S6. Various tyre products S7. All of tyre service in both of car and truck service	W1. Family organizational culture W2. Reactive management W3. One branch W4. Poor promoting communication W5. Michelin image: Loss to sell in other brand
Opportunity	Strength-Opportunity (SO)	Weakness-Opportunity (WO)
O1. Fleet management service O2. Mobile service at customer place in night shift O3. Technology in management: data base, BI and etc. O4. Online marketing and E-commerce O5. Sale team O6. Suspension service for one stop service	1. Provide new service solution for fleet management (S1,S2,S3,O1,O3,O5,O6) 2. Expand to online market (S6,S7,O4)	1. Create online channel to approach customers (W3,W4,O4) 2. Utilize technology for management to reduce conflict within company (W1,O3)
Threat	Strength-Threat (ST)	Weakness-Threat (WT)
T1. Uncertainty of Thai political T2. Globally economic recession: COVID-19 situation T3. Customer behavior changing T4. Pricing competition due to high competitors T5. Online shopping T6. Employment issues	1. Penetrate market by providing optimal price in various products and service with highly efficient skills (S1,S3,S6,S7,T2,T4,T5) 2. Treat operators in company like as family (S4,T6)	1. Transform to proactive management by making relationship with customers (W2,T2,T3,T4) 2. Enhance offline and online marketing due to communicate with customers (W4,W5,T4,T5)

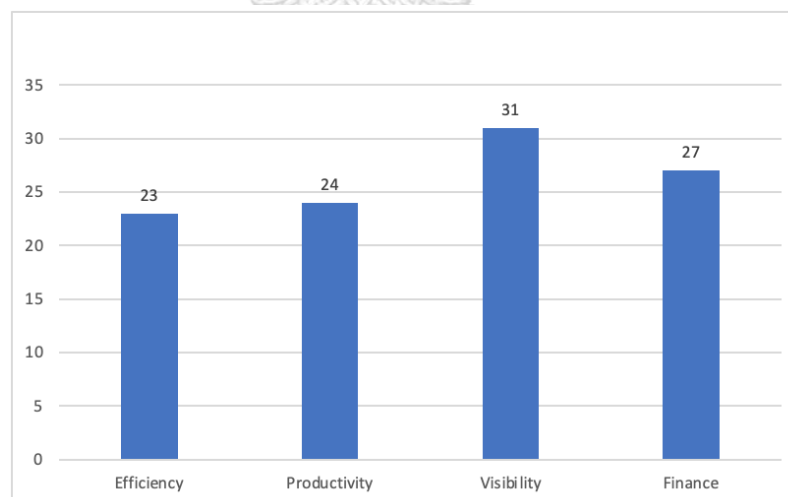
TOWS matrix allows to create strategy that uses strength to maximize opportunity and minimize threats, similarly, there is a strategy to reduce weakness by taking advantages from opportunity and avoiding threat. Therefore, in this case, TOWS matrix shows the interesting solution for company development that the company is able to transform to proactive management by making relationship with customers in order to complete in highly competitive market. Moreover, there is maxi-maxi strategy (SO) to support this direction which there is the new service solution for fleet management. This solution is the strength point for company which there are knowledges and experiences about tyre industry. Also, there is the support from reputed tyre manufacturing partnerships to share knowledges and know-hows for customer service. Furthermore, this direction is the great opportunity to expand the new service for fleet management service and also there are many technologies to support operation.

## 2. Target customers

There were called interviews with a sample group of existing target customers in order to ask about their opinions in tyre management. Also, there was the selection

of interviewees from different businesses since various kinds of customers faced different problems. Therefore, the interview question included general information of customers and their company performance including efficiency of tyre utilization, productivity of work, visibility in tyre performance and finance for tyre expense as question shown in Appendices section B.

According to Figure 4.1, customers were the most interested and concerned in visibility section (31 points) which asked about data of tyre performance and how to manage schedule service maintenance. Also, there were inefficient data collection which affected to poorly manage schedule maintenance. Moreover, the following problem was finance issue which customers needed to lose their money with unnecessary cost such as breakdown and changing tyre caused by damage from external factor. In addition, productivity and efficiency were almost similarly concerned levels from customers which were 24 and 23 points respectively. Obviously, productivity was about frequency of breakdown while efficiency was concerned in tyre utilization so both of sections were caused by careless inspection of drivers and owners.



**Figure 4.1** Total points in each section of customers' opinion

### 3. Tyre experts

There were called interviews with tyre experts from Company M and the interviews included questions about existing fleet management model which Company

M provided to customers. Also, there was asking about benefits from fleet management service, financial methods and challenge of company.

As a result, there are three types of service models which Company M provides to customers including Pay as use, Budget allocation and CPK (Cost-per-Kilometer). Table 4.3 shows the summary of interview.

**Table 4.3** Three service models in fleet management of Company M

Topic	Pay as use	Budget Allocation	CPK (Cost-per-Kilometer) Guarantee
<b>Operation</b>	<ul style="list-style-type: none"> <li>• To monitor and control tyre management</li> <li>• To inspect tyre air pressure, depth of tread tyre and physical tyre to analyze and present customers</li> <li>• To measure for tyre management by using Tyrecheck software</li> </ul>	<ul style="list-style-type: none"> <li>• To be outsourcing for customers to monitor and control tyre utilization in order to provide customers pay tyre expense in fix cost</li> </ul>	<ul style="list-style-type: none"> <li>• To calculate cost per kilometer for customers in order to guarantee cost of tyre utilization</li> </ul>

Topic	Pay as use	Budget Allocation	CPK (Cost-per-Kilometer) Guarantee
<b>Finance</b>	<ul style="list-style-type: none"> <li>• Pay as amount of tyre utilization</li> <li>• Inspection fee per vehicle in one time (normally 200-300 baht)</li> </ul>	<ul style="list-style-type: none"> <li>• Pay as amount of contract between company and customers</li> </ul>	<ul style="list-style-type: none"> <li>• Pay as amount of distance</li> </ul> <p>Payment = Amount of kilometers x CPK price</p>
<b>Advantages for customers</b>	<ul style="list-style-type: none"> <li>• Safety check to reduce risk and breakdown because of tyre inspection</li> <li>• High efficiency and visibility of tyre utilization due to record real data and performance analysis</li> <li>• Accurate maintenance schedule and forecast expense</li> </ul>	<ul style="list-style-type: none"> <li>• Easily to allocate budget cause of fix cost for tyre expense</li> <li>• Reduce responsibility about tyre issue</li> </ul>	<ul style="list-style-type: none"> <li>• Visibility for known real cost of tyre utilization in one distance</li> <li>• Highly valuable for logistic company</li> </ul>

Topic	Pay as use	Budget Allocation	CPK (Cost-per-Kilometer) Guarantee
<b>Challenge of company</b>	<ul style="list-style-type: none"> <li>Easily to copy and customers can do by themselves so intelligence software (ERP) is helpful for operation but it is high investment</li> </ul>	<ul style="list-style-type: none"> <li>Require high cooperation from customers in order to reduce tyre damage</li> </ul>	<ul style="list-style-type: none"> <li>Require deep data from customers in order to accurately calculate cost of tyre</li> </ul>

#### 4.1.2 Existing resources review

According to fleet management model, the model is tyre management and reports result analysis for customers in order to enhance tyre performance. Consequently, the operation of the model is about inspection including depth of tread tyre, air pressure and physical tyre in order to apply all of data to analyze and report to customers. Therefore, resources of the model include two main parts which are manpower (technicians) and equipment (Tread depth gauge and Tyre pressure gauge)

##### Manpower

The model is about large vehicle service so operators should have skills and knowledges about large tyres including causes of damage, life extension of tyre and tyre management. Thus, there are six responsibilities for operators to manage in fleet management and all of these are applied tyre knowledge as shown in Appendices section A.

1. Tyre controlling

There are monthly inspection and analysis in order to continuously control efficient tyre performance. Also, the inspection includes tread depth measurement, tyre inflation pressure maintenance and tyre physical checking. Then, all of information will apply to analyze tyre efficiency.

2. Tyre inflation pressure maintenance:

Obviously, tyre pressure is one of the significant parts for tyre performance so technicians should have knowledges and be able to calculate the proper tyre inflation pressure with customers' work.

3. Tread depth measurement

Tread depth measurement can describe tread wear of tyre which is regular or irregular so operators should know the right method of measurement since this step is important to analyze tyre performance and be able to find the problem.

4. Tyre data record

This part is concerned about data record including tyre profile, tyre performance, damage of tyre and etc. So, all of information will be used to analyze in order to manage and enhance tyre efficiency and effectiveness.

5. Tyre life extension knowledge

As can be seen, the fleet management model's objective is to increase tyre productive performance for customers. So, operators should have skills, knowledges and experiences to strengthen tyre life extension and plan how to do with irregular tyres such as replace, rotation, vehicle maintenance and etc.

6. Tyre forecast and stock management

There are separately two sections which the first section is forecasting tyre utilization and planning budget for customers in order to prepare and manage their finance. While, the second section is tyre stock management for the company because there will be known customers' schedule service



maintenance and the company can predict and stock products which customers will require in the future.

### Equipment

There are two significant tools of fleet management model which Tread depth gauge and Tyre pressure gauge.

#### 1. Tread depth gauge

As is well-known, a depth of tread tyre is important to show the tyre life which indicates deterioration of tyre performance to effectively transmit traction to the road. Therefore, generally there are two types of the tread depth gauge including analog and digital gauges, however, both of two types measure in same method.



**Figure 4.2** Existing analog (Left) and digital (Right) tread depth gauges

In addition, there are six steps of using the tread depth gauge as following below.



**Figure 4.3** Setting zero for tread depth gauge

Step 1: To confirm or set zero for the tread depth gauge when against a flat surface when fully compressed. [31]



**Figure 4.4** Placing a probe for measurement

Step 2: Place a probe into any location of the central of circumferential tyre groove and push down on the gauge's base. [31]



**Figure 4.5** Avoiding tread wear indicators

Step 3: Be careful to unplace the probe on the tread wear indicators (wear bar) which are surrounding into tyre groove. Also, do not place on any raised surface of tread design. [31]



**Figure 4.6** Reading tread depth

Step 4: Carefully, remove the gauge by holding without touching the probe before reading the tread depth for analog gauge. While digital gauge can record after hearing sound from the gauge. [31]



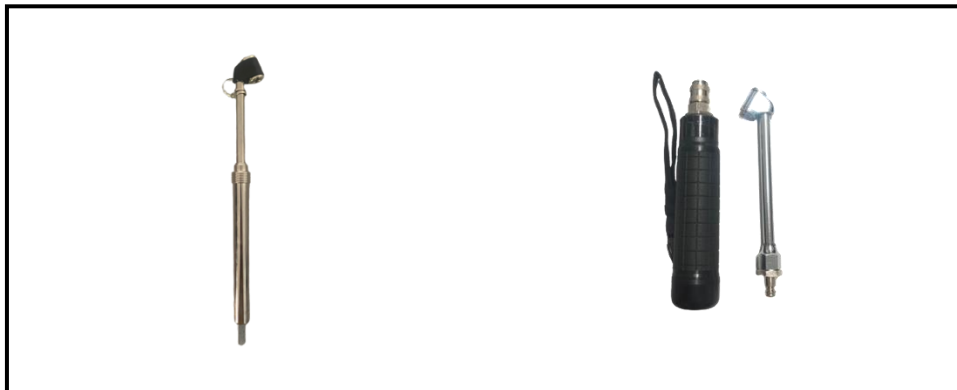
Step 5: Place the probe and measure all of circumferential grooves. [31]

Step 6: Average all readings and identify the remaining tread depth. [31]

**Figure 4.7** Placing the probe and measuring all circumferential grooves

## 2. Tyre pressure gauge

In General, tyres have been lost air pressure 1 psi (pound per square inch) every month so checking all tyres including spare tyre are important for once a month or before a long trip. However, there is a condition to measure air pressure which is temperature inside tyre. The temperature influences to pressure value which is accorded to ideal gas law ( $PV = nRT$ ) where P, V, n, R and T are pressure, volume, temperature, amount of substance and ideal gas constant respectively. [32] Therefore, the accurate data for checking tyre air pressure should be measured when tyre are cold. [33]



**Figure 4.8** Existing analog (Left) and digital (Right) tyre pressure gauge

In addition, there are five steps to check tyre air pressure.

Step 1: Check tyres are cold.

Step 2: Unscrew the valve stem cap from the valve stem on the tyre.

Step 3: Insert tyre pressure gauge into the valve stem on the tyre.

Step 4: Read and record air pressure data.

Step 5: Screw the valve stem cap with the valve stem on the tyre. [33]











**Figure 4.9** Five steps of checking tyre air pressure

#### 4.1.3 Business Model Canvas (BMC) drafting

This section is shown the draft of new service model by using Business Model Canvas (BMC) for fleet management service and there is applying results of information gathering to fulfill in the model. Identically, BMC is the strategic management template which is used to describe in the high-level strategic detail for

developing the new business models. Also, there are four main sections including customer, value proposition, infrastructure and finance as shown in Table 4.4

**Table 4.4** Draft of Business Model Canvas

<b>KEY PARTNERS</b>  <ul style="list-style-type: none"> <li>• Tyre manufacturing company : Michelin, Bridgestone, Continental, Deestone and etc.</li> </ul>	<b>KEY ACTIVITIES</b>  <ul style="list-style-type: none"> <li>• Strengthen knowledges and skills for technicians</li> <li>• Development in inspection technology and data analysis system</li> </ul>	<b>VALUE PROPOSITION</b>  <ul style="list-style-type: none"> <li>• Visible real data of tyre performance</li> <li>• Minimizing frequency of tyre changing</li> <li>• Breakdown reduction</li> <li>• Save money by minimizing unnecessary cost</li> </ul>	<b>CUSTOMER RELATIONSHIP</b>  <ul style="list-style-type: none"> <li>• Tyre inspection (dept of tread tyre, air pressure and physical tyre)</li> <li>• Schedule service maintenance</li> </ul>	<b>CUSTOMER SEGMENTS</b>  <ul style="list-style-type: none"> <li>• Private companies who belong large vehicles</li> </ul>
<b>COST STRUCTURE</b>  <ul style="list-style-type: none"> <li>• Fixed costs: Utility expense, Salary and Welfare</li> <li>• Valuable costs: Cost of goods sold, Maintenance cost, Training cost and R&amp;D</li> </ul>	<b>KEY RESOURCES</b>  <ul style="list-style-type: none"> <li>• Technicians</li> <li>• Equipment for inspection</li> <li>• Analytical system</li> </ul>		<b>CHANNELS</b>  <ul style="list-style-type: none"> <li>• Directly present in customer's company by sale team</li> </ul>	

To start with customer side, this part is included customer segments, customer relationship and channels so there are applying information from company experts. For customer segment, there is focusing on fleet management service in order to develop relationship with the main customer of company so the target customers are private companies belonging large vehicles. Also, there is providing in tyre inspection and schedule service maintenance for customers to build relationship in aftersales service, as a result, both of process are customer relationship of the model. Moreover, this service focuses on private companies so the company should directly present and promote the new service at customers' companies in order to approach customers for proactive sale which is channel of the model.

Moving on to value proposition, this part describes about value of service which responds customers' requirements and solves their pain points. To refer with customers' interviews, there were requirements about visible data of tyre utilization and maximizing tyre performance in order to reduce frequency of tyre changing and save money from unnecessary cost. As a result, the value proposition of BMC would offer these solutions for customers.

In addition, another group is infrastructure which is shown production of the company before providing to customers. Also, there are three parts including partners, activities and resources. To start with key partners, the related business partners for this service is tyre manufacturing company which helps the company to analyze tyre performance and update knowledge and technology about tyres. Next, key activities motivate and enhance the company's value proposition so strengthening knowledges and skills for technicians are important for inspection process. Also, development of inspection technology and data analysis system enhance values for customers in term of fast, accuracy and efficiency. The last is key resources that there are operators (technicians), equipment of inspection (tread depth gauge and tyre pressure gauge) and analytical system.

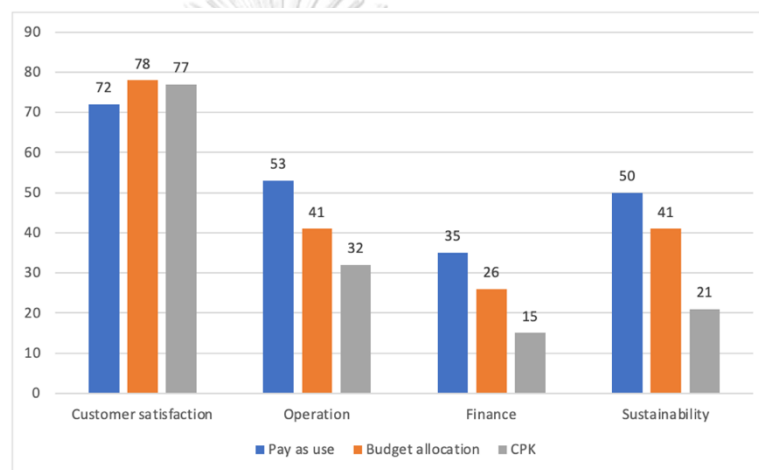
Finally, there are two parts of finance including cost structure and revenue streams. Obviously, there are two significant cost structures including fixed cost and variable cost. That means, fixed cost is about utility expense, salary and welfare while variable cost is cost of goods sold, maintenance and development (training and R&D). For revenue streams, there are three ways which are inspection fee, maintenance service and products selling. Evidently, this business model provides the opportunity for the company to be stronger relationship with customers, as a result, the company can know customers' problems and can promote products and maintenance services to solve their problems.

## **4.2 Model Development Result**

### **4.2.1 Benchmark of fleet management models analysis**

According to benchmark method, it is a tool for continuous improvement of potential company. [34] Also, the purpose of benchmark is to systematically identify the performance outcomes and processes of outstanding organizations from competitors to compare within the organization in order to change and develop business performance. [34-41]

Similarly, this process applies benchmark concept to compare existing fleet management model from Company M due to transform and adapt model for using in Company A. Therefore, there were a discussion with company experts and a questionnaire (as shown in Appendices section C) to point each model due to summary outstanding performance for adapting own model. Also, all of company experts selected performances which based on existing resources and customers' requirements in the market. Therefore, there are four topics in the questionnaire including customer satisfaction, operation, finance and sustainability.



**Figure 4.10** Total points from all members in different sections

Figure 4.10 shows results of discussion about three models to compare performance outcomes which base on existing company performance and a current situation. Also, there is summary of comments in each topic as is follows;

#### 1. Customer satisfaction

Actually, all of three models enhance efficiency of tyre utilization and reduce vehicle breakdown so these benefits can make customer satisfaction in term of management and cost reduction. Moreover, all of them provide different specific benefits. The Pay as use model is the most satisfied in the least sharing internal information of company. While, Budget allocation model provides the highest customer satisfaction which company will be responsive all of tyre utilization instead of customers. For CPK model, it provided demonstrative visible data in cost per kilometer.

## 2. Operation

Obviously, the Pay as use model is able to strengthen efficient performance and potential of existing resources including manpower, machine and equipment. Also, the model is un-complicate for operation since there are only inspection and analysis of data to present customers. Contrastingly, other models require accurately and carefully to operate including data collection, calculation of cost, customer's cooperation and etc. so these are weak points to easily make mistake.

## 3. Finance

According to making revenue, the Pay as use model is easier to make revenue than other models since there are inspection and analysis only while others have risk to lose money if there are poor management and poor cooperation from customers. Furthermore, the Budget allocation and CPK models require in deep information from customers in order to apply information for models' operations, therefore, there would be more investment in manpower and management system. While, the Pay as use model is able to enhance existing resources without more investment.

## 4. Sustainability

Actually, most of target customers' businesses in Phuket market are bus service, constructions and consumer goods. Thus, the CPK model may be not responded from customers since this model is specific for logistic group which is smaller customer group comparing with others. In addition, the Budget allocation model depends on cooperation with customers and accurate management system in order to avoid over cost of model. Therefore, the Pay as use model may be sustainability of company in current situation because there are existing resources to use in this model and the model is un-complicate to operation in the first-time project.



**Table 4.5** Summary of comments in Benchmark in fleet management models

Topic	Comments		
	1. Pay as Use	2. Budget allocation	3. CPK guarantee
<b>Customer satisfaction</b>	+ Less a conflict to share information from customers	+ High convenience for customers to be not responsible in tyre management	+ visible data of tyre cost (cost per kilometer)
<b>Operation</b>	+ Easily to operate with adding inspection and data analysis	- Highly to require cooperation from customers - Carefully to control tyre utilization under budget	- High complication due to require a lot of data
<b>Finance</b>	+ To enhance existing resource without more investment	- To risk in losing money if there is poor cooperation	- High investment in manpower and management system to analyze data
<b>Sustainability</b>	+ No risk because of no more investment and uncomplication for operation	- Depend on cooperation from customers to avoid over budget	- A small group of logistic business comparing with others

According to comments of stakeholders, the overview of the pay as use model provides benefits to Company A in term of operation, finance and sustainability.

Evidently, the model operation is not complicate and there is no more investment because it can use existing resource for operation. However, the goal of service model creation is to maximize customers' satisfaction with company service so concept of Budget allocation model can provide in this point since vendor is allowed to operate their tyre management instead of them. Also, customers can save their time and reduce concerns about tyre utilization. On the one hand, the concept of CPK guarantee is beneficial to explain real cost of tyre utilization for one kilometer so this provides customers to gain real visible data of tyre cost.

In conclusion, three models have different strengths to create model for customers. However, the period of research and current situation of Company A are obstacles to blend valuable benefits of each model to create the hybrid model. Therefore, applying the Pay as use model is a prototype of customer service model which is the least risky for company A in term of investment, operation and sustainability in current situation.

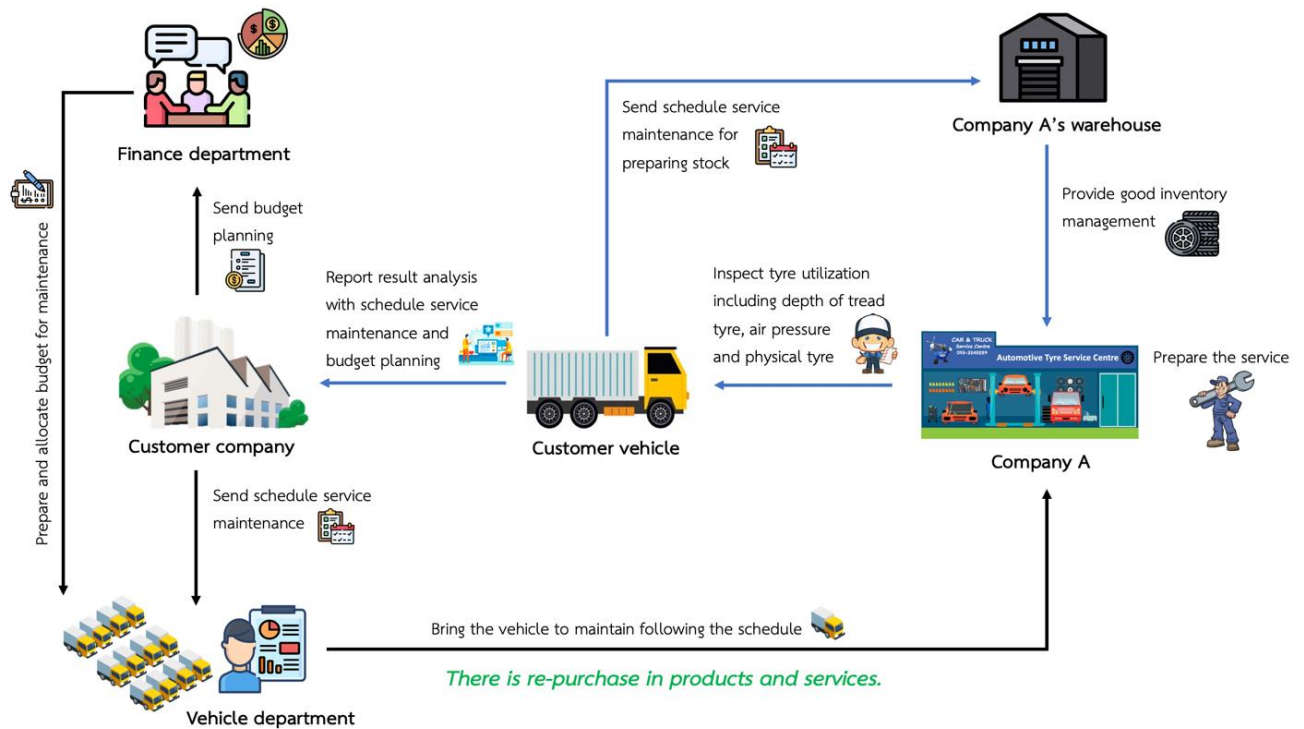
#### **4.2.2 Design the new service model in Vendor Managed Service (VMS)**

According to objective of service model for fleet management, the goal is to build relationship with customers by using existing company resources due to maximize customers' satisfaction in the new service and minimize investment of service. Therefore, this section describes the own service model for fleet management which applies knowledge and information from customers' requirements, company performance and current services.

Additionally, there is applying the concept of Vendor Managed Inventory (VMI). As is well-known, VMI provides relationship with retailers by helping them to manage inventory and make own-decision instead of them. For customers' viewpoint, they can minimize inventory cost and reduce complexity because vendor will operate all of process. Similarly, vendor can know the information of customers such as power of sale, inventory data and etc.

Therefore, there is adapting this concept to be Vendor Managed Service (VMS) that the company will help customers to manage their tyres by adding two processes which are inspection and analysis of their tyre utilization. That means, there are inspecting depth of tread wear, air pressure and physical tyre in order to measure tyre efficiency of customers' work and analyzing tyre performance due to report for customers. Moreover, there are a schedule service maintenance and a budget planning for customers. Also, the service model is able to provide in visibility for customer in data recording and performance analysis.

Figure 4.13 shows process of the new service model which Company A will inspect customer's vehicles and analysis data in order to report the schedule service maintenance and budget planning to customers. For customers' side, the result analysis will be included the visible of tyre utilization, root-cause of problems and solutions for problem-solving. Then, customers will prepare maintenance budget and vehicle maintenance following the reports. In the same vein, the company can manage the inventory to prepare for customers in order to provide service and maximize customer satisfaction when customers re-purchase. Also, this solution can reduce lack of stock problem.



**Figure 4.11** Process of the new service model

To summary, this service solution provides the company to develop relationship with customers and enhances customer engagement and trust in the company service because the model can show the visible data of tyre utilization. Also, this solution can save customers' operation cost and maximize tyre efficiency. Moreover, the new service model enhances efficiency of Company A's operation, especially, inventory management because the company will know the schedule service maintenance of customers. Consequently, the company can prepare and promote products and services for customers when customers come back to re-purchase. Therefore, the service model strengthens relationship between customer and company more than traditional service which maximizes tyre performance in high efficiency and effectiveness for customers.

### 4.3 Model Validation Analysis

#### 4.3.1 Market experiment result

According to the market experiment, there was the experiment on April 2021 and technicians inspected and recorded the depth of tread tyre, air pressure and physical tyre in every Sunday. Thus, Table 4.6-4.7 and Figure 4.12 show results of inspection while Table 4.8 presents a calculation of budget planning for financial management.

#### Definition

1. Replacing (R)

Replacing means there is a regular tread wear of tyre and dept of tyre is around 0-3 mm. so the tyre needs to change.

2. Replacing and Maintenance (RM)

Replacing and Maintenance means there is irregular tread wear of tyre (dept of tyre 0-3 mm.) caused by a vehicle problem and it needs to maintenance before changing the tyre because if there is no maintenance, it will be damaged in the new tyre.

3. Damage and Replacing (DR)

Damage and Replacing means the tyre is impacted from sharp object or cut at sidewall area. Although, there is high depth of tread tyre, the tyre cannot repair so the solution is to change only.

4. Underinflation (U)

Underinflation means air pressure inside tyre is low for loading and it is the cause of irregular tread wear.

5. Overinflation (O)

Overinflation means air pressure inside tyre is high for loading and it is the cause of irregular tread wear.

6. Maintenance (M)

Maintenance means there is the vehicle problem which affects to irregular tread wear.

#### 7. Preparation (P)

Preparation means depth of tyre is around 4-5 mm. which is almost as same as level of wear bars so there is warning to prepare for changing in the next time.

#### Result of inspection and Data analysis

This part is shown results of inspection and data analysis which apply knowledges from tyre maintenance and tyre damage from external factors in Appendices section A. Evidently, there are Schedule service maintenance (Table 4.6), Result of inspections in each week (Table 4.7), Summary of total issues from all inspections (Figure 4.12) to express issues which discovered from inspection with sample vehicles. Also, there is a calculation the expenditure of maintenance in order to present budget planning (Table 4.8) for customer.

First of all, the schedule service maintenance explains in detail of tyre utilization in each position of wheel tyre including depth of tread tyre, air pressure and physical of tyre. There are divided in two cases including emergency (red) and warning (yellow) cases. That means, emergency case needed to maintain suddenly which included Replacing, DR and RM while warning case had to plan for maintenance including prepare and maintenance. Also, underinflation and overinflation were warning case but these problems adjusted at that time. Therefore, the schedule service maintenance is beneficial to express which wheel tyres have to be maintain and helps customers to enhance in maintenance planning and avoid breakdown from accident.

Secondly, Table 4.7 and Figure 4.12 are shown summary of total issues in each inspection and the majority of causes which is frequent happening. Obviously, over 80% of issues were affected from external factors which excluded Replacing because of regular tread wear. Also, most of external factors caused from wrong utilizations

(Underinflation and Overinflation) and accidents (RM, DR and Maintenance). Moreover, the most percentage of issue was RM which was almost a half of all (46%), as a result, it was caused by vehicle problems. Also, the vehicles needed to maintenance before changing due to reduce issues in the future. Next, second and third issues are Underinflation and Maintenance which were 16% and 14% respectively. In contrast, overinflation is the least percentage of issue which is only 3%. To sum up, all of issues had affected to decrease efficient of tyre and tyre life. Also, these caused to decrease productive work of customer and increase frequency of changing.

In addition, Table 4.8 presents budget planning which applied data from inspection and estimates the budget for customer in order to maintenance vehicle problem and replace unserviceable tyres. There were separately two sections including cost of product and service calculation in each inspection and cost for the future planning. Obviously, there was the total number of tyres which had to be fixed and replaced in each inspection time because these tyres were unusable and dangerous if they were still been working. Furthermore, there was a prediction and calculation of tyres which had around 4-5 mm. in dept of tread tyre. Also, these tyres were almost unusable and needed to change.

To conclude, all of analysis is helpful for customers to manage tyre utilization and maximize tyre efficiency. Also, the schedule service maintenance shows which wheel tyre should be maintain for accident avoidance. Similarly, summary of inspection issue is beneficial in explanation about the frequency of root-causes and finding the solutions for these problems. Another advantage is budget planning which provides customers to prepare and allocates their budget for tyre maintenance in order to enhance operational management.

**Table 4.6 Schedule service maintenance**

Inspection	Vehicle code	Mileage	INSPECTION																							
			Position 1			Position 2			Position 3			Position 4			Position 5			Position 6			Position 7					
			Dept (mm)	Air (pound)	Physical	Dept (mm)	Air (pound)	Physical	Dept (mm)	Air (pound)	Physical	Dept (mm)	Air (pound)	Physical	Dept (mm)	Air (pound)	Physical	Dept (mm)	Air (pound)	Physical	Dept (mm)	Air (pound)	Physical			
1	A	184967	8,8,8,8	100	OK	9,9,9,9	100	OK	3,2,0,0	110	RM	3,2,0,0	110	RM	8,8,8,8	110	OK	8,8,8,8	110	OK	8,8,7,8	110	OK	6,6,6,6	100	OK
	B	118193	7,7,7,7	100	OK	7,7,7,7	100	OK	6,5,3,3	110	M	4,4,5,6	110	M	5,5,5,6	110	OK	5,5,5,6	110	OK	6,6,6,6	110	OK	7,7,7,7	100	OK
	C	90144	3,4,4,5	100	DR	2,3,3,3	100	DR	2,2,3,4	110	RM	4,3,2,2	110	RM	1,1,1,2	110	R	1,1,1,2	110	R	4,3,3,3	110	P	6,6,6,6	100	OK
	D	84466	4,4,4,5	100	DR	0,0,1,1	100	R	1,0,0,1	110	R	4,3,1,1	110	RM	0,0,0,1	110	R	0,0,0,1	110	R	0,0,0,1	110	R	6,6,6,6	100	OK
	E	39694	8,8,8,8	100	OK	8,8,8,8	100	OK	8,7,7,7	110	OK	6,6,6,6	110	OK	6,6,7,7	110	OK	6,6,7,7	110	OK	7,7,7,7	110	OK	10,10,10,10	100	OK
2	A	187984	8,8,8,8	100	OK	8,8,8,8	100	OK	9,9,9,9	110	OK	9,9,9,9	110	OK	8,8,8,8	110	OK	8,8,8,8	110	OK	8,8,8,8	110	OK	6,6,6,6	100	OK
	B	121322	7,7,7,7	100	OK	7,7,7,7	100	OK	5,3,0,0	110	RM	2,3,4,6	110	RM	3,3,4,6	110	RM	3,3,4,6	110	RM	4,3,2,2	110	RM	7,7,7,7	100	OK
	C	93565	11,11,11,11	100	OK	11,11,11,11	100	OK	11,11,11,11	110	OK	11,11,11,11	110	OK	11,11,11,11	110	OK	11,11,11,11	110	OK	11,11,11,11	110	OK	6,6,6,6	100	OK
	D	87859	11,11,11,11	100	OK	11,11,11,11	100	OK	11,11,11,11	110	OK	11,11,11,11	110	OK	11,11,11,11	110	OK	11,11,11,11	110	OK	11,11,11,11	110	OK	6,6,6,6	100	OK
	E	42977	7,7,7,7	110	OK	6,7,7,7	110	OK	7,7,6,5	120	M	5,5,6,7	120	M	5,5,6,7	120	M	5,5,6,6	120	OK	7,7,6,6	120	OK	10,10,10,10	100	OK
3	A	188773	6,6,6,6	100	OK	6,6,6,6	100	OK	8,8,8,8	110	OK	8,8,8,8	110	OK	8,8,8,8	110	OK	8,8,8,8	110	OK	8,8,8,8	110	OK	6,6,6,6	100	OK
	B	122372	10,10,10,10	100	OK	10,10,10,10	100	OK	1,1,2,3	110	RM	1,1,3,4	110	RM	3,3,4,6	110	RM	3,3,4,6	110	RM	2,3,2,1	110	RM	7,7,7,7	100	OK
	C	95027	9,9,9,9	100	OK	9,9,9,9	100	OK	9,9,9,9	110	OK	9,9,9,9	110	OK	9,9,9,9	110	OK	9,9,9,9	110	OK	9,9,9,9	110	OK	6,6,6,6	100	OK
	D	89422	9,9,9,9	100	OK	9,9,9,9	100	OK	9,9,9,9	110	OK	9,9,9,9	110	OK	9,9,9,9	110	OK	9,9,9,9	110	OK	9,9,9,9	110	OK	6,6,6,6	100	OK
	E	44391	5,6,6,5	110	OK	5,6,6,5	110	U	5,4,3,3	120	M	4,4,4,4	120	P	4,4,4,4	120	P	4,4,4,4	120	P	5,4,4,4	120	P	10,10,10,10	100	OK
4	A	193895	6,6,6,6	100	OK	5,6,6,5	100	U	7,7,7,7	110	OK	7,7,7,7	110	OK	7,7,7,7	110	OK	7,7,7,7	110	OK	7,7,7,7	110	OK	6,6,6,6	100	OK
	B	131211	8,8,8,8	100	OK	8,7,7,8	100	O	9,9,9,9	110	OK	9,9,9,9	100	OK	9,9,9,9	110	OK	9,9,9,9	110	OK	9,9,9,9	110	OK	7,7,7,7	100	OK
	C	103606	8,8,8,8	100	OK	7,8,8,7	100	U	6,6,7,7	110	OK	8,9,9,9	110	OK	8,8,8,8	110	OK	8,8,8,8	110	OK	8,9,9,9	110	OK	6,6,6,6	100	OK
	D	89501	9,10,10,9	100	U	9,10,10,9	100	U	8,9,9,8	110	U	9,9,9,9	110	OK	8,8,8,8	110	OK	8,8,8,8	110	OK	8,9,9,9	110	OK	6,6,6,6	100	OK
	E	55937	4,4,4,4	100	P	4,4,4,4	100	P	4,2,1,1	110	RM	1,2,3,4	110	RM	1,2,3,4	110	RM	1,2,3,4	110	RM	4,2,1,1	110	RM	10,10,10,10	100	OK

**Note:** 1. Position of tyre Position 1: Left – Front wheel tyre

Position 5: Dual Right – Rare wheel tyre (Inner)

Position 2: Right – Front wheel tyre

Position 6: Dual Right – Rare Wheel tyre (Outer)

Position 3: Dual Left – Rare wheel tyre (Outer)

Position 7: Spare tyre

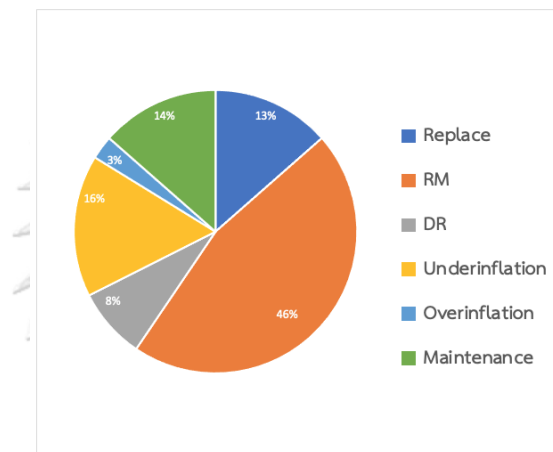
Position 4: Dual Left – Rare wheel tyre (Inner)

2. Color code Red means emergency case needs to maintain suddenly before accident. Yellow means warning for planning maintenance.



**Table 4.7** Result of inspections in each week

ISSUE	Inspection1	Inspection2	Inspection3	Inspection4	TOTAL
Replace	5	0	0	0	5
RM	5	4	4	4	17
DR	3	0	0	0	3
Underinflation	0	0	1	5	6
Overinflation	0	0	0	1	1
Maintenance	2	2	1	0	5
Prepare	1	0	3	2	6
<b>TOTAL</b>	<b>16</b>	<b>6</b>	<b>9</b>	<b>12</b>	<b>43</b>

**Figure 4.12** Summary of total issues from all inspections**Table 4.8** Budget planning from inspections

Budget planning				
Cost of product and service	Inspection1	Inspection2	Inspection3	Inspection4
New Tyre (tyre)	13	4	4	4
New Tyre (baht)	130,000	40,000	40,000	40,000
Maintenance (tyre)	7	6	5	4
Maintenance (baht)	7,000	6,000	5,000	4,000
Total cost (baht)	137,000	46,000	45,000	44,000
Cost for future				
Prepare new tyre (tyre)	1	0	3	2
Prepare budget for replace (baht)	10,000	-	30,000	20,000

Assume:

*New tyre = 10,000 baht per each*

*Maintenance = 1,000 baht ( Actually, it depends on case)*

*Underinflation and Overinflation services are free*

### 4.3.2 Evaluation of customer feedback by using Customer Journey Mapping (CJM)

This section describes customer's perspectives and satisfactions in the service by applying Customer Journey Mapping (CJM). As is well-known, the CJM is the process of customer journey which shows a visual story of customer's interactions with service in viewpoint of customer's need, feel and perspective. Therefore, there are two maps including traditional service and new service to compare customer's satisfaction which are evaluated by stakeholder 8 who tested the new service model.

Table 4.9 shows the mapping of traditional service while Table 4.10 presents the CJM in new service model. Obviously, the traditional service had only four stages of journey including Awareness, Consideration, Decision and Service. Also, it found issues which made customer's negative perspective which customer felt confuse and unconfident in the product because of less knowledge and fear in cheating. Consequently, this was able to be a problem in the future if customers had a problem but they did not know the root-cause of issue, this would affect to company service which provided poor products for customers.

On the other hand, the new service model added two steps in after sale services which were inspection and analysis of tyre performance. Evidently, the new service helped customers to explain in real data and the root-cause of problem. Also, it provided the solution to solve and enhance in tyre efficiency. According to the result of experiment in Table 4.6, most of issues were from external factors which affected to tyre efficiency and minimized tyre life time. However, the schedule service maintenance from inspection expressed to monitor tyre utilization and avoid breakdown before happening so this could minimize unnecessary costs including frequency of tyre changing and breakdown. Therefore, both of these steps could clear customers' concerns in quality of products and made the confidence in the company service. Also, it developed the relationship between the company and customer which customer decided to come the centre again for re-purchasing. As a result, the model enhanced customer engagement and maximized customer loyalty.

**Table 4.9 Customer Journey Mapping in traditional service**

Stages of journey	Awareness		Consideration	Decision	Service			
	Arrive at the automotive tyre service centre	Welcome and ask problems and requirements			Present and sell product (or service)	Make decision	Wait for service	Check product and service
Activity	There was available to service (No queue).	Great welcomed from staffs.	There were many products and promotions to compare for making decision.	Staff provided a recommendation which was suitable with a condition.	There was comfortable area and spent less than 1 hr. for waiting.	There was no problem with the product and service.	There were many payment choices and not waited for making bill.	Staff helped to look other vehicles when moved the own.
Customer Need								
Moment of truth								
Customer Perspective	Positive							
	Negative							
Customer Perspective	It spent around 30 mins for waiting queue.	There was a staff to welcome and invited to wait at waiting area. Also, she asked about requirements.	Happy to see many options but <b>there was confusing about how to choose products.</b>	There was great recommendation from staff but <b>there was a conflict to trust because of less knowledge and fear in cheating.</b>	It spent around 1.30 hr. for waiting because of waiting the queue. But there were Wifi, drinks and convenience area for waiting.	Everything was good and there was no problem during service.	There were various payment options including cash, transfer and credit card. Also, unwasted time for waiting bill.	Staff took care and helped to beware other vehicles for safety.



**Table 4.10 Customer Journey Mapping in new customer service**

Stages of Journey	Awareness		Consideration			Decision	Service				Service			Loyalty
	Activity	Arrive at the automotive tyre service centre	Welcome and ask problems and requirements	Present and sell product (or service)	Make decision	Wait for service	Check product and service	Make payment	Leave from the truck service center	Appointment for tyre inspection at customer place	Present result analysis	Advise solution	Come back to the center for fixing	
<b>Customer Need</b>	There was available to service (No queue).	Great welcomed from staffs.	There were many products and promotions to compare for making decision.	Staff provided a subtle with a condition.	There was comfortable area and spent less than 1 hr. for waiting.	There was no problem with the product and service.	There were many payment choices and not waited for making bill.	Staff helped to look other vehicles when moved the own.	There was an inspection in depth of tread tyre, air pressure and physical tyre.	There was a presentation about tyre performance and explained issues which affected to tyre efficiency.	There were a solution and advice in order to solve issue and increase tyre efficiency.	Technicians could fix the problem following the advice.		
<b>Moment of truth</b>														
<b>Customer Experience</b> <b>Customer Perspective</b>	Positive													
	Negative													
<b>Customer Perspective</b>	It spent around 30 mins for waiting queue.	There was a staff to welcome and invited to wait at waiting area. Also, she asked about requirements.	Happy to see many options but there was confusing about how to choose products.	There was great recommendation from staff but there was a conflict to trust because of less knowledge and fear in cheating.	It spent around 1.30 hr. for waiting because of waiting the queue. But there were Wifi, drinks and convenience area for waiting.	Everything was good and there was no problem during service.	There were various payment options including cash, transfer and credit card. Also, unwelcomed time for waiting bill.	Staff took care and helped to beware other vehicles for safety.	Technicians inspected and recorded depth of tread tyre, air pressure and physical tyre in order to analyse tyre performance.	The result analysis provided real data and described root-causes which affected to tyre performance. So, this made a confidence in product which the problem was made from usage and was not from quality.	The solution was able to solve issues and enhanced tyre efficiency in order to reduce breakdown.	Customer could use tyre in high efficiency and reduce frequency of tyre changing (save money).		

In addition, the table below is shown comments from stakeholders including company experts, representative of target customer (stakeholder 8) and tyre experts to share their ideas for both of CJMs including traditional and new customer service.

**Table 4.11** Comments in CJM from stakeholders









Stakeholder	Comment
Stakeholder 1 Company A' Owner	This is better to create customer loyalty than traditional service, however, there is an advice that how to guarantee which customers will come back to use service in the centre for re-purchasing.
Stakeholder 2 Finance manager of Company A	The new customer service is good for current situation in order to provide new service for customers and also, it is alternative to increase revenue.
Stakeholder 3 Technical manager of Company A	For the new service, the company might recruit new technicians because the service needs to inspect in customers' places. On the other hand, it needs to appoint customers to inspect in the centre but this way might cause customer to waste their time and be inconvenienced.
Stakeholder 4 Sale manager of Company A	This is a benefit for sale section since it can make confidence for customers to trust in the company service.

Stakeholder	Comment
<p style="text-align: center;">Stakeholder 8 Driver and Vehicle manager of consumer goods company</p>	<p>The new service provides visible data in tyre utilization and root-cause of problem which enhances tyre utilization and save cost in breakdown and frequency of changing.</p>
<p style="text-align: center;">Stakeholder 9 Senior account manager of Company M</p>	<p>Currently, there are a lot of strategies to attract customers in the market such as pricing competition, promotion and etc. so this is a good solution of the company A to provide new service for customers in order to strengthen relationship with customers and develop in sustainable service.</p>
<p style="text-align: center;">Stakeholder 10 Account manager of Company M</p>	<p>The new service can help customers to easier make decision in product purchasing because normally, most of this customer group has less knowledge to maximize their tyre utilization and find the root-cause of damage.</p>

#### 4.3.3 Completing Business Model Canvas (BMC)

This section is completing Business Model Canvas (BMC) of new customer service model for fleet management service. Also, this improves and adds relevant information from the draft of BMC because there is gathering information from model development and model validation to create completing BMC.

**Table 4.12** Business Model Canvas of new customer service

<b>KEY PARTNERS</b>  <ul style="list-style-type: none"> <li>• Tyre manufacturing company : Michelin, Bridgestone, Continental, Deestone and etc.</li> <li>• Tyre equipment company</li> </ul>	<b>KEY ACTIVITIES</b>  <ul style="list-style-type: none"> <li>• Strengthen knowledges and skills for technicians</li> <li>• Development in inspection technology and data analysis system for fast, accuracy and efficiency</li> </ul> <b>KEY RESOURCES</b>  <ul style="list-style-type: none"> <li>• Technicians</li> <li>• Data analysts</li> <li>• Mobile service car</li> <li>• Machine and equipment for inspection</li> <li>• Analytical system</li> </ul>	<b>VALUE PROPOSITION</b>  <ul style="list-style-type: none"> <li>• Visible real data of tyre performance and root-cause of problems (<i>a confidence in products</i>)</li> <li>• Enhancing tyre efficiency with breakdown reduction</li> <li>• Reducing unnecessary cost with minimizing frequency of tyre changing and breakdown</li> <li>• Safety for drivers and vehicles (<i>a productivity increase</i>)</li> </ul>	<b>CUSTOMER RELATIONSHIP</b>  <ul style="list-style-type: none"> <li>• Mobile service in customer's place for inspection</li> <li>• Providing data analysis with schedule service maintenance</li> <li>• Providing budget planning</li> </ul> <b>CHANNELS</b>  <ul style="list-style-type: none"> <li>• Directly present in customer's company by sale team</li> <li>• Social media: Facebook, Google my Business and Website</li> </ul>	<b>CUSTOMER SEGMENTS</b>  <ul style="list-style-type: none"> <li>• Private companies who belong large vehicles</li> </ul>
<b>COST STRUCTURE</b> : <i>Value Driven in the business model</i> <ul style="list-style-type: none"> <li>• Fixed costs: Utility expense, Salary and Welfare</li> <li>• Valuable costs: Cost of goods sold, Maintenance cost, Training cost and R&amp;D</li> </ul>		<b>REVENUE STREAMS</b>  <ul style="list-style-type: none"> <li>• Inspection fee for operation in customer's place</li> <li>• Maintenance service following schedule service maintenance</li> <li>• Products selling following schedule service maintenance (<i>good inventory management</i>)</li> </ul>		

To start with customer section, there is adding budget planning in customer relationship for helping customers to allocate their budget in maintenance. Similarly, there is another alternative channel to easily approach customers by using online media. Secondly, value proposition provides to respond customers' requirements which offers visible in real data of tyre utilization and solution for root-cause of problems. Moreover, there are values for customers to enhance tyre efficiency with breakdown reduction and minimize costs in tyre changing and breakdown. Also, there is enhancing in safety for driver and vehicle due to increase productivity of work. Thirdly, infrastructure section expresses adding in key partners and key resources. As is seen, the service model provides mobile service in customers' places and presents accurate data analysis so there are adding data analysts and mobile service car in key resources. While, key partners group is expanded to cooperate with tyre equipment company in order to share knowledge and support in the model operation. Finally, finance section consists revenue streams and cost structure. Evidently, there is the schedule service maintenance to provide the company to know what customers' needs and improve inventory management. As a result, this increases opportunity of company for selling products and maintenance service following schedule service maintenance. Also, inspection fee is included providing inspection at customer' place and adjusting air pressure after inspection. For cost structure of the model, it is value-driven which focuses on creation

and delivery of high value proposition in order to be highly customized to the customer's preferences for long-term customer relationships.

In addition, the table below is shown comments from company experts to share their opinions in BMC of the new customer service and compare with traditional service.

**Table 4.13** Comments in BMC of new service model from company experts

Stakeholder	Comment
Stakeholder 1 Company A' Owner	The model shows clearly overall relevant elements for the business model creation. However, there is a concern how to ensure customers will come back to centre and re-purchase products and services again so there should be more learning in customer section due to carefully screen customer segment.
Stakeholder 2 Finance manager of Company A	This business model provides to enhance potentiality of existing resource which there is no more investment. So, this is good for the company to provide alternative service for customers.
Stakeholder 3 Technical manager of Company A	There is a concern about analytical system which actually, tyre damage is not caused from tyre utilization only but it also, makes from hidden causes such as driver, road conditions and etc. So, there should be deep learning in order to maximize efficiency of data analysis.



Stakeholder	Comment
<p style="text-align: center;">Stakeholder 4 Sale manager of Company A</p>	<p>The business model is good to provide alternative service for customers. Also, it can reduce customer's pain points. However, it may hard to present and attract customers to make decision with the new service in the first time and there is concern in customers' trust in service model so it needs to be careful in channel section.</p>



## **Chapter 5**

### **Discussion and Conclusion**

This chapter aims to discuss and conclude about the research and there are divided four sections including discussion of research results, limitation of research, recommendation of research for future development and conclusion. Firstly, discussion of research results is described the valuable results of research which can develop and achieve the research objective. Secondly, limitation of research explains conditions which affected to research results. Thirdly, there are recommendations which can enhance the research to be advance for future development. Lastly, conclusion expresses the overall of research performance to conclude all of research operation.

#### **5.1 Discussion of research results**

##### **5.1.1 Providing valuable benefits for customers with the new service model**

According to the new service model, the model is able to enhance tyre utilization for customers in order to strengthen tyre efficiency and customers' productivity. Also, there are provisions in the visible data of tyre performance and root-cause of problems. Obviously, the market experiment shows the testing the service model in real-situation with existing customer of company who has problems in tyre utilization and impacts to productivity decrease. The result presents the service model can reduce customer pain points and provides valuable benefits for customer in both of monetary and non-monetary benefits.

To start with monetary benefits, the model is able to reduce cost of vehicle breakdown and frequency of tyre changing. Evidently, the schedule service maintenance (Table 4.6) shows hidden causes including vehicle problems and unsuitable tyre air pressure which were found by inspection only. On the other hand, if there was no inspection, these hidden causes would not express until changing tyre causes by unserviceable tyre before their life time or happening in unexpected situations

such as exploded tyre during driving, tyre damage due to underinflation and etc. (as shown more information in appendices section A). Consequently, the new service model can enhance tyre utilization in maximizing efficiency in order to decrease unnecessary cost in frequency of tyre changing and unforeseen cost. Although, there is inspection fee for model operation, it is still more worthy than paying in new tyres and happening unpredictable situations in the future. So, there is calculation in both of inspection and no inspection in Table 5.1 to compare expense for customer making-decision.

**Table 5.1** Comparison of costs between inspection and no inspection

Case 1: Inspection and maintenance following schedule service maintenance				
List of cost	Amount		Cost per unit (Baht)	Total cost (Baht)
Inspection fee (inc. air pressure adjustment)	5	vehicle	300	1,500
Maintenance (RM+Maintenance issue)	22	tyre	1,000	22,000
<b>Total</b>				<b>23,500</b>
Case 2: No inspection throughout tyre utilization				
<i>Note: Calculation in cost of changing tyre without maintenance in hidden causes</i>				
List of cost	Amount		Cost per unit (Baht)	Total cost (Baht)
Changing tyre: RM issue	17	tyre	10,000	170,000
Changing tyre: Maintenance issue	5	tyre	10,000	50,000
Changing tyre: Underinflation issue	6	tyre	10,000	60,000
Changing tyre: Overinflation issue	1	tyre	10,000	10,000
<b>Total</b>				<b>290,000</b>

Assume:

*New tyre = 10,000 baht per each*

*Maintenance = 1,000 baht ( Actually, it depends on case)*

*Inspection fee (inc. air pressure adjustment) = 300 baht/vehicle*

- To refer cost of inspection fee from the maximum cost of Pay as use model of Company M

It is obvious that the cost of inspection including inspection fee and estimating maintenance cost is dramatically lower than cost of tyre changing which is around

266,500 baht. So, this is the big different value which customer can lose money from hidden damages to decrease tyre life. Moreover, this cost is excluded estimation of unforeseen cost from unexpected situations which happen in anytime such as loss of productivity, accident during driving and etc. caused by no inspection. Therefore, the tyre inspection provides valuable benefit for customer to reduce unnecessary cost in frequency of tyre changing and unforeseen cost which cannot be estimated.

Moving on to another advantage of new service model for customer is non-monetary benefits and there are two significant benefits including visible data analysis and safety for drivers and vehicles. First of all, the model provides visible data analysis of tyre utilization in schedule service maintenance for customers in order to apply all data to manage their financial section and vehicle section for maintenance. Also, customers can adapt this data to improve their internal business which studies in root-causes of problems and improves for avoiding in the future development. Secondly, the model enhances safety for drivers and vehicles that means there is clearly schedule service maintenance to minimize unexpected situations during work. For example, tyre explores during driving because of overloading with underinflation or there is using abnormal tyres such as zero in dept of tread wear, bulges in sidewall of tyre are the cause of danger for driver, vehicle and environment surrounding. Therefore, the new service model enhances to be more confident and safer for driver and vehicle because there are inspection and data analysis processes to check and find irregularity of tyres in order to maintenance before happening.

In case of stakeholder 8's company, the company has problems in frequency of tyre changing and accidents during operation which affects to breakdown and waste time for maintenance. Consequently, all of these problems influence to be unconfident in products and impact to dissatisfy Company A's service. However, the new service model can reduce their problems and increase their confidence by proving to express root-causes of problems and helping to manage their tyre utilization with maximizing tyre efficiency. Therefore, it can be clearly shown in the comparison between the traditional service (Table 4.9) and the new service (Table 4.10), CJM in the traditional service shows the customer had concerns and nervous feeling in quality of products and worth for purchase. Also, there was less knowledge about tyre which is the cause of

non-trust and fear in cheating. As a result, all of these issues caused the customer to have negative perspectives and affected to hard making decision. In contrast, the new service model had adding two steps including inspection and data analysis. Obviously, both of two steps provided the customer to be more confident in products because there was shown in data of tyre utilization and found the root-cause in order to advise the solutions for the customer. Additionally, the solutions helped reduce opportunity of breakdown and increase tyre efficiency so both of them influenced to increase customer's productivity and saved cost in frequency of tyre changing.

In summary, the new service model provides valuable benefits for customers in both of monetary and non-monetary benefits. That shows, monetary benefits minimize unnecessary cost and increase productivity to avoid unexpected situations, while, non-monetary benefits provide customers to be confident in products and safe when driving. Therefore, the new customer service model can reduce customers' pain points and maximize customer satisfaction in the company service.

### **5.1.2 Development of Customer Relationship Management (CRM) for maximizing customer engagement**

According to the traditional service of the company, there are selling products and services in the centre only so this impacts to weaken relationship with customers. Also, it affects to lost sales opportunity and no selling point in highly competitive market. In contrast, currently many automotive service centers including brand and local companies create and provide various strategies in order to attract and sell products and services for customers. As a result, the company has to develop Customer Relationship Management (CRM) due to strengthen relationship between the company and customers for enhancing customers' satisfaction in company service and making customer loyalty. As is well-known, the CRM is the strategy to integrate among internal processes, functions and external networks in order to create and deliver values to target customers. [42] Moreover, the CRM provides to build trust and gain loyalty from customers with company service and also, this management maximizes customer engagement to be the emotional connection between the company and the customers. Thus, this is valuable for customers of the company, especially, the main customer

group which is the dealing in Business-to-Business (B2B) service for sustainable service provision.

To refer with the new customer service model for fleet management, the operation of model can develop CRM of the company which the model provides the company to recognize customer needs and customer pain points. Also, there is collecting customer data and analyzing customer information in order to efficient response customer service so this supports the sales team in closing faster deals with customers than the traditional service. Evidently, the traditional service is reactive service which needs to wait customers in the centre only. In contrast, the new service model supports the sales team to strengthen effective cross and up selling of products to customers which there is data of customer needs and their previous purchases. As a result, this process enhances customer engagement which the company has an interaction with customers through the new customer service model. Also, the model enhances CRM of the company to create the new service by developing relationship with customers in order to achieve in maximizing customer loyalty.

However, there is a challenge for the company to achieve in the new service model which attracts customers to use this service because this is the new service that the company offers to customers. Also, it impacts to hardly make decision for customers to trust in the service as mentioned in comment of sale manager (stakeholder 4) in BMC model (Table 4.13). Consequently, the channel of business model needs to more approaching with customers due to build their engagement and trust. Therefore, there should be some activities for motivation of new service model such as promotion, membership, free-testing and etc. in order to attract customers in the first time for using the service and developing Customer Relationship Management (CRM) to maximize customer engagement.

In conclusion, the new service model can build stronger relationship between the company and the customers to be more proactive service in order to enhance customer engagement through operation of the new service. Also, the company can create connection with customers to help them in tyre management to develop

interaction more than traditional service which provides trading and service only in the centre. Although, there is the challenge to promote and attract customers to trust and participate in the new service model, sale promotions can motivate customers to be interested in the new service and enhance CRM operation. Additionally, the model develops company service to be more sustainable service by gaining customer loyalty.

### **5.1.3 Transforming reactive management in form of proactive management for Company A administration**

According to the current management of Company A, there is operation in reactive management which there is a weak relationship with customers after customers purchase products and services in the centre. So, this causes Company A lost customer loyalty to others and also, Company A operates with poor management, especially, inventory management since there is unknown of customers' requirements and the company needs to predict customers' requirements by using own data. Consequently, it affects to poor operation if there is no product to service and it influences to inconvenience in company service and customers' dissatisfaction.

On the other hand, the new service model can develop to transform proactive management which Company A can be closer customers and effective provide service with adapting information from the schedule service maintenance. Evidently, Company A can sell products and services with efficiently responding customers' requirements since there is preparing products and services following the schedule service maintenance. Moreover, the new service model can develop inventory management to reduce unnecessary stock and save holding inventory cost. Additionally, the new service model develops customer engagement with the company which customers can trust in company service because the company can prove and help customers to monitor their tyre utilization in high efficiency and effectiveness. As a result, this solution enhances the proactive management for expanding and strengthening customers' connection with company to be customer loyalty and sustainable service provision. Furthermore, the company can apply customer data-base to develop and create the new service strategy to provide for customers in continuous service development.

In conclusion, the new customer service model can initiate the company management to transform proactive management in term of inventory management and customer engagement. Identically, the company can enhance internal management of business which there is monitoring stock in effective accuracy because there is informed in schedule service maintenance of customers. Also, this improves financial management to reduce holding inventory cost and increase customer revenues from closing deals of sales team. Furthermore, the service model develops company service to be more proactive service which builds customer engagement to interact with customers more than the traditional service. Consequently, the model supports and increases the opportunity for the company to build stronger relationship with the main customers group of company and enhance sustainable service provision in long term relationship with customers.

## **5.2 Limitation of research**

According to COVID-19 situation, the effect of COVID-19 dramatically disrupted in economy system which people around the world were affected to significantly drop of their productivity. In the same vein, the location of research (Phuket) is one of the affected places and this situation affected to the results of market experiment that there was lower utilization than normal situation. Therefore, the results of market experiment might not be the best results from experiment because of non-fully utilization with comparing in normal situation. Moreover, the Covid-19 impacts to economy situation and Company A performance to be terrible so both of these were obstacles to affect the research operation which could not provide in fully performance such as collecting information, testing model and etc. As a result, all of these influenced the research results to have some weak points and there was continuous improvement.

## **5.3 Recommendation of research for future development**

This section is about recommendation for future development in order to improve weakness of research to further develop in company service. Also, there are two significant topics which are creation of mixed customer service model and



development of customer engagement for selling trust to customers. Obviously, both of them can enhance efficiency and minimize weakness of the company service due to develop in highly efficient service solution for fleet management in competitive market.

### 5.3.1 Creation of mixed customer service model

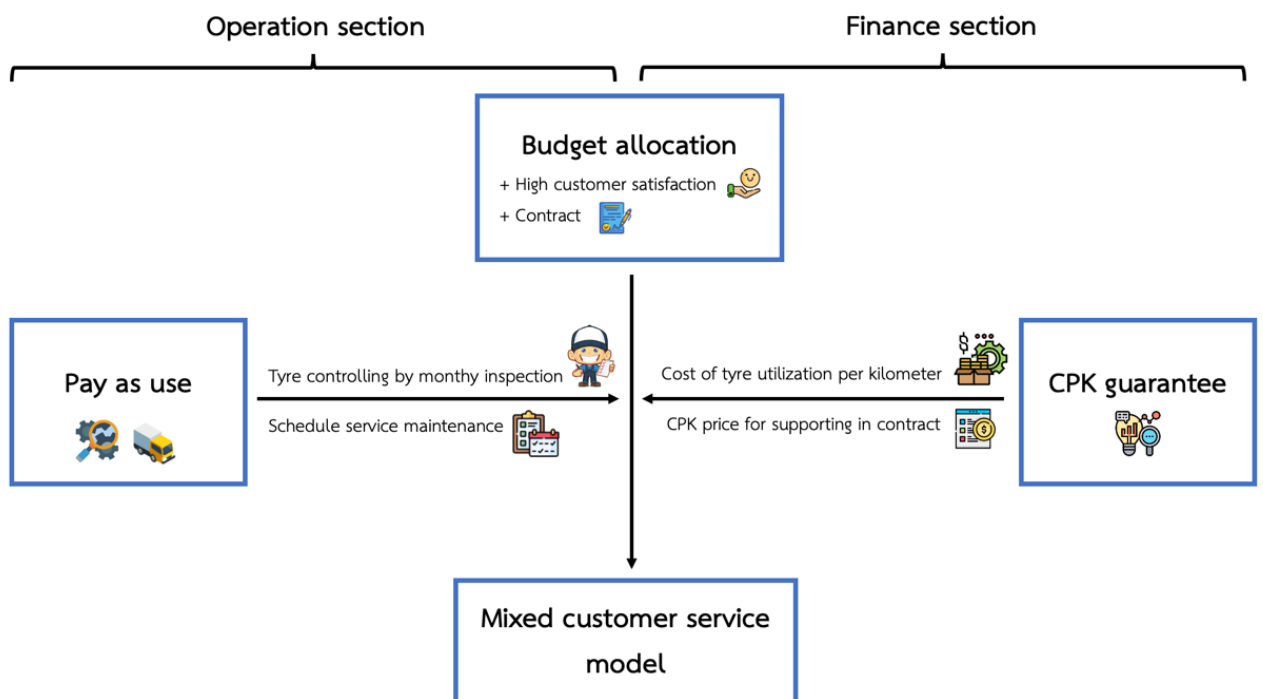
According to benchmarking analysis for the model creation, three models of Company M provide different advantages and disadvantages for their operation and the new service model of Company A still has weakness that there is a process which customers need to operate cooperating with the company. However, this mixed customer service model is improved to be higher customers satisfaction by blending valuable benefits of three model. Also, the table below is described outstanding of strengths and weaknesses in each model.

**Table 5.2** Summary in advantages and disadvantages of three models

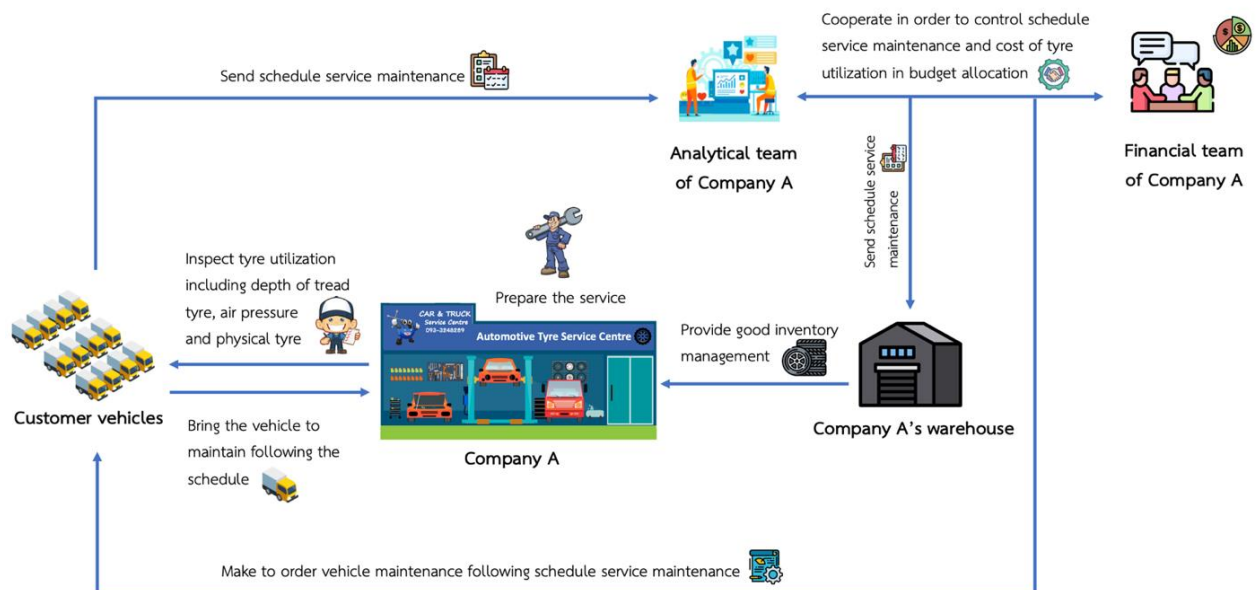
Characteristics	Model		
	1. Pay as use	2. Budget allocation	3. CPK guarantee
Advantages	1. Tyre inspection in order to control performance of tyre utilization	1. High customer satisfaction to be responsibility in tyre management instead of customers 2. To earn in revenue certainty because of contract	1. To know cost per kilometer which helps in calculation of cost structure
Disadvantages	1. Risky for customers coming back which	1. Key point in customer cooperation	1. Specific model with suitable for logistic business to

Characteristics	Model		
	1. Pay as use	2. Budget allocation	3. CPK guarantee
	depends on customer trust		calculate cost in travel trip

For further development, the mixed customer service model for fleet management may be created as a hybrid of the three existing models to take advantage of the good points of each model to fuse into one model. The budget allocation model outstanding shows the highest customer satisfaction since vendor monitors all fleet but there is a challenge in customer cooperation which is about drivers to carefully utilize their tyres. Thus, there is applying Pay as use model which using tyre inspection to control their tyre utilization in monthly inspection and also, there is CPK guarantee technique to help calculate in cost structure of tyre utilization. That means, vendor can adapt this technique to be supportive in creating policy and contract with customers in order to control and calculate cost for the service as shown in Figure 5.1.



**Figure 5.1** Mixed customer service model creation



**Figure 5.2** Process of mixed customer service model

Figure 5.1 shows blended concept of three models to mix for new customer service model while Figure 5.2 explains all of process which mixed model provides to customers. Obviously, the mixed model is operated all fleet management instead of customers so this model provides in fully service in Vendor Managed Service (VMS) concept. As a result, there is reduction of process for customer operation in managing in financial section and allocation vehicle maintenance following schedule service maintenance as same in Figure 4.11 chapter 4. Also, this solution supports customers to operate their business only. Additionally, further development should be more supportive studies in order to achieve in highly effective customer service for fleet management.

#### 1. Study in detail of customer information gathering

According to mixed customer service model, the model operation is to monitor all fleet of customers so there should be penetration of information gathering in customer detail due to analyze this information. For example, kinds of customer work including load, distance and road condition are significant information to analyze because all of these influences for tyre utilization. Another one is customer vehicles

which is important influence since type of vehicle and vehicle deterioration affect to tyre performance. Consequently, customer information gathering is necessary process because the mixed model operates in monitoring management under condition of contract so clearly visible data enhances to achieve model operation.

## 2. Study in advance technology

The studying in technology is one of the concerns from company experts to support the model performance so further development should study in advance technology to develop model efficiency. Obviously, the significant of this service is inspection process including measurement, tracking data and analysis. Thus, the advance technology will help operate in tracking data in real-time in order to analyze and find the root-cause of problem for minimizing loss such as customer's productivity and tyre effectiveness. Moreover, Enterprise Resource Planning (ERP) system is significant software to support in company implementation with high efficiency and effectiveness because ERP can collect, manage, store and interpret data for company. [43] Therefore, this is valuable benefit to operate in high accuracy and efficiency and the innovative technology will enhance company performance to maximize customer satisfaction in the company service.

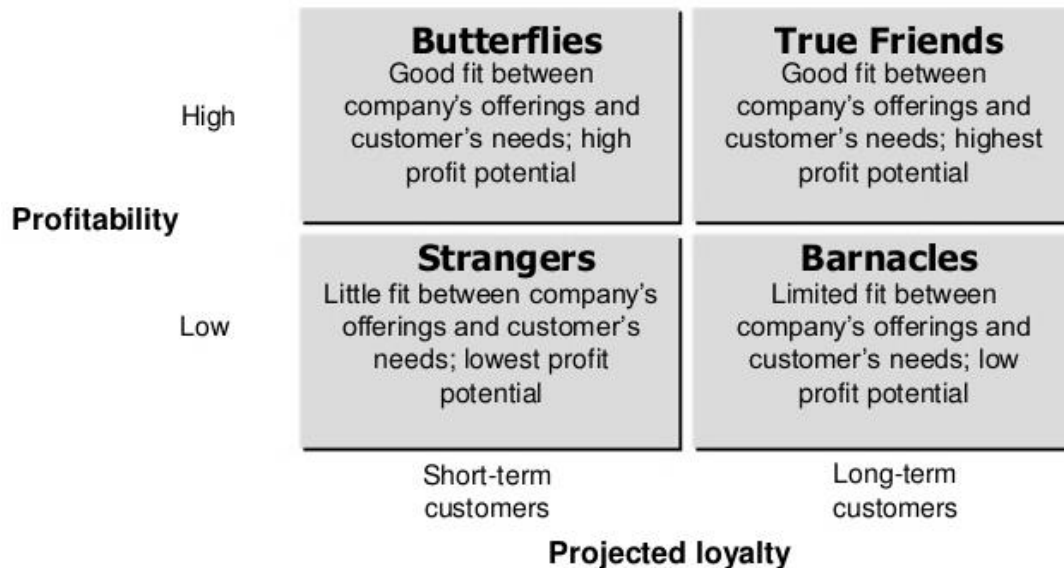
In conclusion, this is overview of the mixed customer service model creation is adapted concepts and advantages of three models to blend and improve customer service in fleet management for future development. Also, this model supports the company performance to be more proactive management in term of service provider and internal management. Therefore, this solution is continuous improvement in order to strength company performance and maximize customers satisfaction.

### **5.3.2 Development of customer engagement for cultivating trust into customers**

According to the new customer service model of Company A, the model is not only selling the service for customers, but it also cultivates customer trust with the company service. That means, customers trust and are confident the company to help them in tyre monitoring and analyzing the tyre performance. Also, customers rely on

operating their tyre management following schedule service maintenance from company making without their concerns. Therefore, it is obvious that customer trust is the key success factor for the model achievement.

Trust is expressed into understanding in customer needs, respect customers and offer relevant service. Although, there are various constituents to build relationship between the company and the customers such as products/services, employees' performance, company image/brand name and etc., customer trust is beyond these constituents. That means, customer trust remains an essential component in developing and achieving customer loyalty toward the company. [44] Moreover, customer trust is a reciprocal behavior between the company and the customers which it is not only significant to make customer loyalty and re-purchase the service, but it insists to be friends for doing business together. To similar, the type of customer in different relationship management is divided the customer relationship into four categories in order to build the right relationship with the right customers. [45].



**Figure 5.3** Customer relationship group

**Source** Available at: <https://mudassarsabri.blogspot.com/2015/06/customer-relationship-groups.html?m=0> [Accessed 25 August 2021]. [46]

In case study of Company A, there is provision the customer service model for the main customer group of company in order to develop relationship between the

company and the customers across proactive customer service for sustainable service. To similar, “true friends” relationship is explained to provide products/services to customers who have high potential profitability for maximizing their customer satisfaction due to gain their customer loyalty. Also, these customers are treasures of company which should be constantly delight, nurture and retain their loyalty for long-term relationship. Consequently, the company should maintain and keep relationship with this customer group likely as a family.

Therefore, development of Customer Relationship Management (CRM) is the essential solution for building customer trust, gaining customer loyalty and engaging customers with the company. As is seen, CRM can record and recognize customer information based on up-to-date information including customer profiles, issues and concerns of customers. Also, these CRM databases maximize company service in high efficiency and enhance customer satisfaction with the company service. Consequently, the achievement of new customer service model is depended on customer trust and relationship with customers. Thus, the further development should create the activities to increase customer engagement in order to support customers to be confident and trust in the company service. As a result, there are two activities to push and support sale promotion due to promote the new customer service model for customers and make customer engagement with the company. There are consisting sale promotion for free-testing and member engagement strategy by using membership which both of activities allow customers approaching to model benefits and trust in model operation.

First of all, this customer service model is the new service of Company A so this influences to make customer non-confidence for investment. Thus, the future development should provide sale promotion in free-testing to motivate the new service in first time period of launching the service in order to shows valuable benefits of model for customers. In addition, the free-testing is the one of the solutions to motivate customers’ interesting to try and assent for participation since customers need not to invest for selling the service. On the other hand, the company can increase customer engagement which boots brand and customer experiences to provide valuable benefits from service model to customers. As a result, these customers will help company to

promote the service in viral marketing in word-of-mouth information while the company can enhance the service profile and promote this for new customers. Another solution is member engagement strategy by using membership motivation which customers can be participation with company like as family because they will receive member incentive more than general customers. Moreover, this motivation creates win-win situation in long-term service that means customers will receive benefits with continuous values while the company gains loyalty from customers. Therefore, both of solutions maximize customer trust with the new service model which customers can test and receive benefits for the model in order to expand customer databased of model. Additionally, the company can apply these to promote for new customers in term of viral marketing from customers and service profile.

In summary, customer engagement is significant for the new service model in order to make customer trust in the model. Also, this development can reduce the weakness and improve the sale channel of new service model as mentioned in comment of BMC (Table 4.13). Moreover, there will be developments in customer trust and making customer to be more confident in the new service. As a result, this will increase company performance to be more proactive management and maximize customer satisfaction with the company service.

#### **5.4 Conclusion**

This research is to create the new service model for Company A which is the automotive tyre service centre in order to transform the company administration from reactive management to proactive management. As is well-known, the company is currently operating in reactive management which is risky to lose customers because of poor relationship with them. Also, this research focuses on private company belonging large vehicles because of the main customer group of the company. Moreover, the pain points of this customer group lack of time and knowledge for monitoring their tyre utilization in high efficiency and effectiveness. Therefore, the new customer service model for fleet management solution will help and solve these issues for them. Also,

there is developing relationship between the company and the customers due to maximize customer engagement and loyalty in long-term relationship.

According to the new customer service model, there was information gathering for creation of fleet management service which collected information from company experts, target customers and tyre experts. Also, these stakeholders share their opinions and experiences throughout the research. Moreover, there was applying Business Model Canvas (BMC) to be the structure of model because BMC covered all of element for business creation. Also, the model adopted concept of Vendor Managed Inventory (VMI) to provide service by helping customers to manage and control their tyre utilization. Additionally, there was evaluation with Customer Journey Mapping (CJM) to compare customer satisfaction in traditional and new services.

As a result, the new customer service model added two processes from traditional service which there were inspection and data analysis. For inspection, there was recoding in depth of tread wear, air pressure and physical tyre in order to measure tyre utilization. While, there was data analysis to analyze tyre performance and root-cause of problem due to report and advise the solutions for customers. Furthermore, there was market experiment with an existing customer in real-situation. The result was that the customer satisfied with the service because it could provide the customer realized and understood the root-cause of issue. Also, the solution could enhance tyre efficiency and reduced opportunity of breakdown. Furthermore, it was able to make customer trust in the company service, identically, the customer made decision to come back in the centre for re-purchasing the service.

In addition, the new customer service model provides valuable benefits for customers and the company. To start with customer benefits, there are both of monetary and non-monetary benefits for customers. Obviously, the model can reduce unnecessary cost such as frequency of tyre changing and unforeseen cost such as breakdown and accident because of providing schedule service maintenance. That, there are inspection of irregular tyres and maintenance them before happening. While, non-monetary benefits are safer for drivers and vehicles and more confident with the



company service so these values can reduce customers pain points and maximize customer satisfaction. Next to company benefits, the new service model develops company management to transform proactive management which improves inventory management for holding inventory following schedule service maintenance. Also, there is the development of customer engagement which strengthens relationship between the company and the customers by helping in tyre management. As a result, this maximizes customer trust in the company service to gain customer loyalty in sustainable service provision.

However, the new customer service model has some points to be improved in order to maximize model performance for providing high customer satisfaction in the company service. Obviously, the model should be developing in fully service provider in tyre monitoring for all fleet instead of customers monitoring. Thus, the further development should be improvement in covering all of processes which blends valuable benefits of three models from existing fleet management service models in information gathering section to transform in the mix customer service model. Another development is to enhance customer engagement since the new service model needs to be trusted by customers. Therefore, there should be motivations to increase customer engagement such as promotion for free-testing and member engagement by using membership.

In conclusion, this research is able to contribute valuable benefits in both of academic values and commercial values in real situation of automotive tyre service centre. To start with academic values, there were applying Business Model Canvas (BMC), Vendor Managed Inventory (VMI) and Customer Journey Mapping (CJM) methods to develop customer service for automotive company. Obviously, values of three methods enhanced the company potentiality in high efficiency and effectiveness. That means, BMC provided to create new service in canvas template which included and covered all of relevant sections to build the new business so this solution was value for clearly visible data in one template. While, principles of VMI were adapted to develop in form of Vendor Manage Service (VMI) which strengthened the company performance to maximize customer satisfaction. Moreover, CJM was expressed

customer needs, expectations and experiences so this was valuable for the business to highly respond customer requirements.

Moving on to another contribution of this research, commercial values are provided for fleet management service that applies the new customer service model to develop relationship with customers. Identically, the new service model is able to enhance customer engagement and customer trust in the company service which the model can reduce customers pain points and enhance their productivity. Consequently, the research can express benefits for automotive tyre service companies to provide the service solution for fleet management in maximizing customer trust in the company service and gaining customer loyalty for sustainable service provision.



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dangerous&text=Look%20out%20for%20any%20tears,accident%20caused%20by%20tyre%20blowout> [Accessed 14 February 2021].





**Appendices**

จุฬาลงกรณ์มหาวิทยาลัย  
**CHULALONGKORN UNIVERSITY**


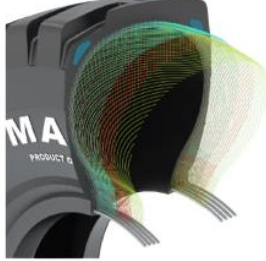

## A. Tyre knowledge

This section explains tyre knowledges in order to more understand about tyre so there are four main topics including tyre construction, components and functions, tyre and vehicle maintenance, and tyre damage from external factors.

### A.1 Truck tyre construction

Tyres are ring-shaped design which consists many components including natural rubber, synthetic rubber, wire, fabric, carbon black and other chemical compounds. Also, there are three types of tyre construction including Radial, Bias and Solid tyres. Obviously, Solid tyres are non-pneumatic tyres which are not filled with air inside and usually used on non-automotive applications in industry such as light-duty, railroad or slow-moving applications. Contrastingly, Radial and Solid tyres are pneumatic tyres and used on motorbikes, cars, trucks and aircrafts.

**Table A.1** Tyre construction includes Radial, Bias and Solid tyres

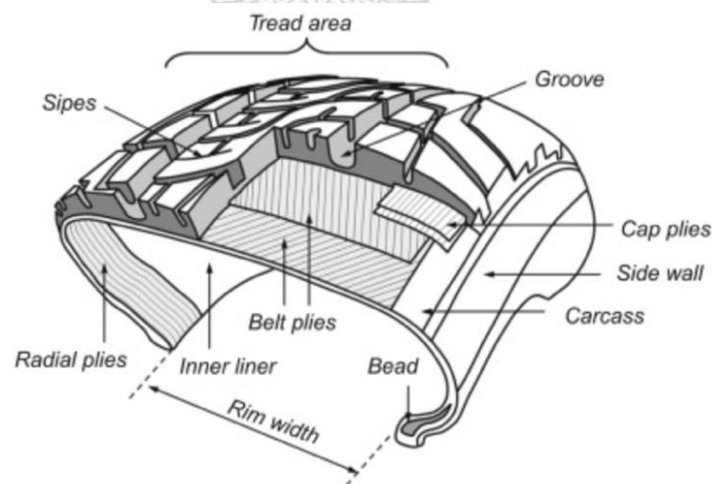
Tyre construction		
Pneumatic tyre		Non-Pneumatic tyre
Radial tyre	Bias tyre	Solid tyre
		

**Source** Available at: <https://magnatyres.com/tyre-construction-differences-radial-bias-solid/> [Accessed 11 February 2021]. [46]

According to truck tyre construction, there are two types including Radial and Bias tyres. Also, both of them are pneumatic tyres which need to be filled with air however, there are some specific advantages for different kinds of structure design, machinery and applications.

## 1.1 Radial tyre

A Radial tyre or a radial-ply tyre is designed which cord plies are arranged 90 degrees to the direction of radially or travel from the center of tyre. Obviously, radial plies are running from bead to bead which is reinforced by embedded steel wires. Also, there is a belt with cords (Kevlar, polyester, steel and etc.) surrounding with the tyre to support performance in any movements such as braking and cornering conditions. Moreover, the sidewall of radial tyre is designed for more flexible comparing with Bias tyre in order to be shorter and wider footprint. So, all of these provides benefits in term of lower fuel consumption, less rolling resistance, more grip and better ride comfort at higher speeds. In addition, there is a great hearing resistance which is less heat inside the tyre because there is no movement between plies. Also, there are more puncture and traction resistance since there are belts under the tread area to prevent deformation of tyre. However, radial tyres still have some disadvantages at low speeds on off roading (rough road) which are low self-cleaning ability, lower grip performance at low speeds and more rigid sidewall. [46]

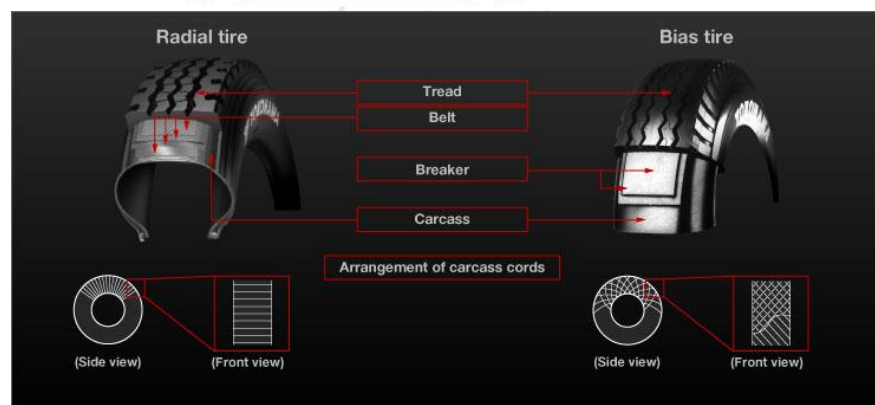


**Figure A.1** Structure design of Radial tyre

**Source** Essentials of vehicle dynamics [47]

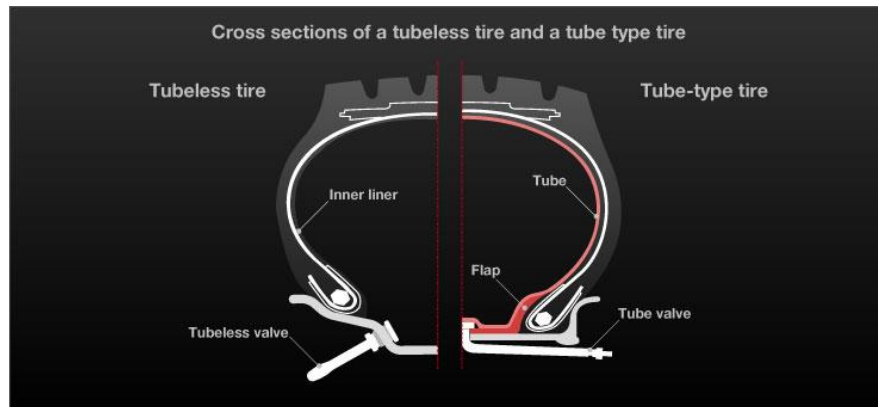
## 1.2 Bias tyre

A Bias tyre or a diagonal tyre is made from rubber-coated and plies of fabric which are laid at angles less than 90 degrees to the center line of tread area which is around 30 – 40 degrees. Also, the structure is similarly a crisscross pattern due to support force which applies to tread area. In addition, the sidewall is a symmetrical construction so it consists an even number of crossed plies and cord of the Bias tyre is made from synthetic fabrics such as nylon and polyether. Moreover, an air-tight inner tube tyre and flap tube tyre are necessary for this tyre in order to keep certain pressure. Therefore, the bias tyre is beneficial for rough road because of great resistance for impacts and cuts and also, there is great smooth and comfort ride performance on rough area while there is a high ability to withstand with high load condition so the Bias tyre is usually used on machinery in terminals, ports, construction works and etc. Also, there is less complicated of construction so it makes lower cost than the radial tyre. However, the performance of Bias tyre is dropped in high-speed situation. As is seen, this tyre will show down-side impacts because the potential is low grip in high-speed movement. Also, there is highly sensitive for overheating and high accelerated wear so all of these impacts to be higher fuel consumption which is compared with radial tyre. [46]



**Figure A.2** Structure and Ply lines of Radial and Bias tyre

**Source** Available at: <https://yokohama.com.sg/technology/tireknowledge/othertireconstruction.html> [Accessed 11 February 2021]. [45]



**Figure A.3** Cross section of a tubeless tyre (Radial tyre) and a tube type tyre (Bias tyre)

**Source** Available at: <https://blobs.continental-tires.com/www8/servlet/blob/912078/43454e4c730edd55db5278fa78389630/continental-basics-en-data.pdf>  
 [Accessed 13 February 2021]. [49]

## A.2 Truck tyre components and functions

The table below shows the component of truck tyre which includes seven parts. Also, there are materials which are commonly used on each part and function description in each part of truck tyre. [46]



**Figure A.4** Radial truck tyre structure

Source Available at: <https://blobs.continental-tires.com/www8/servlet/blob/912078/43454e4c730edd55db5278fa78389630/continental-basics-en-data.pdf>  
 [Accessed 13 February 2021]. [49]

**Table A.2** Summary of truck tyre components and functions

Component	Material	Function
1.Tread area	Rubber compound	<ul style="list-style-type: none"> <li>• High wear resistance</li> <li>• Good grip in any road conditions</li> <li>• Minimize tread temperature</li> <li>• Low rolling resistance</li> </ul>
2.Multi-ply steel belt <i>*Radial tyre only</i>	Steel cords embedded in rubber compound	<ul style="list-style-type: none"> <li>• Strengthen driving stability</li> <li>• Decrease rolling resistance</li> <li>• Increase long service life with structural strength</li> </ul>
3.Steel casing	Steel cord	<ul style="list-style-type: none"> <li>• Tyre structural strength</li> <li>• Supportive driving comfort</li> </ul>
Inner liner <i>*Radial tyre only</i> <i>**Bias tyre uses inner tube and flap tyre</i>	Rubber compound	<ul style="list-style-type: none"> <li>• Prevent diffusion of moisture and air for tubeless tyre</li> </ul>



Component	Material	Function
Sidewall	Rubber compound	<ul style="list-style-type: none"> <li>• Protect scrubbing and impact from external factors such as weather</li> </ul>
Bead reinforcement	Steel cord, Nylon, Aramide	<ul style="list-style-type: none"> <li>• Reinforce bead against shear force</li> <li>• Secure the end of steel cord ply to bead core</li> </ul>
Bead core	Rubber compound with embedded steel wire	<ul style="list-style-type: none"> <li>• Ensure firm fit of the tyre with the rim</li> </ul>

### A.3 Tyre and vehicle maintenance

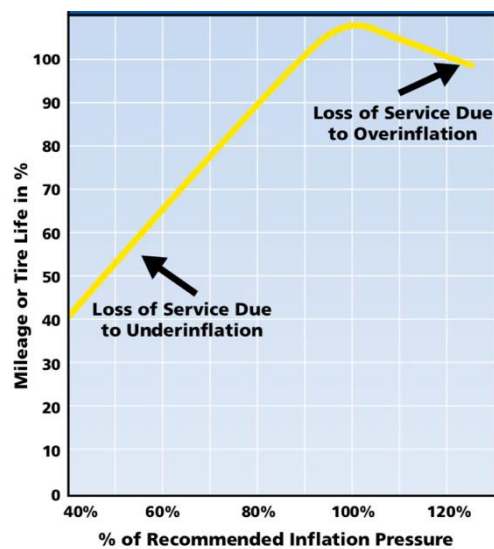
Tyre maintenance is one of the importance to expand tyre life in order to maximize the best tyre performance, safety and fuel economy. Also, maintenance and care of tyre lead to reduce tyre costs, irregular wear, tyre replacement, wheel replacement, tyre waste and natural resource. Therefore, there are two main parts of maintenance including tyre and vehicle which affect to tyre life.

#### 1 Tyre maintenance

This maintenance describes about tyre care and factors which influence to the life of tyre usage. Obviously, there are three parts of maintenance in order to check the tyre which are tyre inflation pressure, tyre inspection and tread depth of tyre.

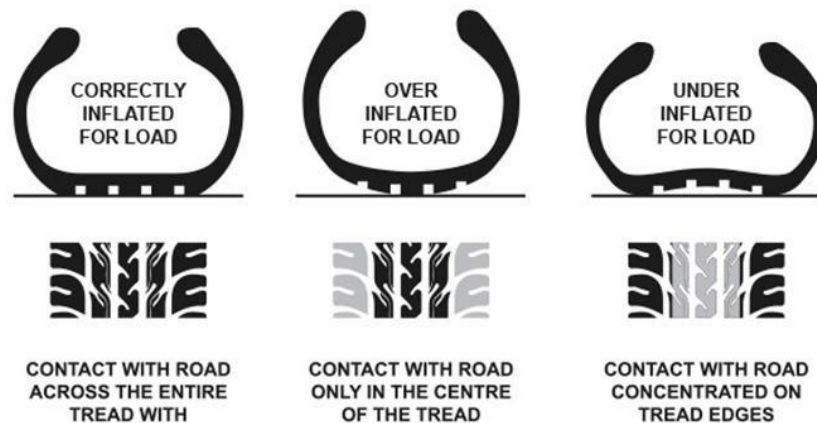
### 1.1 Tyre inflation

The tyre inflation is one of significant aspects for tyre maintenance because correct inflation is able to carry load and avoid tyre damage. That means, the amount of tyre air pressure depends on speed, load, road condition and handling so insufficient air pressure is able to make tyre damage. [50]



**Figure A.5** Effect of inflation pressure on tyre life  
**Source** MICHELIN Truck Tire Service Manual [50]

According to the graph above, it can be seen that the relationship between the percentage of tyre life, which is measured by mileage of tyre, and the percentage of recommended inflation pressure. Obviously, there are three phases of inflation which are underinflation, proper inflation and overinflation.



**Figure A.6** Tyre inflation pressure

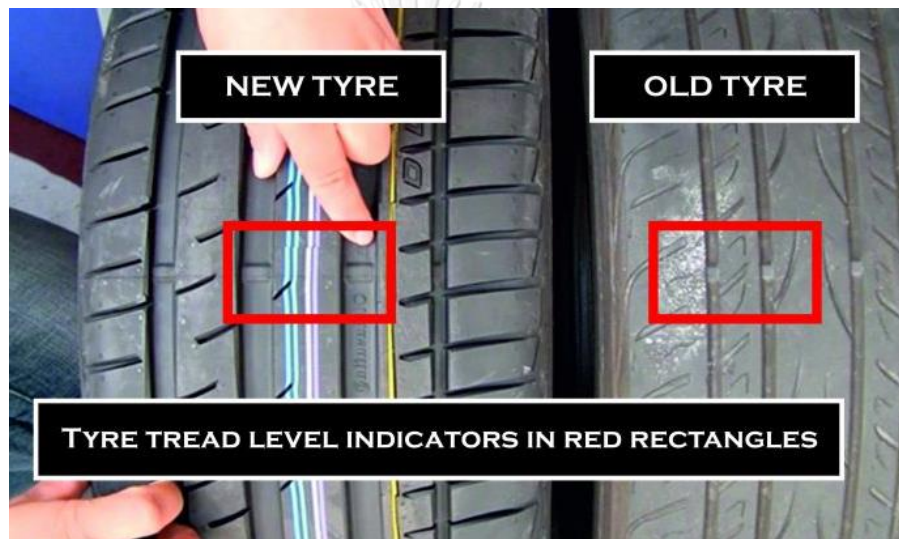
Source Available at: <https://www.chinatires.org/factors-affecting-tyre-performance-and-tyre-lfe-2450/> [Accessed 13 February 2021]. [51]

- I. Proper inflation: It is correctly inflated air pressure for loading so there is the full contact with road and promote performance of traction, safety and braking capability. [50]
- II. Overinflation: This is detrimental too much air pressure for loading cause tyre contacts with road only in the center of tread. Also, it leads to faster tyre deterioration and irregular wear caused of shorten the tyre life. Moreover, overinflation leads to minimize resistance to penetrations and impacts which adverse for handling conditions. [50]
- III. Underinflation: There is low air pressure for loading cause to contact with road on tread edges (tyre shoulders). Also, it causes to increase the force on the outside tyre edges, generate excessive heat and decrease tyre durability. In addition, underinflation can lead to tyre casing fatigue, rupture and degeneration caused of tread life decrease. [50]

Therefore, Tyre inflation pressure is the most critical factor for tyre maintenance in order to extend tyre life because it is beneficial to avoid the hazards of tyre.

### 1.2 Tread depth measurement

This measurement shows the wear of tyre and it can indicate wear level to be regular or irregular by comparing with wear bars in circumference of tyre to be indicator. Obviously, if the tread is worn until same as wear bars from either normal wear or irregular wear, the tyre must be removed from the service because there is no any resistance and leads to be dangerous. In addition, the remaining amount of tread can be calculated to tyre life span to compare with the new tyre tread depth. [50]



**Figure A.7** Comparing tread depth between new tyre and old tyre

**Source** Available at: <https://www.tyremarket.com/tyremantra/how-to-check-the-tread-depth-of-your-vehicle-tyre/> [Accessed 13 February 2021]. [52]

### 1.3 Tyre inspection

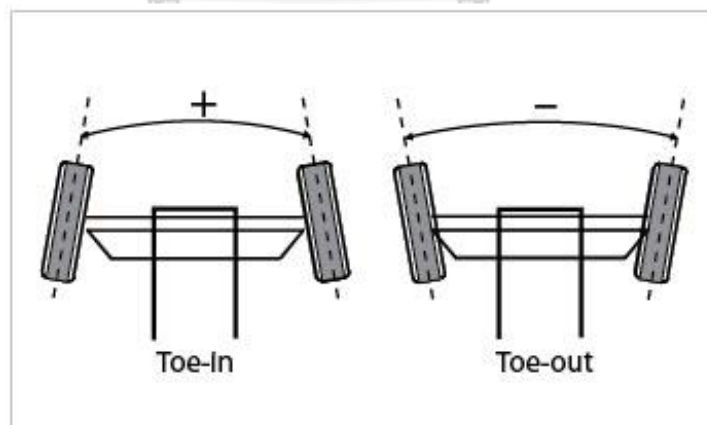
This maintenance is to inspect the physical tyre which see any damage of tyre and wheel that looks for cracks, bulges, penetrations or cuts. Also, this maintenance is able to inspect while checking inflation pressure because inflation pressure level can sign abnormality of tyre such as valve leakage, penetration, wheel damage and etc.

## 2. Vehicle maintenance

This section is one of the influences which makes a lot of tyre problems come from mechanical conditions of the vehicle cause to minimize the tyre performance and the major vehicle factor which affects to tyre life is vehicle alignment. Evidently, alignment is not included only the various angles of steer axle geometry but it also tracks all of axles on the vehicle including trailer. Also, there are five components of alignment including Toe, Camber, Caster, Ackermann, Axle parallelism (Thrust angle and Scrub angle).

### 2.1 Toe

Toe is the most critical alignment condition which affects to steer axle tyre wear and also, the zero toe is the goal of setting due to allow the tyre straight running within normal operative condition. Identically, the toe is the different of distance between front and rear of the pair of front wheels which means the inward or outward status of the wheels in top of vehicle view point. Moreover, the toe measurement depends on load condition which is affected from axle rating, axle manufacturer and steering arm geometry. Obviously, there are toe-in and toe-out which both of them affect to irregular wear of tyre as appearing at the edge of tread tyre. [53]

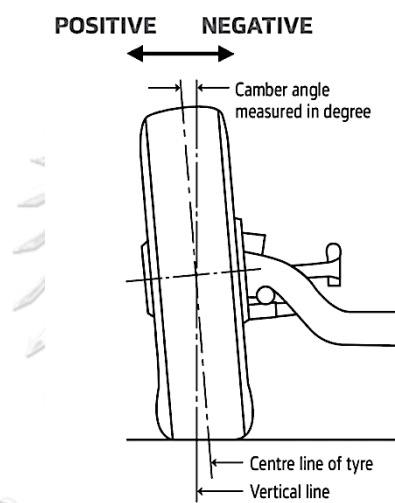


**Figure A.8** Toe-in and toe-out of vehicle in top of view

**Source** Available at: <http://straightlinealignment.com/catid=6/> [Accessed 13 February 2021]. [54]

## 2.2 Camber

Camber angle is the angle (degree) that the center line of tyre is inclined from the vertical center line perpendicular with road surface. For in front of view, the camber is the inward or outward tilt of the tyre steering axles. Also, a positive camber provides the wheel is leaned out of the perpendicular while a negative camber becomes from the lean-in of the wheel cause by load increase, therefore, all of these influences to tyre wear and shorten tyre life. [53]



**Figure A.9** Camber angle of vehicle in front of view

Source Hankook manual [53]

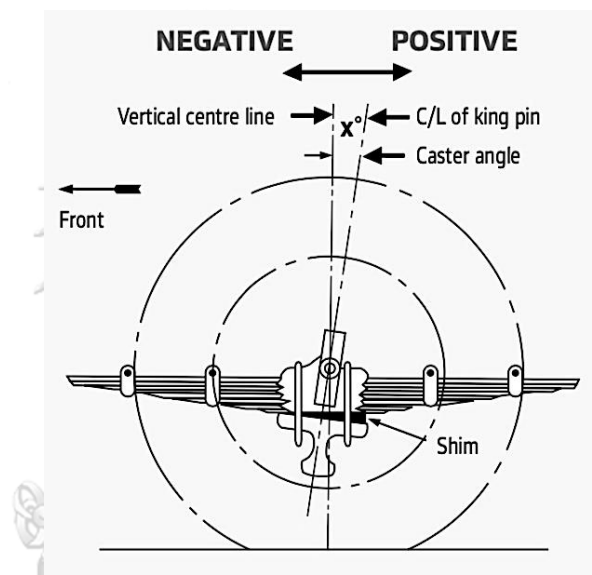


**Figure A.10** Positive camber (left) and negative camber (right) in front of view

Source Hankook manual [53]

### 2.3 Caster

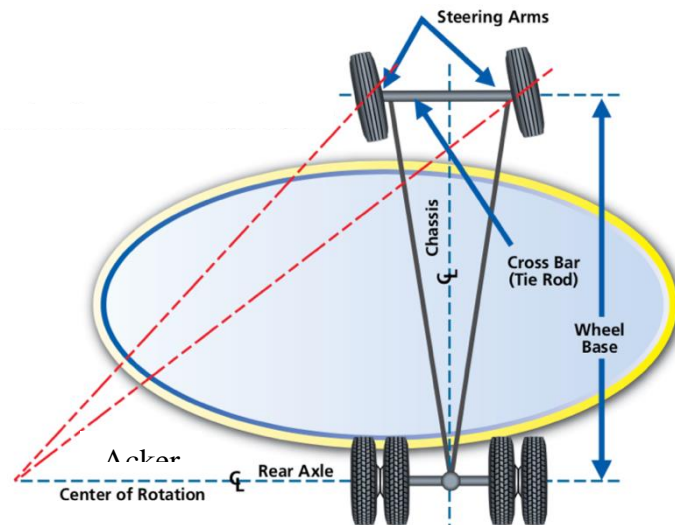
Caster is forward or rearward tilt of the kingpin of steering axle in side of view and the purpose of caster provides the stability when self-aligning forcing on steer tyres when straight driving under braking, power conditions and freewheeling. Also, caster angle should be the same value for both wheels on the given axle. Therefore, too much and too little caster impact on the abnormal tyre wear. [53]



**Figure A.11** Caster of vehicle in side of view  
**Source** Hankook manual [53]

### 2.4 Ackerman

This problem is applied from Ackerman principle which describes deformation of toe-out-on-turn caused from the arcs difference by turning of steering tyres. Moreover, the Ackerman wear appears a rounded edge radial feature wear across the tread tyre area. Thus, the goal is to prevent inside tyre when scrubbing around a turn since the outside tyre (loaded tyre) is determined the turning radius of steer axle. [50]

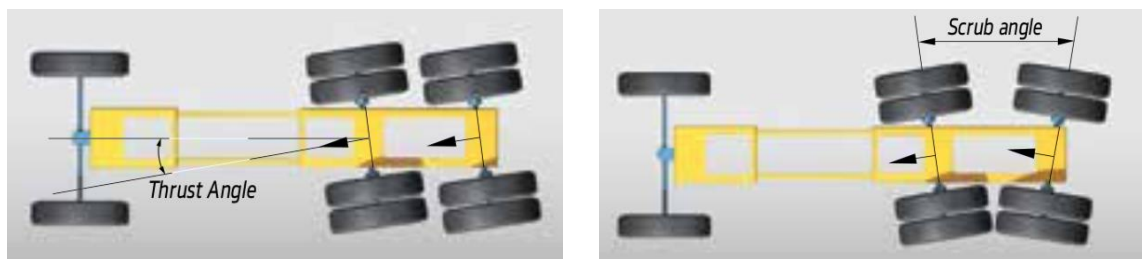


**Figure A.12** Ackerman principle

Source MICHELIN Truck Tire Service Manual [50]

### 2.5 Axle Parallelism

There are two angle which are Thrust angle and Scrub angle (Tandem scrub). It can be seen that Thrust angle is the difference between the line perpendicular to the center line of axle and vehicle and also, each driving axle has own thrust angle. Contrastingly, Tandem scrub or Scrub angle is the different angle between thrust angle of the driving axles. However, both of angle has the same target which the angle should be zero in order to avoid irregular wear of tyre. [53]



**Figure A.13** Thrust angle (left) and Scrub angle (right) of vehicle

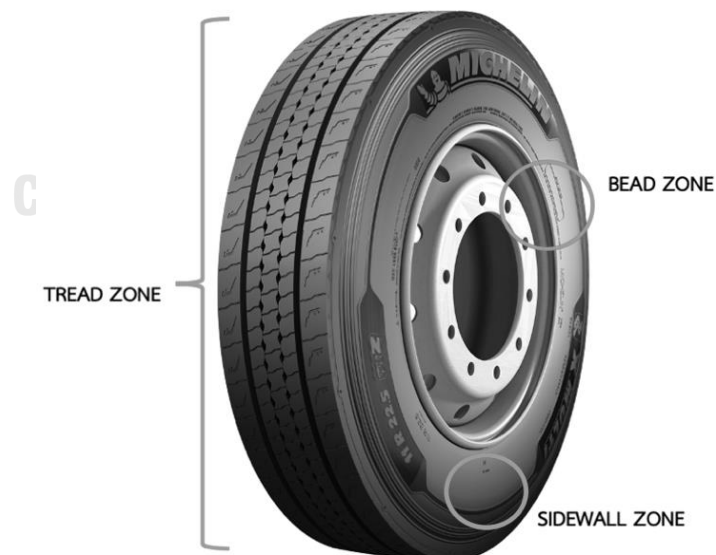
Source Hankook manual [53]



#### A.4 Tyre damage from external factors

According to tyre damage, there are two main principles which are factory damage and mechanical damage. The factory damage is happened during manufacturing process which causes to make tyre defects. However, this problem is less possible to occur when is compared with another damage that means the mechanical damage is occurred while the tyres are been using. Obviously, the happens will come when the tyre contact with rough materials and various sharp objects to make air pressure leakage or impact something to make damage inside the tyre. Moreover, there are a lot of common causes for mechanical tyre damage such as exceeding vehicle load, unsuitable tyre pressure (too high and too low), puncturing (nails, sharp objects), cutting and rubbing the side of tyre, curb or pothole impact with high speeds, installation mistake and tyre's age issue. [55]

Therefore, tyre damage is high possible cause of external factors and it will show on irregularity at level of tyre wear or physical characteristics of tyre. Thus, there are three main areas for common damage including tread, sidewall and bead zones.



**Figure A.14** Common damage area from external factors

**Source** Available at: <https://www.carrushome.com/en/michelin-x-multi-z-2-ready-to-rock-the-truck-tyre-market-in-asia/> [Accessed 14 February 2021]. [56]

#### 4.1 Tread zone

This zone is tyre surface area which contacts with road, sharp materials and impact somethings. Also, the tread area is important zone and the highest possibility to show damage of tyre with tread wear issues including flat spots, cracking between tread, rapid tread wear at shoulder or center and etc. Also, this damage is caused from suspension, wheel alignment, brake problem and etc. so all of these can show on tread zone. [57] So, there are around thirteen issues for common damage at tread area.

##### 1.2.1 Abnormal one-sided wear

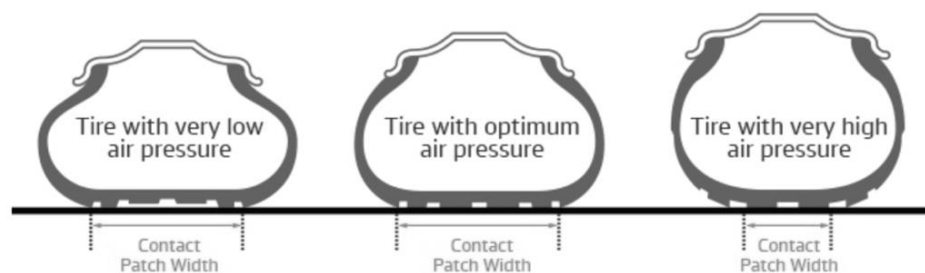
The cause of this problem is that wheels are frequently used to incline to the direction of motion in one-side, as the result, toe-in/toe-out of value is adjusted that means axle and wheel alignment of vehicle is made to be irregular. [49]

##### 1.2.2 Abnormal one-sided wear on both sides in shoulder area

This wear pattern causes from low air pressure which means there is excessive force on the both side in shoulder areas and it made the edges of tread tyre are worn quicker than center point. [49]

##### 1.2.3 Abnormal center wear

The cause is occurred from too high tyre air pressure which it makes the shape of tyre like as balloon then the center area is forced more than other areas which is the cause of abnormal tread wear. [49]



**Figure A.15** Tyre pressure status

**Source** Available at: <https://www.hankooktire.com/mea-en/services-tips/care-guide/pressure.html> [Accessed 14 February 2021]. [58]

#### 1.2.4 Abnormal one-sided wear in shoulder area

This wear outstandingly occurs with trailer tyre cause of unsteady loading, high center of gravity of vehicle, one-sided load distribution, trailer tow-bar bending and trailer coupling ring issue. [49]

#### 1.2.5 Scale-like wear

This wear pattern is rough wear caused by slipping which it is worn following the direction of tyre movement. So, the cause of this problem is the acceleration of vehicle when start or suddenly braking stop. Also, improperly tyre air pressure is one of factor in this issue. [49]

#### 1.2.6 Tramline wear

This wear causes from using unsuitable tyre application and the wear outstands at the edge of tyre circumference on tyre on non-driven axles such as trailer and front axle. Also, this low wear is occurred in vehicle which is used to drive in motorway. [49]

#### 1.2.7 Circumferential wear

This tread wear is cut by protruding or bent of vehicle parts or other objects trapping in the tyre so this causes to damage tread tyre area. [49]

#### 1.2.8 Spotty wear

Spotty wear is that there are different wear levels in the circumferential tread tyre and there are three factors including different diameter on dual tyres, varying tyre air pressure on dual tyres and irregular suspension on vehicle. [49]

#### 1.2.9 Exposed steel cords

This wear occurs with regroove tyre since there is too deep of regrooving to the belt of tyre. Then, the damage affects moisture and dirt to penetrate into the steel cords and makes the rust. Thus, the structure of tyre is fragile and dangerous for using. [49]

#### 1.2.10 Flat spot

The flat spot is caused by braking of vehicle which the brake locking is one of factor to make flat spot since there is incorrect adjustment of brake system. Also, harsh braking or emergency stop influences to make the flat spot because it makes the tyre which is driving to stop suddenly with high temperature and pressure inside the tyre. [49]

#### 1.2.11 Break up of tread due to impact break

This case is similar with flat spot wear which is suddenly braking. However, it is more dangerous which there is impact braking with the angular object with high-speed cause of broken tyres. Also, it can be seriously harsh accident, if there is overloading. [49]

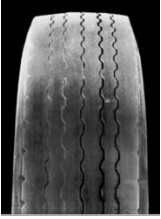



#### 1.2.12 Cuts





This is normal damage of tread tyre which is affected by sharp-edged objects such as glass, metal, stones and etc. So, all of these objects can make tread tyre damage and also, it can seriously affect to be deeply localized cut and unrepaired. [49]

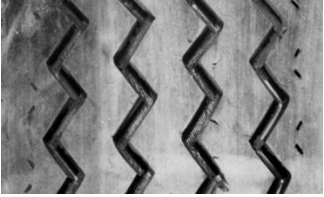



#### 1.2.13 Stressed tread area, cuts caused by spinning cuts



Physical characteristics of road influences to tread tyre which it can be seen that this were is caused by driving on stony ground. That means, the tyre needs to spin on rough surface which can be exacerbated by overloading and moisture, especially, using incorrect tyre air pressure and type of tyre. [49]

**Table A.3** Summary of tread damage

<b>Tread damage</b>		
<b>Wear Characteristics</b>	<b>Cause</b>	<b>Feature</b>
1. Abnormal one-sided wear	<ul style="list-style-type: none"> <li>• Incorrect on toe-in/toe-out of vehicle</li> </ul>	
2. Abnormal one-sided wear on both sides in shoulder area	<ul style="list-style-type: none"> <li>• Too low air pressure</li> </ul>	
3. Abnormal center wear	<ul style="list-style-type: none"> <li>• Too high air pressure</li> </ul>	
4. Abnormal one-sided wear in shoulder area	<ul style="list-style-type: none"> <li>• Unsteady loading which one-sided load distribution</li> <li>• Irregular suspension of vehicle such as tow-bar and trailer coupling ring</li> </ul>	

Tread damage		
Wear Characteristics	Cause	Feature
5. Scale-like wear	<ul style="list-style-type: none"> <li>• Quickly accelerating start</li> <li>• Suddenly braking stop</li> </ul>	
6. Tramline wear	<ul style="list-style-type: none"> <li>• Using unsuitable tyre application on non-driven axles</li> </ul>	
7. Circumferential wear	<ul style="list-style-type: none"> <li>• Cuts caused by object trapping</li> </ul>	
8. Spotty wear	<ul style="list-style-type: none"> <li>• Different diameter on dual tyres</li> <li>• Different air pressure on dual tyres</li> </ul>	

<b>Tread damage</b>		
<b>Wear Characteristics</b>	<b>Cause</b>	<b>Feature</b>
	<ul style="list-style-type: none"> <li>• Irregular suspension of vehicle</li> </ul>	
9. Exposed steel cord	<ul style="list-style-type: none"> <li>• Too deep regroove on regrooved tyre</li> </ul>	
10. Flat spot	<ul style="list-style-type: none"> <li>• Excessive sharp braking (emergency break)</li> <li>• Brake locking</li> </ul>	
11. Break up of tread due to impact break	<ul style="list-style-type: none"> <li>• Suddenly braking with angular object and high-speed</li> </ul>	<p><u>Inside of tyre</u></p>  <p><u>Outside of tyre</u></p> 

Tread damage		
Wear Characteristics	Cause	Feature
12. Cuts	<ul style="list-style-type: none"> <li>Sharp-edged object impact</li> </ul>	
13. Stressed tread area, cuts caused by spinning cuts	<ul style="list-style-type: none"> <li>Road conditions such as stony ground</li> </ul>	

**Source** Available at: <https://blobs.continental-tires.com/www8/servlet/blob/912078/43454e4c730edd55db5278fa78389630/continental-basics-en-data.pdf>  
 [Accessed 13 February 2021]. [49]

### 1.3 Bead zone

This zone is significant because if there is damage around bead zone, the tyre will not use or fix again because there is a hole between bead of tyre and rim of wheel cause of air pressure leakage. So, there three situations to make damage at bead of tyre. [49]

#### 1.3.1 Scorched bead

This damage is occurred from irregular brake system since there is excessive warmth on brake so it makes the surface between bead tyre and rims have overheat cause of scorched bead. [49]

#### 1.3.2 Damage from mounting

Mounting is one of cause to make damage of tyre which there are using sharp-edge fitting tools or incorrect tools to mount the tyre from the rim. Also,




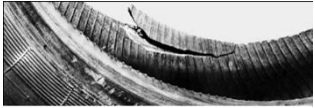

there is no using lubricant while mounting so this cause can make the bead tears.  
[49]

### 1.3.3 Damage from rim

The bead of tyre is sheared cause of rusty rim so the rust and physical characteristic of rim are significant to check before fitting with tyre. [49]



**Table A.4** Summary of bead damage

<b>Bead damage</b>		
<b>Wear Characteristics</b>	<b>Cause</b>	<b>Feature</b>
1. Scorched Bead	<ul style="list-style-type: none"> <li>Excessive warmth on rim and brake of vehicle</li> </ul>	
2. Damage from mounting	<ul style="list-style-type: none"> <li>Using sharp-edge fitting tools</li> <li>Non-using lubricant while mounting</li> </ul>	
3. Damage from rim	<ul style="list-style-type: none"> <li>Rusty rim</li> </ul>	

**Source** Available at: <https://blobs.continental-tires.com/www8/servlet/blob/912078/43454e4c730edd55db5278fa78389630/continental-basics-en-data.pdf>

[Accessed 13 February 2021]. [49]

#### 1.4 Sidewall zone

This zone is one of seriously careful area because it keeps the vehicle stable and built to be strong in order to withstand the extreme load and pressure. However, there are highly risk accidents in the sidewall area while driving and there are seven caused of sidewall damages. [59]

##### 1.4.1 Cut

Obviously, sidewall surface is area which can be touched from other objects especially sharp-edged objects such as glass, metal, stones and etc. Thus, if this area is damaged in deep localized cuts, it will make air pressure to leak and it needs to replace with the new tyre. [59]

##### 1.4.2 Casing rupture due to fatigue

This damage causes from insufficient tyre air pressure while driving and loading. It can be seen that there is using unsuitable air pressure with the load situation or there is leakage in somewhere such as a nail puncture. As a result, the tyre has to be rupture due to fatigue from exceed loading with insufficient air pressure. [59]

##### 1.4.3 Casing rupture due to impact

This situation will occur when there is excessively high tyre air pressure or overloading and the tyre is suddenly impacted with objects or obstacles so it makes the tyre ruptures. [59]

##### 1.4.4 Casing rupture due to foreign object trapped between dual tyres

This cause usually occurs with truck vehicle because there are dual tyres at the rear. Obviously, there will be stones or objects to trap between dual tyres so this leads to sever damage at the sidewall. [59]

#### 1.4.5 Rupture damage

The rupture damage is caused by sharp-edged objects penetrating at the sidewall. Also, this case normally be replaced the new one because there will make a big damage and there is no solution to repair in this area. [59]

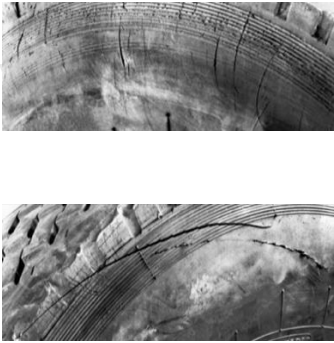

#### 1.4.6 Destruction of the casing


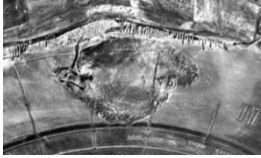



The root cause is insufficient tyre pressure while driving. Also, there are several ways to lose air pressure such as leaking valves, nails or sharp object penetrating, defective inner tube or flap tyres, cracking in the rim of tubeless tyre. [59]

#### 1.4.7 Chafing

There is frequent scraping along and bumping into curbs causes of casing damage so it is necessary to select a special tyre due to match with the application such as buses. [59]

**Table A.5** Summary of sidewall damage

Sidewall damage		
Wear Characteristics	Cause	Feature
1. Cuts	<ul style="list-style-type: none"> <li>Deep localized cuts from sharp-edged objects</li> </ul>	
2. Casing rupture due to fatigue	<ul style="list-style-type: none"> <li>Driving and loading with insufficient air pressure</li> </ul>	

<b>Sidewall damage</b>		
<b>Wear Characteristics</b>	<b>Cause</b>	<b>Feature</b>
3. Casing rupture due to impact	<ul style="list-style-type: none"> <li>• Suddenly impact with excessive high air pressure and overloading of tyre</li> </ul>	
4. Casing rupture due to foreign object trapped between dual tyres	<ul style="list-style-type: none"> <li>• Trapping of object between dual tyres</li> </ul>	
5. Rupture damage	<ul style="list-style-type: none"> <li>• Penetrating of sharp-edge object at the sidewall</li> </ul>	
6. Destruction of the casing	<ul style="list-style-type: none"> <li>• Insufficient air pressure</li> </ul>	
7. Chafing	<ul style="list-style-type: none"> <li>• Scraping along and bumping into curbs</li> </ul>	

**Source** Available at: <https://blobs.continental-tires.com/www8/servlet/blob/912078/43454e4c730edd55db5278fa78389630/continental-basics-en-data.pdf>

[Accessed 13 February 2021]. [59]

## B. Review in interview Result

There were interviews with three different groups including company experts, target customers and tyre expert in order to study perspectives for each group to truck fleet management. Thus, following statements are the results of interview.

### B.1 Focus group of company employees

This part is a description of focus group with experts of Company A to discuss and share about current situation including company performance (Strength and Weakness), current issues, customers' requirements, solutions, and perspective in fleet management. So, there are representatives from different departments for interview.

#### Interview information

Date of interview: 3<sup>rd</sup> February 2021      Time of interview: 09.00 a.m.

Place of interview: Meeting room at Company A

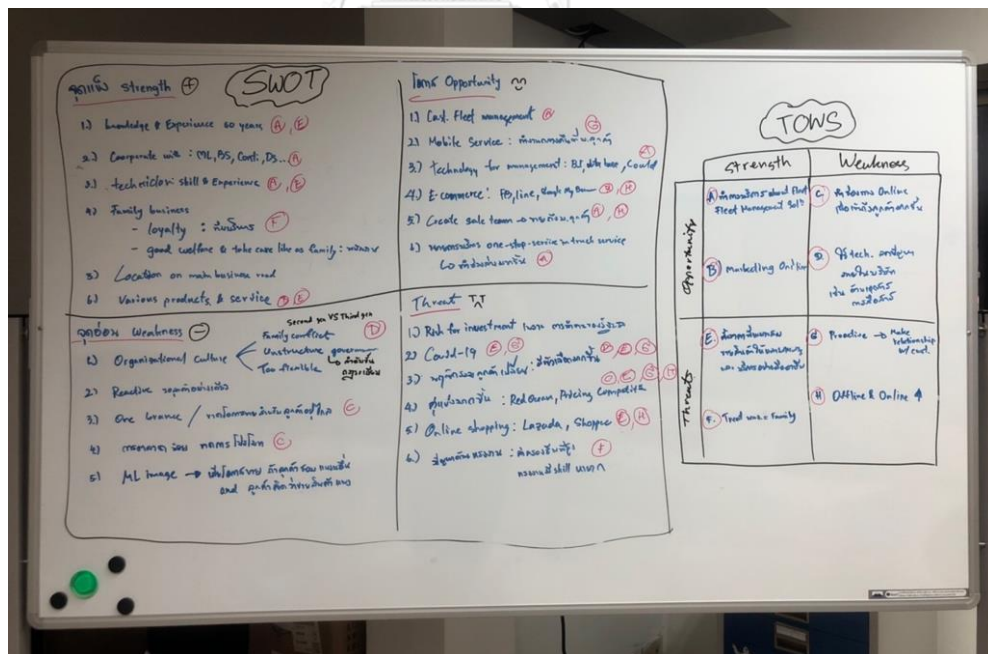


Figure B.1 Summary of result in focus group



**Figure B.2** Phenomenon in focus group

## B.2 Questionnaire of target customers

According to interview target customers, there is using a questionnaire to collect information and there are 16 questions to ask interviewees. So, the questionnaire is as follows;

### Questionnaire about Fleet management for new customer service model

#### Part1: Personal information

1. What is your gender?

Male       Female       Other :.....

2. Which of following age group do you belong to?

Less than 30 years       31-40 years       41-50 years  
 51-60years       Over 61 years

3. What kind of your position is?

- Business owner       Manager       Driver  
 Other :.....

4. How long have you been this occupation?

- Less than 1 year       1-5 years       6-10 years  
 More than 10 years :..... Years

5. What is your level of education and major?

- High school       Bachelor degree       Master degree  
 Other:.....  
Major:.....

## Part2: About your business

6. What kind of your company is?

- Construction       Bus/Tour       Logistic  
 Retailer       Other:.....

7. How many vehicles are there in your company?

- 1-10       11-20       21-30       More than 30

8. What kind of your vehicles are? (*you can choose more than 1*) and how many for each?

- Car :.....  Light truck/Pick up :.....  Van :.....  
 Bus/Coach :.....  Truck :.....  Other :.....

## Part3: Opinion about tyre management in current operation

Please fill  $\surd$  into blank which rates your satisfaction level

- Note      5      means      Strongly satisfied/Strongly agree/Very often  
             4      means      Satisfied/Agree/Often  
             3      means      Partly satisfied/Partly agree/Medium  
             2      means      Unsatisfied/Disagree/Seldom



1 means Strongly unsatisfied/Strongly disagree/Very seldom

**Table B.1** Questionnaire about Fleet management for new customer service model

Question	1	2	3	4	5
<b>Efficiency</b>					
9. How often do you change your tyre?					
10. Do you think you utilize your tyre in the inefficient tyre performance?					
<b>Productivity</b>					
11. How often do you have breakdown cause of tyre problem?					
12. Do you think you waste your time for solving breakdown cause of tyre problem?					
<b>Visibility</b>					
13. Do you think you have lack of data in tyre performance?					
14. Do you think you manage a poor schedule maintenance and service?					
<b>Finance</b>					
15. Do you think you lose your money for changing tyre with unnecessary?					
16. Do you think you lose your money for cost of breakdown?					

### **B.3 Tyre expert information**

This part is a description of interview with officers from Company M which is the top tyre manufacturing company to discuss about fleet management in the present market. As a result, there three models Company M to operate for their customers.

#### Interview information

Date of interview: 5<sup>th</sup> February 2021      Time of interview: 02.35 p.m.

Place of interview: Interviewed through calling with interviewees

### Interview questions

There were interview about fleet management for large vehicle which Company M provides to their customers and questions were about how to do, advantages for customer, how to make payment and challenges for company. So, the interview results are;

#### 1. Pay as use model

Operation:

This model will help customer to manage and operate tyre utilization that means teams provide to inspect and record dept of tread tyre, air pressure and physical in order to analyze the efficiency of tyres. Then, they will report results to customers and advice how to maximize tyre performance. Also, Company M will help customers to provide the right information about tyre usage to be proper with their activity work such as optimizing air pressure for loading and proper tyre qualification with their job.

In addition, the company provides this service solution by using “Tirecheck” program to measure for management of tyre. It can be seen that this software is innovative technology to correct data in accuracy, reliability and real-time. Therefore, this is a highlight of company to be convince and save their time because there are controlling and monitoring with smart devices including tyre pressure gauge and tyre dept measurements by linking the smart phone. Therefore, operators can monitor tyre utilization via their smartphones and also, they can print report for their customers to present tyre performance.

Advantages for customer:

There are beneficial values for customers which it can reduce downtime and minimize cost of tyre usage for customers because it can increase lifespan of tyre and also provide proper maintenance planning. As the result, it can help

customers to allocate expense of company and also, there is provide the visible report for customers in order to manage their business.

Finance:

According to this service, the company will receive revenue from two ways. Firstly, it can be known that the products of Company M are premium brand and the price is almost the most expensive comparing with other brands so this cause is challenge for Company M to sell their products. However, this model can provide highly profitable tyre utilization for customers and they pay as cost of products as they use. Secondly, customers need to pay money for tyre inspection and generally, Company M will charge around 200 – 300 baht per vehicle for one time in order to be operation cost.

Challenge for company:

This model is simply to copy because it is not complicate to operate and customers can do by themselves. However, the significant item is “Tirecheck” program which can make the service model for truck fleet management to be different service from others but customers have to pay the charge of service. So, this is challenge for company to make customers trust in the service.

## 2. Budget allocation model

Operation:

This service model provides Company M to be similarly as the outsource that means customers will hire the company to manage and operate their tyres by themselves and customers will pay in monthly which depends on contract. Identically, the company will operate tyre utilization instead of customers and this option will be responsive all of tyre expenses including tyre changing, maintenance and etc.

Advantage for customer:

This model is help customers to reduce responsiveness about tyre in valuable cost to be fix cost so this is beneficial which customers can allocate

their expense. Moreover, customers are able to minimize tyre problems and concerns because there are tyre experts to monitor and control instead of them.

Finance:

There is contract between customer company and Company M so customers will pay in monthly payment. So, this is the benefit for the company if they can control and minimize tyre cost because customers have to pay in same amount of payment, although, cost of tyre is under than contract.

Challenge for company:

The challenge of this model is customers' cooperation since the company signs contract with customer to be responsive all of tyre issues so it makes customers are able to ignore to carefully utilize their tyres so, this is risk to make over budget of contract.

### 3. CPK (Cost-per-Kilometer) Guarantee model

Operation:

This model is guarantee price of tyre cost that means Company M will learn and research all of information from customers such as kind of business, milage of distance in one round, weight of loading in one round and etc. Then, they will analyze and calculate cost of tyre per kilometer for guarantee price to customers in order to be a fix cost per kilometer for customers to operate in their business.

Advantage for customer:

This model provides customers to clearly know the cost of tyre per kilometer so this is helpful for business which needs to know cost of tyre in one journey such as logistic company. Obviously, the logistic company will calculate service charge from their customers depending on weight of parcel and distance of destination. Also, all of these are related with tyre usage so it is valuable for the company that has guarantee price to easily create service charge to customers.

Finance:

There is calculation similarly pay as use model which customers will pay as amount as they use. But it is different that cost will calculate from the amount of mileage. That means, there will be equation like as;

$$\text{Payment of customers in one month} = \text{Amount of mileage usage} \times \text{CPK guarantee price}$$

Challenge for company:

The risk of this model is Company M has to clearly understand right customers' data because there is to guarantee the cost of tyre per kilometer and customers will pay in this cost. So, the company has to approach in deep data of customers' company due to calculate accurately. Therefore, this is challenge for Company M to ensure that customers will provide all of information and allow to approach the real data.

### C. Benchmark review

According to design the service model section, there is benchmark part in order to classify the outstanding performance from studying models so there is a questionnaire to ask the team company in order to point the prominent point in each model.

#### Interview information

Date of interview: 26<sup>th</sup> February 2021      Time of interview: 09.00 a.m.

Place of interview: Meeting room at Company A

**Questionnaire about Fleet management to compare customer service models**

Please fill point (1-5) into blank which rates your satisfaction level

Note	5	means	Strongly satisfied/agree
	4	means	Satisfied/Agree
	3	means	Partly satisfied/agree
	2	means	Unsatisfied/Disagree
	1	means	Strongly unsatisfied/disagree

**Table C.1** Questionnaire about Fleet management to compare customer service models

Topic	Model		
	Pay as use	Budget allocation	CPK
<b>Customer satisfaction</b>			
1. Customers will satisfy to participate for sharing their information.			
2. A model can increase efficiency of tyre utilization.			
3. A model can reduce vehicle breakdown and save cost.			
4. A model can provide the real data to help customers in management their business.			
5. A model can provide convenience to decrease customer' time for tyre management.			
<b>Total</b>			
<b>Operation</b>			
6. A model can enhance efficient performance and potential of existing resource.			

Topic	Model		
	Pay as use	Budget allocation	CPK
7. A model is easy and uncomPLICATE for operation.			
8. Company can adapt data from a model to manage within company such as inventory management.			
<b>Total</b>			
<b>Finance</b>			
9. A model can increase revenue.			
10. There is least investment including man, machine and management.			
<b>Total</b>			
<b>Sustainability</b>			
11. A model can keep relationship with existing customers.			
12. A model can attract new customers to use the service.			
13. A model is the least risk to be failure.			
<b>Total</b>			

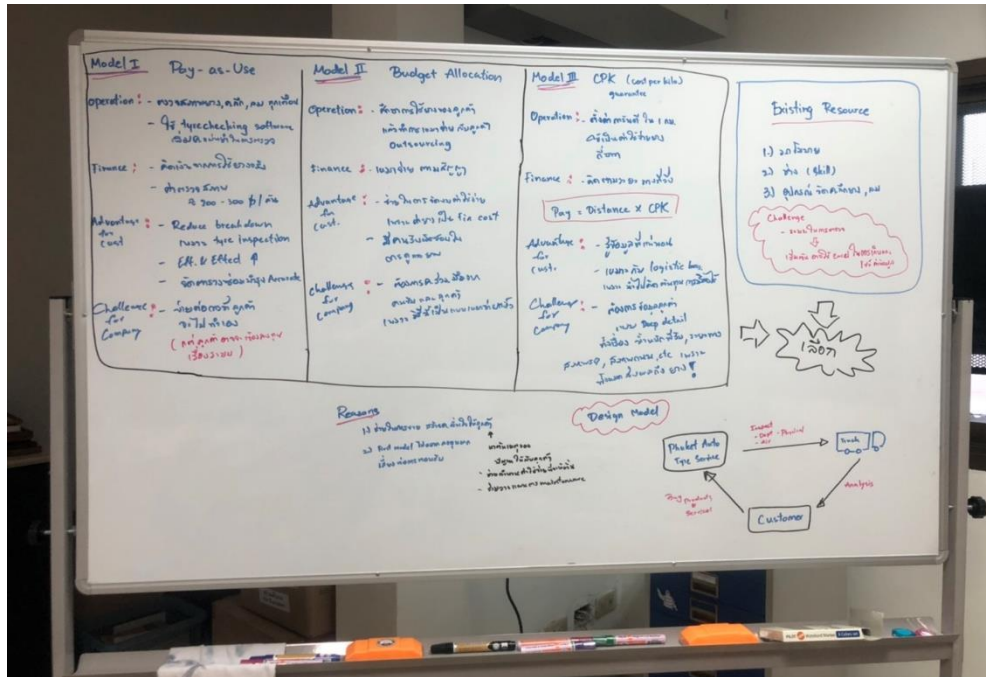


Figure C.1 Sample of discussion in benchmark review (1)

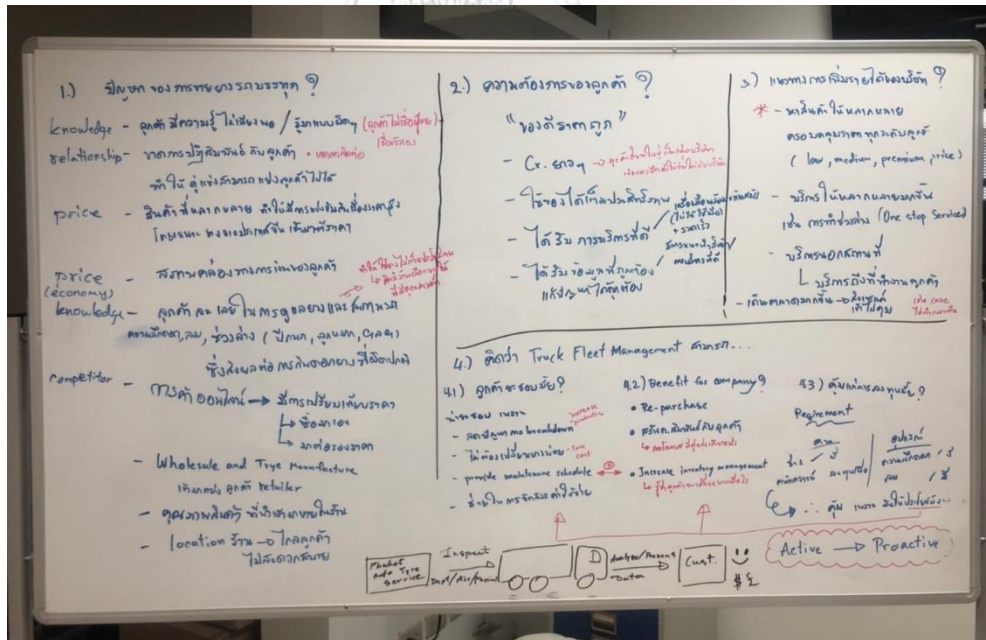


Figure C.2 Sample of discussion in benchmark review (2)



### D. Market experiment operation

According to the market experiment, there was a test of the new customer service model in real situation so there were figures to show technicians' operation.



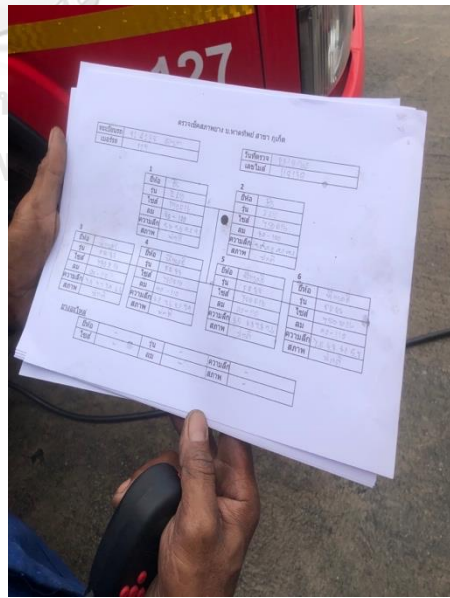
**Figure D.1** Tread depth measurement



**Figure D.2** Air pressure measurement



**Figure D.3** Inspection of physical tyre



**Figure D.4** Recoding of inspection

## E. Ethical Approval Document

This figure below shows a copy of ethical approval confirmation from the Warwick Overseas Programmes Course Office for the research. Also, there is the ethical approval reference number which is **REGO-2021-WMGOS-0010**.



**Figure E.1** Copy of ethical approval confirmation

**Source** Email from [wmg-overseas@warwick.ac.uk](mailto:wmg-overseas@warwick.ac.uk)

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