SERVITIZATION MODEL FOR CHEMICAL INDUSTRY IN THAILAND

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โดยทั่วไปแล้วธุรกิจในอุตสาหกรรมเคมีผลิตและจำหน่ายสินค้าเคมีภัณฑ์ในรูปแบบสินค้าที่จับต้องได้มีการแข่งขันด้านราคาสูงและเน้นขายสินค้าในปริมาณเยอะ เมื่อไม่นานมานี้อุตสาหกรรมเคมีได้ให้บริการอื่นๆ ที่นอกเหนือไปจากสินค้าเคมีภัณฑ์ หลายบริษัทได้เปลี่ยนรูปแบบจากการให้บริการเฉพาะสินค้าเคมีเป็นการให้บริการที่มีทั้งสินค้าและบริการรวมกัน การเปลี่ยนแปลงนี้เรียกว่าเป็นรูปแบบบริการภิวัฒน์ บริการภิวัฒน์สำหรับอุตสาหกรรมเคมีสามารถแยกได้เป็น 4 ประเภท ได้แก่ สินค้าเคมี สินค้าเคมีพร้อมบริการเสริม สินค้าเคมีพร้อมบริการที่แตกต่าง และบริการคือสินค้า จุดประสงค์ของการศึกษาดุษฎีนิพนธ์นี้คือการสร้างกรอบงานวิจัยด้านบริการภิวัฒน์ให้สำหรับซัพพลายเออร์ด้านเคมีภัณฑ์ยกระดับการให้บริการสินค้าและการบริการในการสร้างระบบบริการใหม่ กรอบงานวิจัยส่วนแรกคือการพัฒนารูปแบบบริการภิวัฒน์สำหรับอุตสาหกรรมเคมีในประเทศไทย กรอบงานวิจัยส่วนที่สองคือการกำหนดระดับการให้บริการสำหรับซัพพลายเออร์ที่จะเสนอให้กับลูกค้า งานวิจัยนี้ได้สำรวจแบบสอบถามจำนวน 200 ชุดเพื่อสอบถามไปยังผู้ให้ตัวแทนจำหน่ายสินค้าเคมีภัณฑ์ ตัวแทนย่อย และผู้ใช้สินค้าเคมีภัณฑ์หรือโรงงานผลิตสินค้า เพื่อให้บรรลุถึงจุดประสงค์ของงานวิจัยนักวิจัยได้ประยุกต์ใช้สถิติเชิงพรรณา การวิเคราะห์การถดถอยพหุคูณ แบบจำลองลอจิกพหุนาม (MNL) และ ANOVA แบบทางเดียว เป็นเครื่องมือทางสถิติในการวิเคราะห์ข้อมูล ผลการวิจัยได้ปัจจัยสำคัญ 7 ด้านจากทั้งหมด 12 ด้านแล้วนำมาวิเคราะห์ระดับการให้บริการตามที่ลูกค้าต้องการ นักวิจัยได้วิเคราะห์ความหมายของปัจจัยที่สำคัญแต่ละด้านเพื่อหาความสำคัญและนำมาใช้เป็นข้อเสนอแนะให้กับซัพพลายเออร์ที่ต้องการเปลี่ยนโมเดลทางธุรกิจ คำแนะนำสำหรับซัพพลายเออร์ที่ต้องการเปลี่ยนโมเดลทางธุรกิจเป็นประเภทบริการคือสินค้าคือซัพพลายเออร์ควรเสนอบริการด้านการผสมสารเคมี การจัดเก็บสารเคมี เอกสารทางเคมี และโปรแกรมด้านสิ่งแวดล้อมและความปลอดภัยเป็นบริการที่ควบรวมไปด้วยกัน

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Tanyaporn Kanignant : SERVITIZATION MODEL FOR CHEMICAL INDUSTRY IN THAILAND. Advisor: Assoc. Prof. PONGSA PORNCHAIWISESKUL, Ph.D. Co-advisor: Prof. KAMONCHANOK SUTHIWARTNARUEPUT, Ph.D.

Chemical industry traditionally produces and sells tangible goods in large volume and high price cometition. Recently, firms in chemical industry provide additional services to their customers. Several manufacturers change from tangible product suppliers to both product and service providers. This movement is called servitization (Vandermerwe & Rada, 1988). Chemical servitization levels can be classified into 4 categories which are product only, service added to the product, service differential the product and service is the product (Thoben, Eschenbacher, & Jagdev, 2001). The objectives of this paper are to construct servitization framework for chemical suppliers to shift to product service integration and to examine factors affecting chemical service levels to provide guidance to chemical suppliers to implement product service system (Kortman, Theodori, Ewijk, Verspeek, & Uitzinger, 2006). The first part of the framework is to develop servitization levels for chemical industry in Thailand. The second part is to define servitization levels for suppliers to offer to their customers. Questionnaire surveys were distributed to chemical dealers, sub-dealers, and end-users, and the sample size was 200. To accomplish the research objective, descriptive statistics, Multiple Regression Analysis, Multinomial Logit Model (MNL), and One Way ANOVA were used in this research. The finding includes seven significant factors which were identified in order to analyze the service level of customer needs. Implications and suggestions for suppliers who want to change their business model to providing chemical solution should offer chemical blending, chemical storage, chemical documentation, and environmental and safety program as bundle services with chemical products.

Field of Study:	Logistics and Supply Chain Management	Student's Signature ....
Academic Year:	2020	Advisor's Signature ....
		Co-advisor's Signature ....

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Tanyaporn Kanignant

TABLE OF CONTENTS

Page

LIST OF TABLES

Page

LIST OF FIGURES

Page

CHAPTER 1
INTRODUCTION

1.1 Chemical Industry

Chemical industry traditionally produces and sells physical goods. Recently, the firms in chemical industry provide additional services to their customers. Several manufacturers changed from tangible product suppliers to both product and service providers. Servitization concepts have been introduced to explain the idea that manufacturers or producers turn out to be service providers (Buschak & Lay, 2014; Goedkoop, 1999; Tukker, 2004; Vandermerwe & Rada, 1988). This concept has been applied in many industries including chemical industry. Chemical servitization is a new trend for companies in chemical industry to change their focus to gain competitive advantages and leave out cost competition to win against competitors (Kortman, Theodori, Ewijk, Verspeek, & Uitzinger, 2006; T. Robinson, C. Clarke-Hill, & R. Clarkson, 2002a; Toffel, 2008). Chemical is one of the most important industry that its products are wildly used in our daily lives. Consumers are influenced by chemicals in many ways such that we consume food, housekeeping, painting, pharmaceuticals, agriculture, construction, adhesive, and textile products. The European Chemical Industry Council (CEFIC, 2016) categorized chemical products into three groups which are base, specialty, and consumer chemicals. US Department of Energy, National Renewable Energy Laboratory or NREL (2004) classified products of petroleum-based feed stocks as Figure 1.1 starting from raw materials,

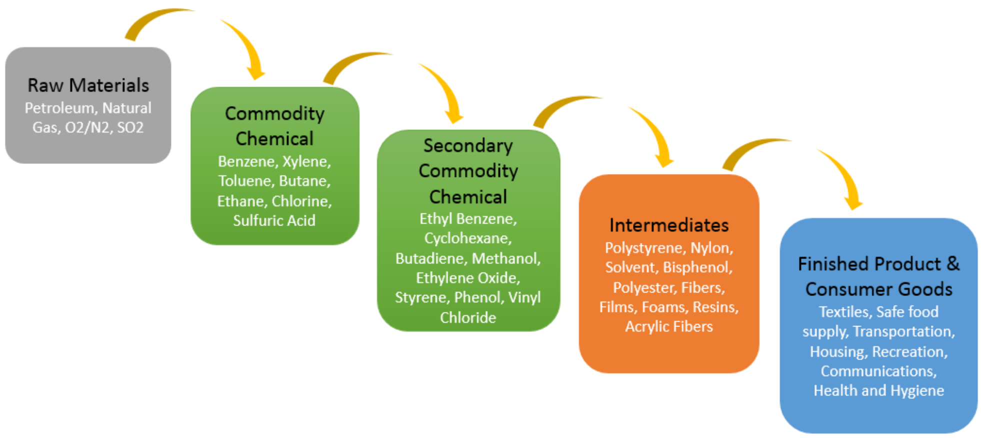


Figure 1.1: *Chemical Product Chain*

commodity chemical, secondary commodity chemical, intermediates, and finished products and consumer goods. As the range of chemical product chain is too wide to concentrate, this study will focus only on chemicals located in both commodity and secondary commodity chemical products in B2B business type in a perception that the chemicals are used as raw materials for manufactures to produce finished goods.

The organizational changes in traditional manufacturers to new trend of servitization have been developed since the last two decades. Shifting an offering from only selling aero engines to providing a total care package – "power by hour", Rolls-Royce Aerospace changed its business model to combine product sales with maintenance services. Revenues come from making the engine available for use, and customers pay for hours they use the engine. With this new business model, the customers are no longer worry about the engine and spare parts care because the company takes responsibility for risk and maintenance. Another similar example is IBM, a traditional manufacturing company, transferred from hardware producer to business solution provider. The company can even create more revenue than it used to. SAFECHEM, a subsidiary of The Dow chemical company located in Europe and North America, provides uses services and solutions. The services cover product life cycle e.g. delivery, inventory and quality monitoring, and recycling of. SAFECHEM cooperated with Pero AG, a manufacturer of metal cleaning machines, and collaborated with Pero Innovative Services founded a new company to provide cleaning services. Pero Innovative Services GmbH produced cleaning machine for metal parts, provided cleaning staff, and was responsible for resource logistics planning, while SAFECOM supplied for cleaning manners, checked quality, and was in charge of waste management. Thus, the cleaning process begins with Preo Innovative Services GmbH provides personnel for cleaning to its customers by using cleaning machines from Pero AG, and chemical supplies accomplished by SAFECOM (Buschak & Lay, 2014).

Logistics 4.0 trends

- Individualization
- Servitization
- Accessibility
- Autonomy
- Global network
- Digitalization
- Green logistics/circular economy
- Sharing economy/ collaboration

Figure 1.2: *Logistics 4.0 trends (Strandhagen et al., 2017)*

Chemical products are commodity products which are uses as raw materials for manufacturing products and can be transformed to intermediate and specialty chemicals (see Figure 1.1) sold by volume with standardized quality and few variants. The commodities are in high market competition because price is the key buying criteria for buyers. Thus, any suppliers who offer lower prices will be more attractive to customers than the suppliers who charge higher prices. When a firm selling commodity product cannot charge customers in high prices, the firm is in a struggle situation namely commodity trap. T. Robinson, C. M. Clarke-Hill, and R. Clarkson (2002b) studied servitization model which is a strategy that helps companies to drip out the community trap but achieve competitive advantages and seek for differentiation instead. The servitization strategy is a strategy for companies changing from traditionally cost oriented to service and relationship management. Servitization is also one element of logistics 4.0 trends for sustainable business model to transform enterprises from tangible product to service-oriented that can increase the value proposition by integrating services and manufacturing processes in their offers (Strandhagen et al., 2017). It develops role of customer in products' life cycle and creates long-term relationship between enterprises and customers. At the end, servitization generates stable revenue in recurring services that would gain larger income and profits than one-time charge for tangible product sales, see Figure 1.2.

1.2 Problems of Chemical Providers

Manufacturing companies are now recognizing that they have to change the focus of their business model from concentrating on selling products to providing customer oriented solutions and services (Davies, Brady, & Hobday, 2007; Grönroos, 2000; Stremersch, Wuyts, & Frambach, 2001). An effective way to escape from competing on the basis of cost is they need to move up the value chain to create and innovate more sophisticated products and services (Neely, 2014). Problems of Thai chemical providers are as follows:

- **Competitiveness markets:** Chemical industry is high competitive in the maturity stage that has many chemical providers in both domestics and global markets.
- **Price sensitivity:** Chemical producers are beaten by price. Chemical manufactures who offer the cheaper price will take the market share, while the manufacturers who charge higher price will lose the market share.
- **Volume based selling with low margin:** Most chemical products are selling by volume and many times cannot be charge as high price. This means the company may sell bulk of chemicals but they receive very low margin in return.
- **Limited services with low value:** Most manufacturing companies provide very limited services which are basically involved with products, and these services are classified as low value services. The chemical providers may give free chemical training service to their customers who buy big volume. This service is a painful of the company.
- **Business model:** The current business model which is focusing on selling tangible product in big volume might not be suitable for chemical providers anymore.

The companies should look for new business model that is more attractive to their customers and can create more value to their products.

Under the uncertainty economic condition, how Thailand's chemical industry can survive in the market has been questioning. Thai chemical providers are also facing the same problems as others in other part of the world. They need to change their focus of their business as well.

1.3 Extended product dimension

To have advantages in competitive the market, manufacturers and suppliers have to integrate their core products with additional services to make their products more valuable and attractive. This concept is defined as Extended Product, which consists of three layers, the kernel as an illustration of the core and functionalities of product (tangible), the middle layer describing the product shell including packaging of the core product (packaging), and the outer layer representing all the intangible assets of the offer (services) (Figure 1.3 (Thoben, Eschenbacher, & Jagdev, 2001)).

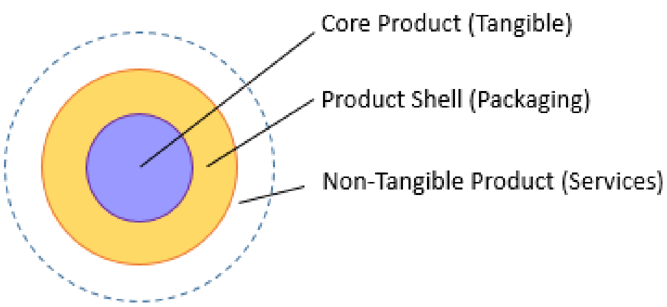


Figure 1.3: *Extended Product concept (Thoben et al., 2001)*

A combination of core product and the product shell is called products in a narrow sense which tangible products are offered to the market, whereas a blending between product shell and non-tangible product is named product in a broader sense as a product solution that both tangible and intangible products are integrated together (Thoben et al., 2001). Figure 1.4 illustrates dimension of migration process based on the expended product concept transforming from tangible product to intangible services and finally service as product (Chen & Cusmeroli, 2015).

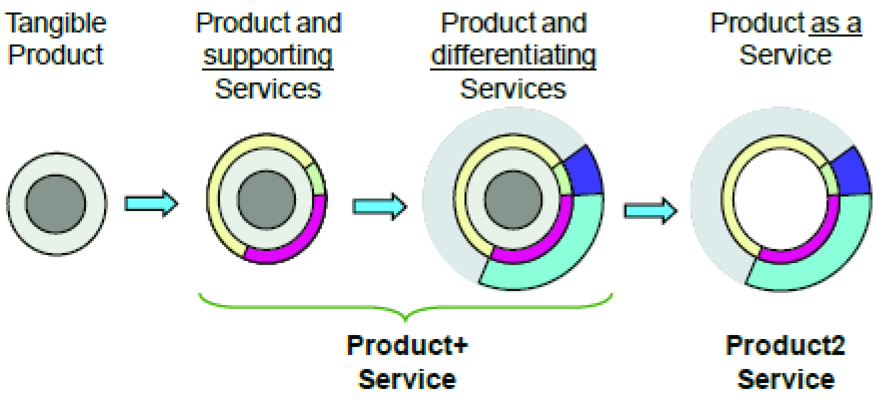


Figure 1.4: *Extended Product dimension (Chen & Cusmeroli, 2015)*

1.4 Servitization

The major points are sustainability and survival driving manufactures to not rely on pure product selling. Instead, they emphasis on the costs and revenues rising throughout the product lifecycle (Adrodegari, Alghisi, Ardolino, & Saccani, 2015; Buschak & Lay, 2014). Consequently, new trends for manufacturers are changing from traditional business model, based on selling products and transferring product ownership, to an application of new product-service oriented business models which have been mentioned in literatures since the '90s. Many literatures discussed this new business models of shifting from products to solutions in several theories. The first introduce of servitization concept was mentioned by Vandermerwe and Rada (1988). The researchers stated that instead of the traditional way of selling products, servitized companies provide bundles of products and services. As a result, this idea has been adopted in almost all industries around the world. It is noticeable that many corporations need both goods (materialization) and services. Servitization is focusing on shifting from products to integrated product services to gain competitive advantages (Robinson et al., 2002a). Going downstream of the value chain and providing services is another meaning of servitization for manufacturers to generate new profit imperative rather than just producing and selling goods (Wise & Baumgartner, 2000). Product-service system (PSS) is another term of servitization as combining tangible products and intangible services to fulfill specific customer requirements (Goedkoop, 1999; Tukker, 2004). Transition from product-based to service-based which core competences and services are converted into value propositions to gain competitiveness is mentioned in literatures (Matthyssens & Vandenbempt, 2010; Vargo & Lusch, 2004). Accordingly, servitization is diversified and can be used in different terminology such as integrated solutions, functional products and product service systems (Buschak & Lay, 2014).

Reasons of why companies should servitize are also mentioned through various concepts, such as "to lock out competitors"; "to lock in customers" and "to increase the level of differentiation" (Vandermerwe & Rada, 1988), "to develop sustainable competitive advantages and profitability" (Porter & Ketels, 2003; Vandermerwe & Rada, 1988) and "to increase sales revenue" (Neely, 2007; Slack, 2005).

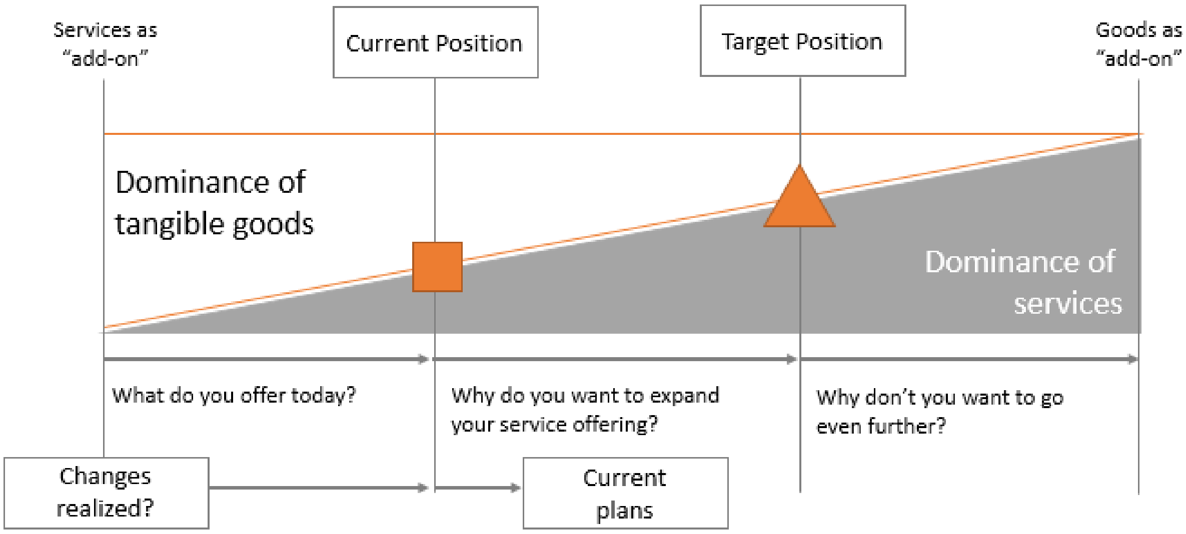


Figure 1.5: *The product service continuum adapted from Oliva and Kallenberg (2003)*

Servitization not only gives several benefits to both manufacturers and suppliers, but also has substantial challenges (Baines, Lightfoot, Benedettini, & Kay, 2009; Neely, 2007; Oliva & Kallenberg, 2003). There are selection forms of servitization with different features. One potential application is called Product-Service Continuum which is a theoretical model of a transition from traditional manufacturer where companies merely sell tangible products and offer services as the add-on to service providers where companies provide services as their main value added solution (Figure 1.5). Many literatures commonly propose three servitization drivers that are important factors for the transition; namely, financial, strategic (competitive advantage) and marketing (Gebauer & Friedli, 2005; Oliva & Kallenberg, 2003).

1.5 Servitization Levels

There is no precise servitization form, but rather different levels of servitization spanning along the product service continuum (Figure 1.5) starting from no service added of pure tangible products, limited product related services, interaction services with customers, through total product service solutions customized by service provider and customer (Neely, 2014; Oliva & Kallenberg, 2003). Thus, servitization levels are steps of transformation from traditionally tangible product to intangible service (Chen & Cusmeroli, 2015). Servitization levels may defined in different terms such as servitization stage (Posselt, 2017), extended product and service (Chen & Gusmeroli, 2015; Thoben et al., 2001).

Servitization has been studied by several researchers in past several years, and chemical servitization has also been included in those researches because it is dangerous good that requires special storage and handling. For example, Neely (2007) investigated financial outputs of 10,028 servitized manufacturers from 25 countries, including Thailand in 27 different industries. The sample firms were selected from companies in the US SIC code as in Table 1.2. Sample companies were selected from various industries, including chemical and some other chemical related industries. Many chemical products, especially hydrocarbon are commonly used for chemical reaction in manufacturing processes of raw material substances to produce consumer products. Chemical products are used for production of various industries such as Biodiesel, Lubricant, Mining, Household Product Rubber Industry, Textile, Intermediate Chemical, Cleaning &Degreasing, Agrochemical, Blowing Agent, Adhesive, and Paint & Coating. As a consequence, chemical products are important for industries and should be studied deeply in servitization perspective.

Another example showing that chemical industry is appropriate to servitize is the servitization study in China from Li et al. (2015) that gathers information from various industries such as electrical machinery, garment and apparel industry, textile industry, chemical fiber manufacturing, chemical raw materials and chemical products manufacturing, computer, communication and electronic equipment manufacturing, automobile manufacturing, rubber and plastic products industry, pharmaceutical manufacturing, and special equipment manufacturing.

Table 1.1: *US SIC codes of companies selected in the exploring the financial consequences of the servitization of manufacturing*

10	Metal mining
12	Coal mining
13	Oil and gas extraction
14	Mining and quarrying of nonmetallic minerals, except fuels
15	Building construction—general contractors and operative builders
16	Heavy construction other than building construction—contractors
17	Construction—special trade contractors
20	Food and kindred products
21	Tobacco products manufacturing
22	Textile mill products manufacturing
23	Apparel and other finished products made from fabrics and similar materials manufacturing
24	Lumber and wood products, except furniture manufacturing
25	Furniture and fixtures manufacturing
26	Paper and allied products manufacturing
27	Printing, publishing and allied industries
28	Chemicals and allied products manufacturing
29	Petroleum refining and related industries
30	Rubber and miscellaneous plastics products manufacturing
31	Leather and leather products manufacturing
32	Stone, clay, glass and concrete products manufacturing
33	Primary metal industries manufacturing
34	Fabricated metal products, except machinery and transportation equipment
35	Industrial and commercial machinery and computer equipment
36	Electronic and other electrical equipment and components, except computer equipment
37	Transportation equipment manufacturing
38	Measuring, analyzing and controlling instruments; photographic, medical and optical goods; watches and clocks manufacturing
39	Miscellaneous manufacturing industries

1.4 Chemical Servitization

Servitization is popularly adopted for innovative business model development in chemical industry to help customers avoid chemical waste. It is used as a link between physical offers and additional services provided to customers (Buschak & Lay, 2014). The innovative business models for chemical industry can be described as follows:

- Chemical product services (CPS) are business models that shifts from selling chemical products by volume to combining with some basic services to fulfill customers and suppliers' requirements (Kortman et al., 2006).
- Chemical management services (CMS) describe business models that create a long-term collaboration between customers and chemical service providers to supply and manage chemical related services (Stoughton & Votta, 2003).
- Chemical leasing is a business model that chemical companies supply specific substances and services, but hold the ownership of chemicals. This means chemical product ownership is not transferred to the customers. The customers or users will pay for the services rendered by chemical supply companies such as number of parts or pipe cleaned which is not for the volume of chemical consumed (Jakl, Joas, Nolte, Schott, & Windsperger, 2004).

In previous days, traditional business models that focused on selling chemical products by volume cause conflicts between customers' interest in reducing chemical costs and volumes bought and suppliers' interest in maximizing sales revenues and volumes sold (Kortman et al., 2006; Reiskin, White, Johnson, & Votta, 1999; Toffel, 2008). In contradictory, CPS business model aligns the interests of suppliers and buyers in the way that both of them get benefit of reduced material consumption from efficiency enhancement on buyer's process, not selling by chemical volume sold (Kortman et al., 2006; Toffel, 2008)

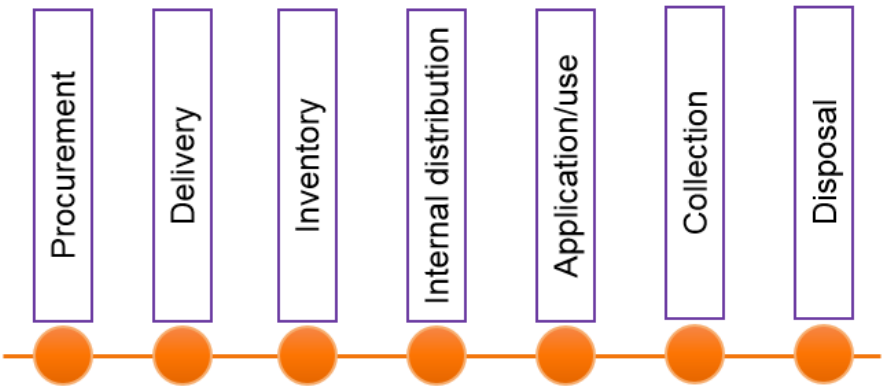


Figure 1.6: *The Chemical Life Cycle (Kortman et al., 2006)*

Business models for CPS are variety by adding some more extra services, and these services can be related to the various stages in the chemical life cycle (see Figure 1.6 (Kortman et al., 2006). Here are some recommended chemical extra services (Kortman et al., 2006):

- Chemical packaging
- Chemical blending
- Chemical management

- Chemical inventory and storage
- Chemical advice on process tuning
- Transportation
- Chemical recycling and waste treatment
- Health
- Environmental and safety programs
- Worker's training

Most CMS cases are applied in specialty chemical products that both suppliers and customers improve and implement chemical product services together (Stoughton & Votta, 2003). Example of this CMS is SAFECHEM, a subsidiary of The Dow chemical company providing chemicals, collaborates with Pero AG, a manufacturer of metal cleaning machine, founded a new company namely Pero Innovative. The new company, a metal components cleaning machine producer, provided material logistics and room, personnel for producing machine, while SAFECHEM delivers adequate chemicals for each cleaning process as well as chemical monitoring and waste management (Buschak & Lay, 2014). Here are examples of CMS services:

- Chemical supply
- Chemical quality monitoring
- Chemical adjustment
- Removal of applied chemical
- Chemical recycling
- Chemical solution network

As mentioned that in chemical leasing, the ownership of chemical product is still on the suppliers, not customers. There are several benefits in chemical leasing for customers such that firstly, chemical leasing generates partnership method which the main focus is no longer on the volume of chemical product sold, but on the service offering integrated with those products. This means profit does not necessary on selling larger volume, but comes from service provided. Secondly, chemical leasing improves worker safety because the number of chemical used is dramatically reduced and the smaller amount of chemicals kept in the manufacturing firms. Thirdly, when chemical consumption is reduced, number of chemical waste and chemical containers in disposal process are decreased as well. This helps more environmental friendly. Therefore, both suppliers and customers get profit from chemical leasing as a true win-win situation (Buschak & Lay, 2014).

1.6 Servitization Levels for Chemical Products

Servitization levels are also mentioned in chemical industry in similar ways as in other manufacturing industries. The starting point is the pure manufacturer traditionally provide chemical product in large volume. The next level is chemical supplier offers some product related services such as transportation, worker training, or chemical packaging in different sizes of container services. Chemical supplier may also provide other different services not directly related to chemical product such as chemical license service or product monitoring system. Lastly, in the highest level, chemical suppliers will focus on providing intangible service and no longer sell physical product (Buschak & Lay, 2014; Chen & Cusmeroli, 2015; Kortman et al., 2006). Example is mentioned in section 1.1 of the chemical trend that SAFECOM cooperates with Pero AG to provide cleaning services to their customers rather than selling chemical products (Buschak & Lay, 2014). Another example is Ecolap, the supplier, replaces new equipment and use non-hazardous dry lubricant instead of the dangerous wet lubricant used in beverage industry at the conveyor belts. (UNIDO, 2011)

1.7 Effects of Servitization

Various literatures study effects of implementing servitization (Fang, Palmatier, & Steenkamp, 2008; Gebauer, Fleisch, & Friedli, 2005; Neely, 2007). Some of these suggest companies will get benefits of implementing servitization on financial as more sustainable and stable revenues, strategic as strong competitive advantage in service offerings, and marketing aspects by increasing in customer satisfaction (Mathieu, 2001).

However, there would be negative outcomes of servitization called servitization paradox (Gebauer et al., 2005; Neely, 2007, 2013) have been introduced when servitization makes an increase in cost but does not generate as high as expected profit. Thus, companies must prepare themselves on the servitization transition carefully because there will be dramatically changes in company structure.

Fang et al. (2008) analyze secondary data and find that before service transition reaching critical levels of service offering, company value is relatively flat or negative. Nevertheless, the company value increases confidently only after the service transition passes the particular point.

A surprised conclusion studied a sampling of 10,846 producers and evaluated by (Neely, 2007) shows that servitized companies have higher chances to file bankruptcy than nonservitized companies. The study also argue that even though servitization relieves the traditional risks, but it causes new risks which are even greater than the traditional ones because companies offer basic services instead of complicated services.

1.8 Research Objectives

To develop servitization model for chemical suppliers in Thailand to change their business models from product based to customer oriented solution and service based.

1. To construct the analytical servitization framework for chemical suppliers to select the proper servitization level to serve the customer needs in each group.

2. To apply the servitization framework of the service level classification strategy for chemical industry in Thailand to see which group of customers require the highest servitization level.

3. To provide a guidance to companies in chemical industry to implement product service system.

1.9 Research Questions

<u>Research Question 1 to Research Objective 1:</u>

1. What are the servitization framework for chemical suppliers to shift to product service integration business strategy for different types of customers in chemical industry (Research question 1)?

1.1 What are the appropriate servitization levels for customers in chemical industry? (Research question 1-A)

<u>Research Question 2 to Research Objective 2:</u>

2. What is the servitization framework for chemical suppliers to select the appropriate servitization level to serve the customer in different groups? (Research question 2)

2.1 How many groups of customers can be divided? (Research question 2-A)

2.2 What are customers' needs in each segment? (Research question 2-B)

2.3 What are the servitization levels that appropriate to the customer in each segment? (Research question 2-C)

2.4 Based on the servitization framework with an implementation to chemical industry in Thailand, which types of services that chemical suppliers should servitize to serve demand of customers in different segment? (Research question 2-D).

2.5 Which servitization levels should be provided by the suppliers to its customer? (Research question 2-E)

2.6 Which group of customer require the highest servitization level? (Research question 2-F)

<u>Research Question 3 to Research Objective 3</u>

3. What are the guidance for chemical suppliers on the appropriate ways about the service levels of product service integration? (Research question 3).

1.10 Scope of the Study

The study of chemical industry is wide-ranging, and there are many chemical items according to chemical stages based on the chemical product chain shown in Figure 1.1. Accordingly, the scope of the study needs to narrow down to focus on major interesting points only that are stated in the research objectives. To complete this research, the scope of the study is explained in details as follows:

1. The chemical products mentioned in this research are chemical products which are considered as commodity products.

2. Size of chemical companies are defined as number of employees based on OSMEP (2000) which can be classified into three groups as follows:

- Small size company: < 50 employees
- Medium size company: 50 – 200 employees
- Large size company: > 200 employees

Respondents in this research are separated by types of industry which can be divided into five groups of:

1) Industrial products: including adhesive, ink, packaging, paint, petrochemicals, resin, thinner, and tire (wheel)
2) Consumer products: including cosmetics, food, and pharmaceutical
3) Resource products: for example, mining
4) Technology products
5) Others

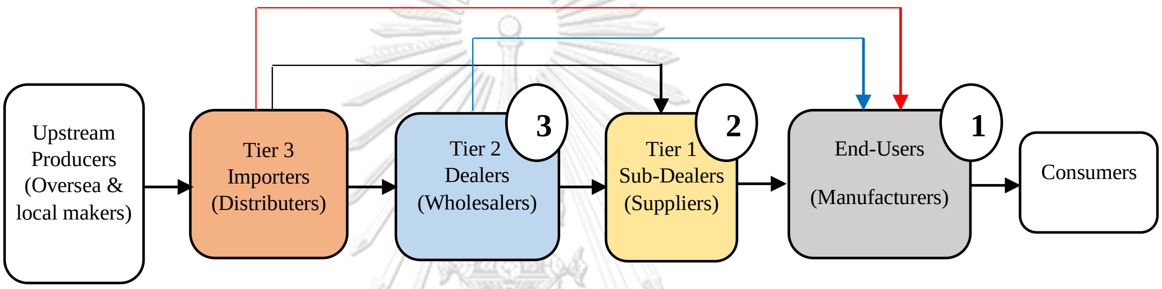


***Figure 1.7:** Chemical supply chain*

3. The study focuses in chemical industry only in Thailand and approaches one B2B business company of tier-3 who is a chemical importer or distributer traditionally provides tangible chemical products for their customers in large volume and have high competitive market. Chemical product in this study is defined as commodity product that has similar property. It is also price sensitive and is often sold in bulky amount. The company's customers are: tier-2 firms who provides chemical products as wholesalers, tier-1companies who performance as sub dealers supplying chemical products to manufacturers, and the end-users who are manufacturers using chemical products as raw materials in production to make products. The study studies servitization strategies for this distributer company to generate product transition for customers. Figure 1.7 illustrates chemical product supply chain for the better picture of targeted respondents.

Respondents in this research are separated by position of companies in chemical supply chain, see Figure 1.7, which can be divided into three groups as 1) end-users or manufacturers, 2) tier-1: sub dealers or suppliers, and 3) tier-2: dealers or wholesalers. This research does not include respondents who are upstream producers or oversea and local makers, tier-3 companies who are importers or distributors, and consumers. Figure

1.7 illustrates chemical product supply chain for an easier point of view of targeted respondents.

1.11 Research Gap

Number of studies mentioned about theoretical servitization frameworks, however very few explain about precise processes of this service levels. Moreover, none of those suggests servitization level process for chemical industry, especially in Thailand. None of those provides a measurement for servitization level. Thus, none of the literature gives a guidance for chemical companies about the servitization levels they should develop to meet the needs of customers in each group.

One of the most accepted in service transition process is four-stage model proposed by Oliva and Kallenberg (2003) (Figure 1.12). The first stage is the consolidating product-related services. These services are traditionally developed in different units of the organization in separation, and counted as nonprofit necessity in selling products. Thus, the first step is to consolidate company's service offering into one organization unit. The second stage is entering the Installed Base service market which is identifying a revenue opportunity and setting up the structures and method to achieve it. The third stage is partitioning into a change from expanding to relationship-based services and expanding to process-centered services. At this stage, companies emphasize on changing from product manufacturers to solution providers. The last stage is companies take over the end user's operation.

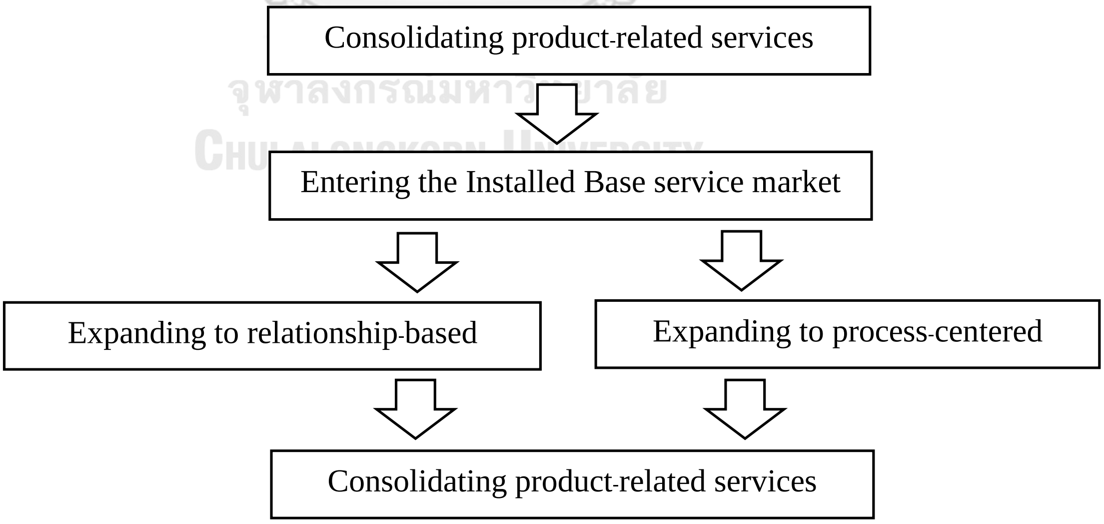


Figure 1.8: *Servitization process (Oliva & Kallenberg, 2003)*

Even though servitization process proposed by Oliva and Kallenberg (2003) is well accepted and suggested by several literatures, very rare researches translate it to action stages. Ryu, Rhim, Park, and Kim (2012a) propose new conceptual approach adopted from a framework to integrate markets, platforms, and competencies (Mayer and DeTore, 1999). The literature framework consists of three major parts: Market, Product-Service-Knowledge System (PSKS), and Competencies in Supply Chain; which sets stages for future research on transition from product platform to product and service integration systems. However, this framework is purely constructed as theoretical idea, but it hasn't been tested in applied cases of servitization.

This means, even though there are several servitization frameworks, they do not suggest what steps are required to do in order to construct servitzation model for Thai chemical industry. Thus, these are significant gaps of prior literatures for companies of how to servitize if they want to make a decision to change their business models from product based to product and service integrated business model. The study combines three well-known servitization concepts of servitization process (Oliva & Kallenberg, 2003), servitization framework (Ryu, Rhim, et al., 2012a), and the extended products dimension (Chen & Gusmeroli, 2015) and propose new conceptual framework which can be applied for the chemical companies namely chemical servitization framework. The suggested framework consists of two parts: servitization model and servitization levels for chemical industry (Figure 1.8). The framework reclaims the gaps by combinding servitization integration process of product service knowledge system proposed by (Ryu, Rhim, et al., 2012a) with the framework for manufacturing servitization proposed by Chen and Gusmeroli (2015).

1.12 Proposed Framework

Based on the proposed servtitzation framework in Figure 1.9, the first part of this stydy develops servitization model for chemical industries in Thailand. Customers are varied by company size (number of employees), industry types, and the servitization integration process of product, service, and knowledge based on their needs. Customers' requirements of the individual group will be collected in this phase. The output of the first pahse will be implement to chemical industry in Thailand in the next phase. The second phase will be an analytical of servitization levels for each group of customers. The output of the second phase is a guidance of servitization levels for chemical companies.

Customers can be segmented by various criteria, thus, the customer segmentation in this research will be classified by cube shape three-axis planes. The x-axis represents differences of customers based on company's size (number of employees) and type of industry. The y-axis is from the extended product dimension

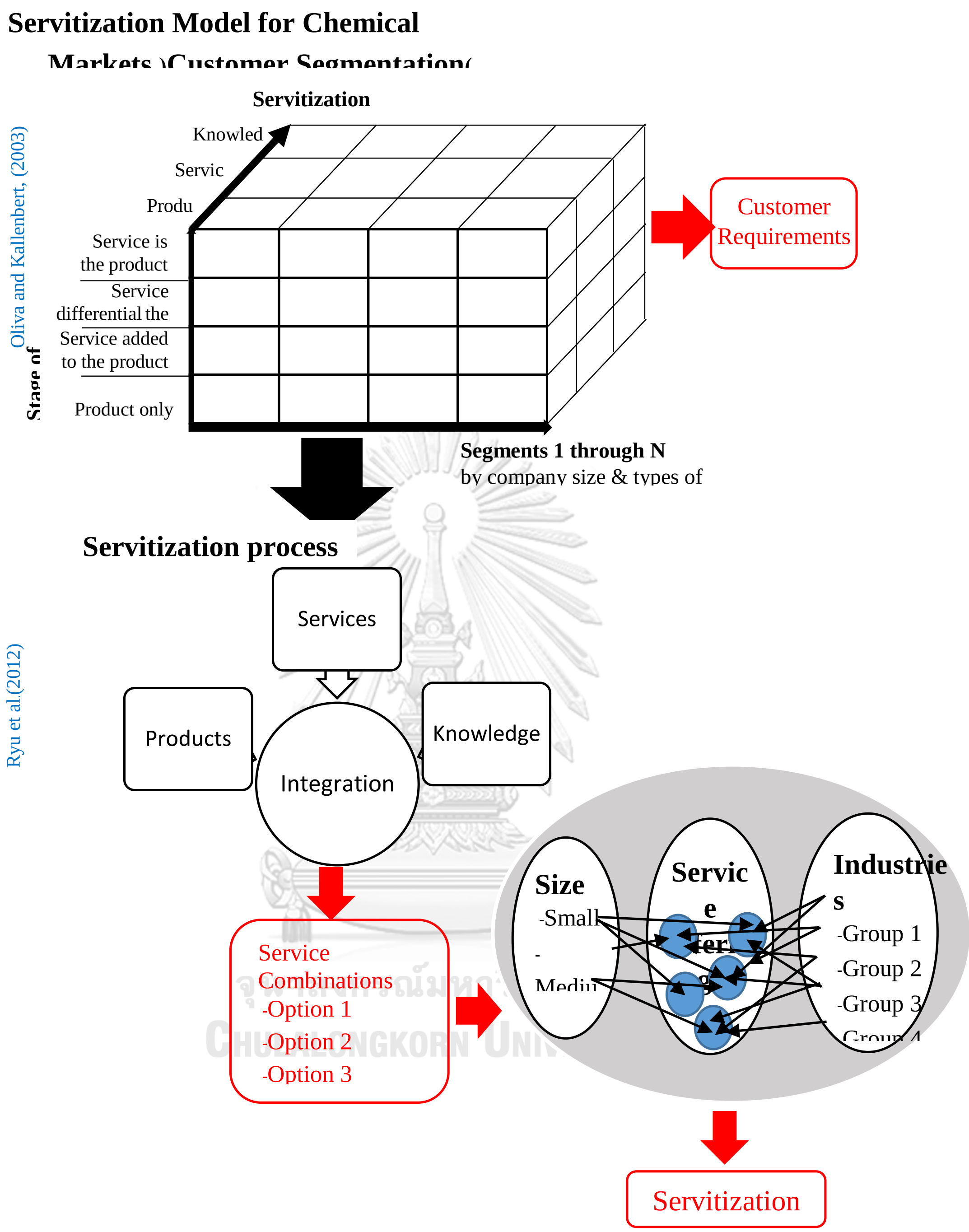


Figure 1.9: *Conceptual Framework : Proposed Servitization Framework*

theory, called as servitization levels, which can be categorize into four levels which are product only, service added to the product, service differentials the product, and service is the product (Chen & Gusmeroli, 2015). Customers in each group will be defined the proper servitization levels they should follow. The z-axis represents servitization transition stages adopted from three stages of the market segmentation suggested by (Ryu, Rhim, et al., 2012a). And the x-axis is servitization process consisting of product, service, and knowledge integration.

1.13 Research Methodology

This research is aimed to propose chemical distribution servitization framework, studied from Thai chemical industry, which can be applied in general cases. The process starts from analyzing current problems and impacts of servitization by changing from traditional business model to product and service integration business model. Next, the research will develop product service integration business model according to customer segments and requirements. In this stage, the research will classify customers into segments and investigate current and future customers' requirements for each group. Meanwhile, the research will analyze service offerings that the company capable provide to its customers and find the guidance of service level according to the customer requirements. The details of methodology will be explained by objectives as follows:

Phase 1: Servitization model for chemical industry in Thailand

The first step for this research is to develop servitization model for chemical industry in Thailand. Companies in this research target group are; tier-2 companies who provide chemical products as wholesalers, tier-1 firms who perform as sub-dealers supplying chemical products to manufacturers, and the end-users or manufacturers who use chemical products as raw materials in the production. Thus, population in this research are the customers who buy chemical products from the tier-3 suppliers who are distributors or importers. Questionnaire survey was distributed to the customers in order to collect data to analyze customers separated by service levels. Parameters in the model are defined by the direction they belong to (Figure 1.10).

- X-axis is the independent parameter represents customer segments which classified by 3 different company sizes and 5 types of the industry.
- Y-axis is the dependent parameter contains 4 different types of servitization levels, namely product only, service added to the product, service differential the product, and service is the product. Servitization levels are defined by literature review.
- Z-axis is the independent parameters of servitization process can be separated as product, service, and knowledge, (PSK). Self-declare in the questionnaire is the method to define the servitization process.

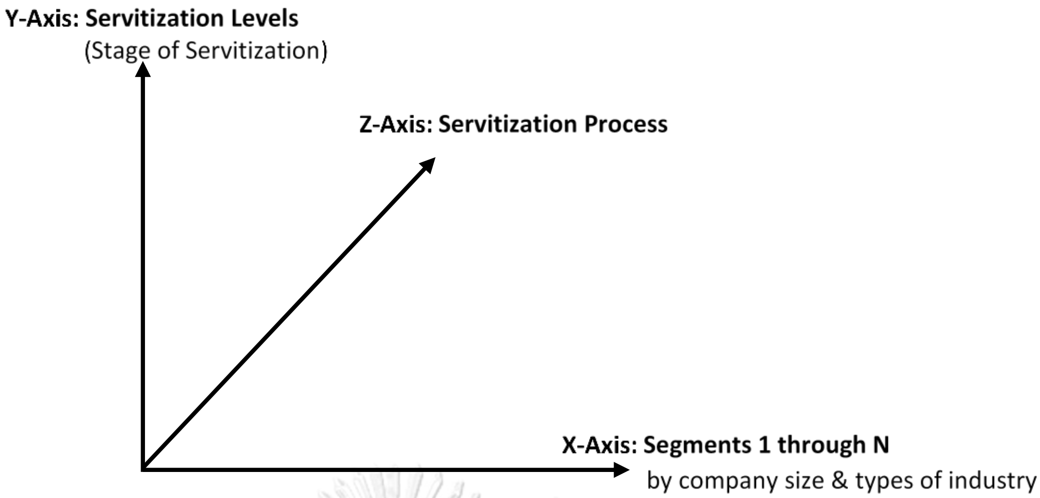


Figure 1.10: *Dimensions of servitization model*

Phase 2: Servitization levels

The purpose of this phase is to provide a recommendation of the servitization levels for suppliers to offer to their customers. In this stage, the data gathered from phase 1 will be used to analyze the servitization levels of the customers in each requirement. The dependent variable in this study is 4-category servitization levels. While the independent variables are company size, type of industry, and customer requirements from each servitization process, namely product, service, and knowledge (PSK). Thus, Multinomial Logit Model (MNL) will be used as the statistical method in this phase. This method is appropriate for categorical dependent variables.

Data collection

The research tools for this study is questionnaire survey distributed to respondents via face to face or an interview. Required information for developing questions in the questionnaire were gathered from literature reviews and discussion with staff from the chemical company. The questionnaire composed of 3 sections; 1) company background, 2) attitude towards product or service needed driven by 10-point Likert Scale ranging from 0 to 10 employ the questions and scale responses in the survey, and 3) comparison attitude towards servitization levels constructed by Analytical Hierarchy Process (AHP) using pairwise comparison between 4 service levels.

The necessary data for data analysis is collected from in depth interview with the questionnaire survey distributed to customers of tier-3 chemical distributor which are tier-2 suppliers or wholesalers, tier-1 suppliers or sub-dealers, and manufacturers who produce products for consumers (Figure 1.11).

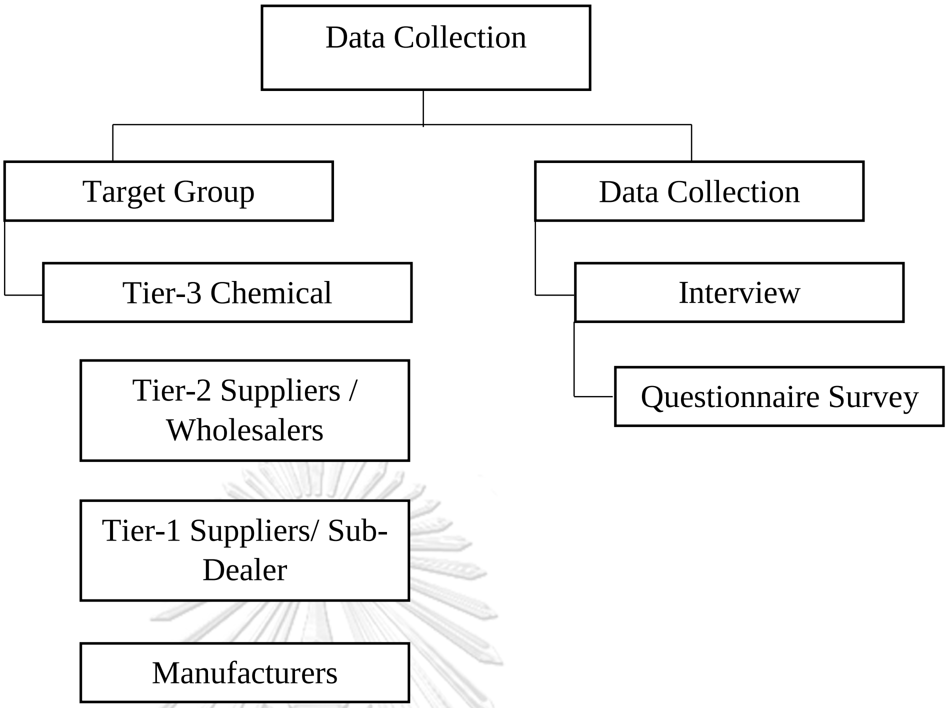


Figure 1.11: *Summarized Data Collection*

1.14 Research Contribution

1. It is the first time that servitization model for chemical industry in Thailand is mentioned in the research study. This model suggests servitization level process and provides a measurement of servitization levels. These chemical servitization process and measurement have also never been studied, and its outcome is a guidance for chemical suppliers to develop servitization levels to achieve the needs of different types of customers.

2. Servitization model makes firms more sustainable and helps them to get out from commodity trap on cost competition. Many chemical companies in developed countries changed their business model from product- to service-based, and it is about the time for companies in Thailand to upgrade their strategies. The results of this study may provide insights to a transition strategy for Thai chemical companies wanting to improve their service levels.

3. Customer service is one of the major logistics activities. It affects logistics in two dimensions: 1) the procedure related with an influence or order taking of the customer 2) the service levels offered to the customer (Coyle et al., 2013). This involves providing the right product to the right customer at the right place, time, and condition at the acceptable cost. Effective customer service generates customer satisfaction which is the output of whole marketing concept.

4. There are several servitization frameworks, but none could provide steps of how to do the process. All of them proposed framework in theoretical perspective, not an empirical one, especially for chemical industry. The result of this study provides guidance for chemical servitization levels of product service integration.

5. The framework suggests an outlook of servitization actions and processes for chemical industry in Thailand that never mentioned before. These processes are divided into important phases of how to measure service levels and process to servitize at the end. This framework can also be applied in various academic fields related to servitization concepts.

CHAPTER 2
LITERATURE REVIEW

This chapter will provide related literature review in order to 1) gather and identify theoretical influences of this study, 2) share frameworks of the understanding, 3) endorse the content validation of the study, and 4) provide chemical industry background and apply the research concept to the case. The structure of this chapter is divided into three major parts (Table 2.1) which are 1) literature reviews, 2) theoretical framework, and 3) chemical industry background and application.

Table 2.1: *Chapter 2 Structure*

Chapter II		
2.1 Literature Reviews 2.1.1 Study in Servitization 2.1.2 Study in Chemical Servitization 2.1.3 Study in Servitization Transition	**2.2 Theoretical Frameworks** 2.2.1 Business Model Strategy 2.2.2 Product Service System 2.2.3 Servitization Frameworks	**2.3 Chemical Background with Problems** 2.3.1 Industry Background 2.3.2 Problems in Chemical Industry 2.3.3 Problems of Thai chemical providers 2.3.4 Possible way out of Thai chemical providers 2.3.5 Proposed Framework

From the above details in Table 2.1, series of literatures are comprehensively reviewed in section 2.1 to deliver the gathering of academic theories related to the research topic. This section starts from an academic study in servitization followed by literature reviews about chemical servitization and the transition. Subsequently, previous theoretical frameworks are explained in section 2.2 to provide prior conceptual frameworks related to the research topic. Among those frameworks, the concepts are explained in general ideas; but many of them have not been proved in the genuine situations. The research links several frameworks together and explores the academic gaps and techniques applied to the chemical industry in section 2.3. At the end of the chapter, the research proposes new framework with guidance in application in order to construct servitization process and investigate what would happen in the financial performance if the chemical companies follow these processes from this study.

2.1 Study in Servitization

To survive in global economies, manufacturing firms have to shift up the value chain to change their focus from selling products to providing product services and solutions in order to create more value, thus they do not have to compete on costs with emerging markets (Neely, 2007, 2013). Many manufacturers in developed countries have changed their business models because they can no longer live on just pure manufacturing. Companies in capital goods industries that their products have long-life cycles have opportunity to supply spare parts and maintenance services (Neely, 2007; Wallin, 2013). Instead of selling the engine, Rolls Royce offers "power by the hour" to its customer that the company still hold the ownership and risk of the engine and provides customers the capability of the engines in hours they have used. This business model generates more stable income for Rolls Royce engines during the product life cycle time (Harrison, 2006). Some companies change business models in other ways; IBM traditionally manufactured hardware computers transitioned to service business as a global solution provider (Dittrich, Duysters, & de Man, 2007); Volvo Group has increased attention on customer satisfaction by focusing more on 'Soft Products' than offering hard products (Remneland Wikhamn, 2011). Therefore, it is noticed that more manufacturing firms in the global market are adding value to their primary business offerings by increasing services.

This evolution is named the "servitization of business" by Vandermerwe and Rada (1988) defining as modern companies offer more packages or bundles of 1) goods, 2) services, 3) support, 4) self-service, and 5) knowledge that these offerings are service dominated to serve demand of customers (Figure 2.1).

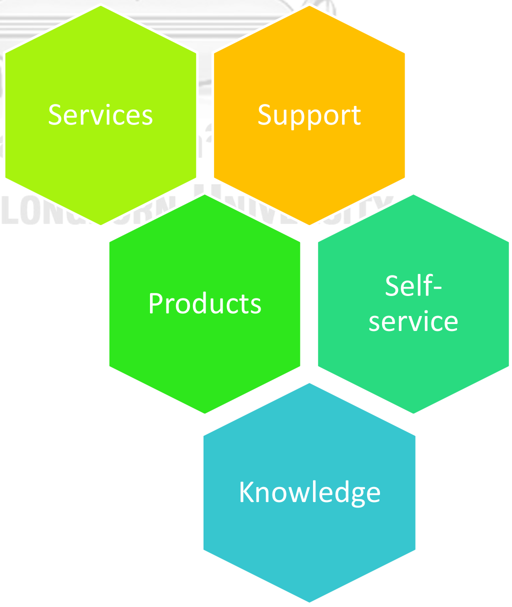


Figure 2.1: *Bundle of Servitization by Vandermerwe and Rada (1988)*

Initially reasons of why manufacturing firms should servitized are 1) to block competitors; 2) to keep customers and 3) to increase differentiation levels (Vanermerwe and Rada, 1988). Later, economic and environmental rationales are suggested as the additional strategic rationales for servitization (Goedkoop, 1999; Wise & Baumgartner, 2000). Another strong rational for manufacturing firms is installed base of products which has been increasing widely in many industries as longer product life extents. Thus, the number of units in installed base is greater than the number of product sold. Example ratios of installed base to unit base of 13 to 1 for automobiles, 15 to 1 for civil aircraft and 22 to 1 for locomotives are reported in literature (Wise & Baumgartner, 2000).

Servitization is driven by customers because they demand more services. Manufacture firms previously emphasized on customer requirements based on their core business activities. However, currently they increase their focus on managing a relationship to the customers by providing broader offerings (Neely, 2007; Tukker, 2004; Vandermerwe & Rada, 1988). Several literatures define servitization in different terminologies as follows:

a. *Shifting from products to integrated product services*

Quinn et al. (1990) suggested management should stop separating producing goods from providing services that make product more attractive and valuable. Figure 2.2 shows a comparison between servitized, the right hand side, and non-servitized systems (the left had side) that the left had picture represents the traditional product offering with an additional of services separated from the tangible products. Whereas the right picture shows an integrated link between core products and service components.

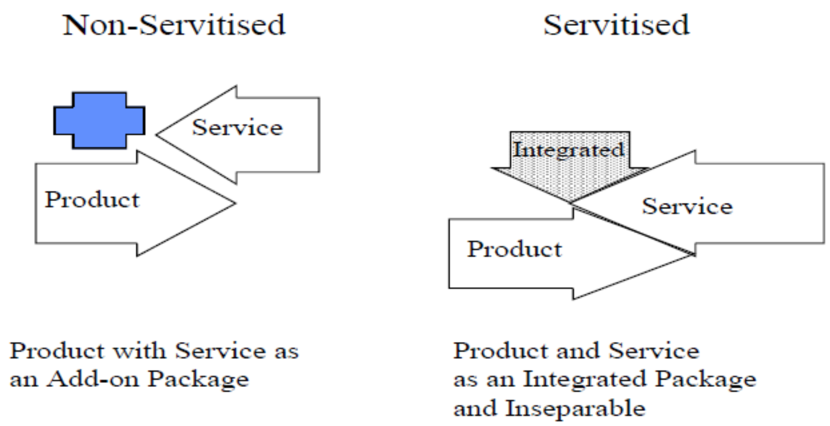


Figure 2.2: *Servitized and Non-Servitized Systems (Robinson et al., 2002a)*

For the chemical industry, there will be four different areas of chemical products and chemical business which often blend to each other. Superior chemical companies often have all four categories of these chemical business (Robinson et al., 2002a). Definitions of four different categories based on principles of undifferentiated/differentiated and high/low volume are presented below in Table 2.2

(Quintella, 1993). These definitions were initially used to explain commodity chemical products, but they can also be applied in other industries.

Table 2.2: *Categories of Products (Robinson et al., 2002a)*

	Undifferentiated Products	**Differentiated Products**
High Volume	**True Commodities** • Sold at relatively low unit values • Widely used in a variety of applications by many customers • Sales concentrated in a few large customers • Contract pricing	**Pseudo Commodities** • Product to accepted performance specifications but with minor differences • Sales concentrated in a few large customers • Some degree of differentiation exists
Low Volume	**Fine Products** • Substantially identical product form and composition • High unit price • Small numbers of customers in low or moderate volumes	**Specialty Products** • Differentiation by formulation • Produced by various suppliers based on performance in use • Designed to solve customer's specific problems • Relatively high unit price • Large numbers of customers • Low volume

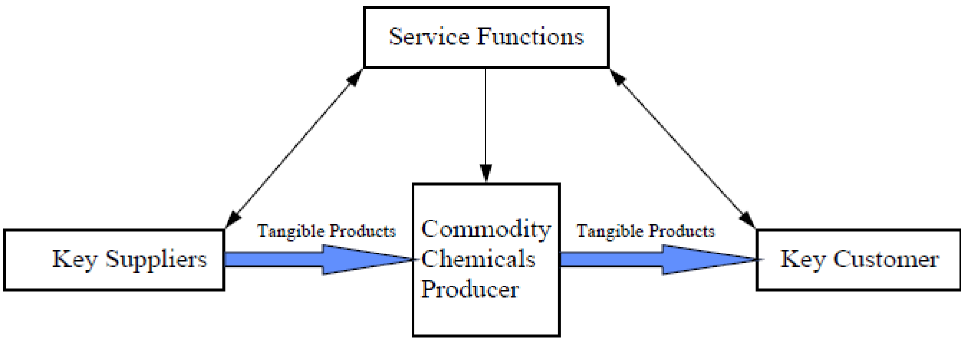


Figure 2.3: *A Typical System Showing Product and Service Functions (Robinson et al., 2002a)*

Previous literatures (Black, 1994; Quintella, 1993; Wei, Russell, Russell, & Swartzlander, 1979) state that commodity chemicals are in marturity markets which ase based mostly on price, where comparatively little service and marketing affort are needed and on production efficiency. Contradictory, later literatures (Kearney, 1996; Mitsh, 1996; Reichheld, 1996) suggest manufacturing firms make relationship approach strategy to their suppliers and customers for sustainable competitive advantages, but they don't specify which area of commodity or speciality referred. Figure 2.3 illustrates a typical marketing system with product and service functions.

Robinson et al. (2002a) studied a differentiation through service for commodity chemicals sector and suggested that service and relationship management are important approaches used by chemical firms to move out the commodity trap of cost competition to win against rivals. This brings commodity chemical firms seek for new differentiation methods. Robinson et al. (2002a) proposed a framework of an integrated or servitised system of value and relationships for commodity chemical products (Figure 2.4) to explain a transition from chemical products that market is based mainly on price to integrated product services which integrated service attributes to core product as integrated offerings. The literature challenges the perception that commodities are type of tangible products (Shostack, 1977) and commodity chemical market is competed by price that focuses on product efficiency with minimal service required (Black, 1994; Quintella, 1993; Wei et al., 1979).

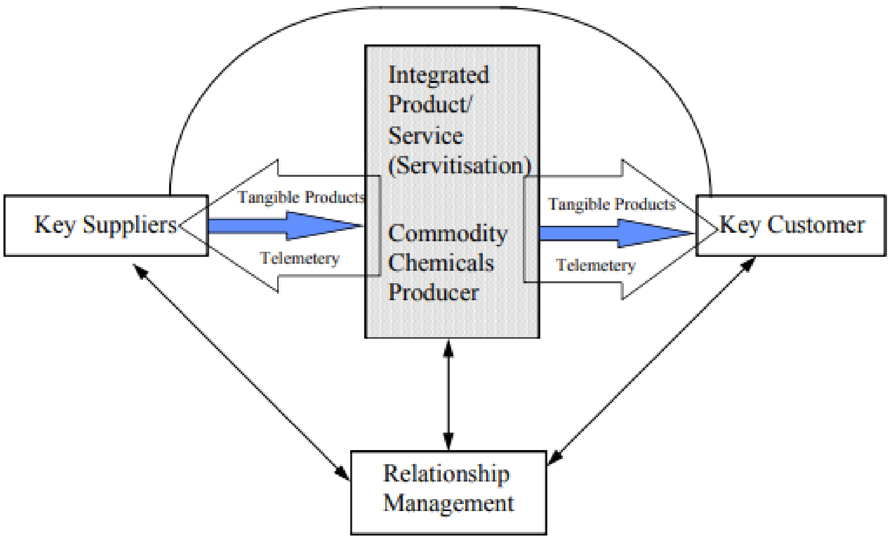


Figure 2.4: *An Integrated or Servitised System of Value and Relationships (Robinson et al., 2002a)*

b. *Going downstream of the value chain*

The focus of manufacturer's traditional value chain has been dramatically dropped from selling goods only because of less attractive needs for products has stagnated in the economy to move downstream the value chain toward the customer (Wise & Baumgartner, 2000). In many industries today, the value of product sales can be counted as small portion of the total revenues. The real portion of money is on providing services. Honeywell, General Electric, Nokia and Coca-Cola are success because they have moved into the valuable competitive movement in the entire product life cycle. Thus, clever manufacturers are moving downstream for a reason that the downstream supply chain creates more value to the customer than the upstream. There are three major drivers in servitization rationales which are growth, profit, and innovation as illustrated in Figure 2.5 (Buschak & Lay, 2014).

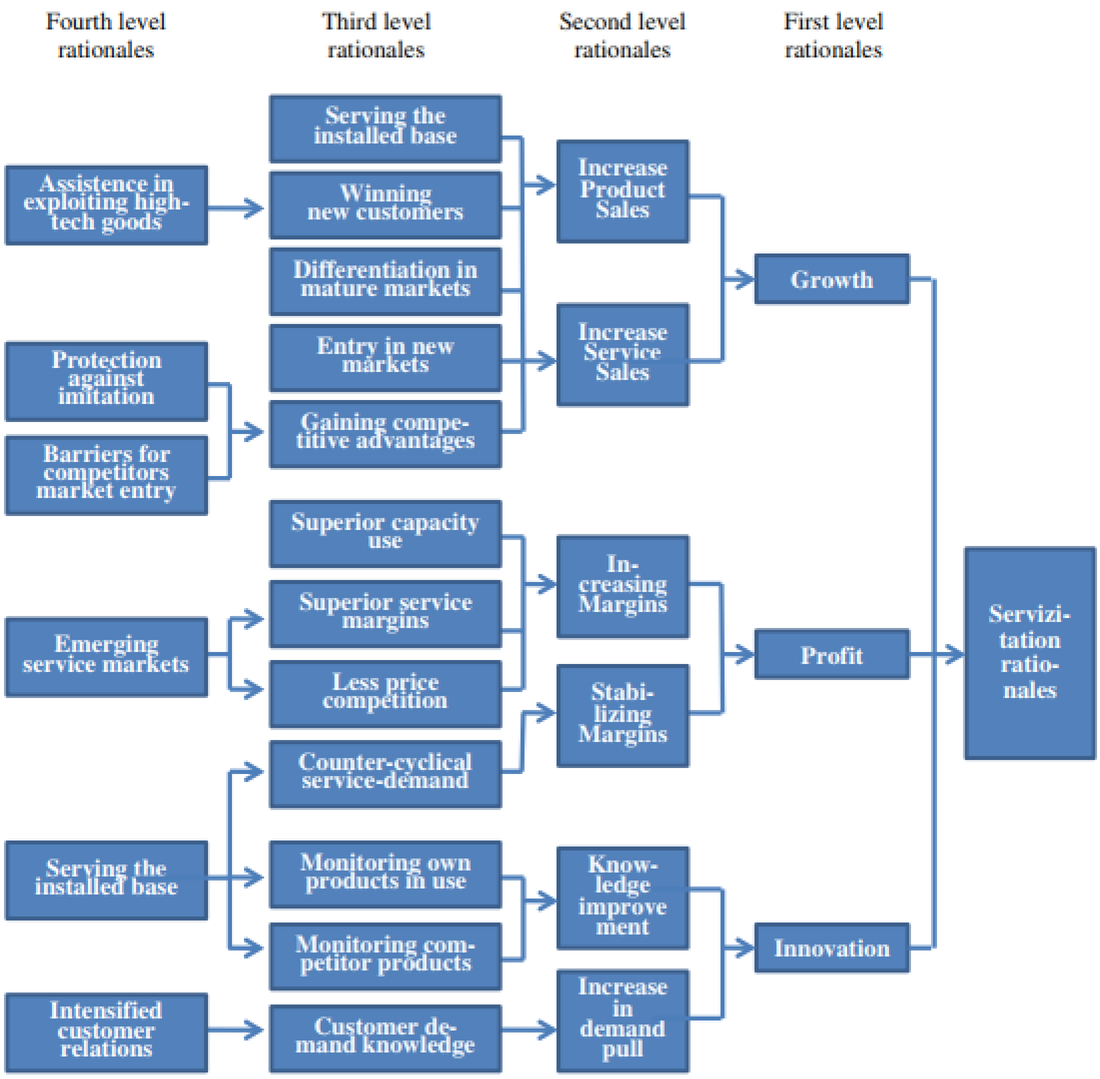


Figure 2.5: *Hierarchy of servitization rationales.*
(Buschak & Lay, 2014)

The growth rationale for servitization is defined as a strategic rationale (Gebauer et al., 2005) and can be accomplished by inspiring selling product base by selling more value added services. As a sequence of these objectives, manufacturing firms gain more competitive advantages with service differentiations in mature markets (Oliva & Kallenberg, 2003; Vandermerwe & Rada, 1988).

The profit rationale is commonly mentioned in literatures as financial driver (Baines et al., 2009) that can help company to 1) increase overall margins, 2) generate greater margins in service markets than product markets, and 3) avoid price war in mature products (Frambach, Wels-Lips, & Gündlach, 1997). In addition, product service is a countercyclical of product manufacturing that helps company generate more steady service revenue stream (Buschak & Lay, 2014; Wise & Baumgartner, 2000). Thus, providing the installed base can create revenue when product sales are in the downturn trend, and make manufacturing firms reduce weakness (Mathieu, 2001).

The innovation rationale is another important driver for servitization as greater service offerings generate customer relations, and better relationship with customer opens opportunity to learn more about customer needs leading to raise technology and innovation (Frambach et al., 1997; Mathieu, 2001). Services in product-related services send back important information to manufactures to improve product development (Brax & Jonsson, 2009; Goh & McMahon, 2009).

Wise and Baumgartner (2000) suggest manufacturer should consider the value chain from customer's viewpoint because the downstream chain is much more complex and can be charged in higher price than traditional manufacturer's perspective. Normally, the manufacturer firms are more likely to view downstream services as painful to be attached with a sale. An example is car manufacturer offers free after sales maintenance services to sell cars. Looking at the aircraft market, the manufacturer's perspective of the value chain is relatively limited at only manufacturing airplane, selling and delivering it, and upgrading and supplying spare parts of the plane; whereas customer's eyes see downstream chain is more delicate. These services are not dealing directly with the airplane, but they are involving with financing and leasing, maintenance, capacity planning and scheduling, catering and servicing. The literature found four successful downstream business models as follows; 1) embedded services are type of services that built new technologies into a product that can help customer reduce labor costs, improve overall efficiency, and improve performance; 2) comprehensive services use the firm position as product supplier to offer collection of services for customers instead of plug in services into the product; 3) integrated solutions are type of business models that combine products and services into solution package to respond to customer requirements; 4) distribution control is a business model that company focuses on controlling distribution activities in the value chain.

Even though moving downstream is one of the proper ways for some manufacturing firms, others may not think so. Before making a decision to move downstream, the company should first evaluate the attractiveness of the downstream by examine at unit sales, costs over the lifespan that relate to product price, and downstream profits relate to product margin as indicator ratios. In addition, the company also need to look at its competitive situations. The company should move downstream if its ability to distinguish its products is minimal or if its customers are dominant in purchasing power. Moving downstream is not an easy task, it requires new skills and new people to change strategic outlook (Rothenberg, 2007; Wise & Baumgartner, 2000).

c. Product-service system (PSS)

PSS is another terminology of servitization and can be described as combining tangible product and value added services to increase ability to fulfill precise customer demand (Tischner et al., 2002). Various types of PSS have been suggested (Behrend et al., 2003; Brezet et al., 2001, Zaring et al., 2001), and one of the most adopted is the three main and subcategories of PSS as shown in Figure 2.6 (Tukker, 2004).

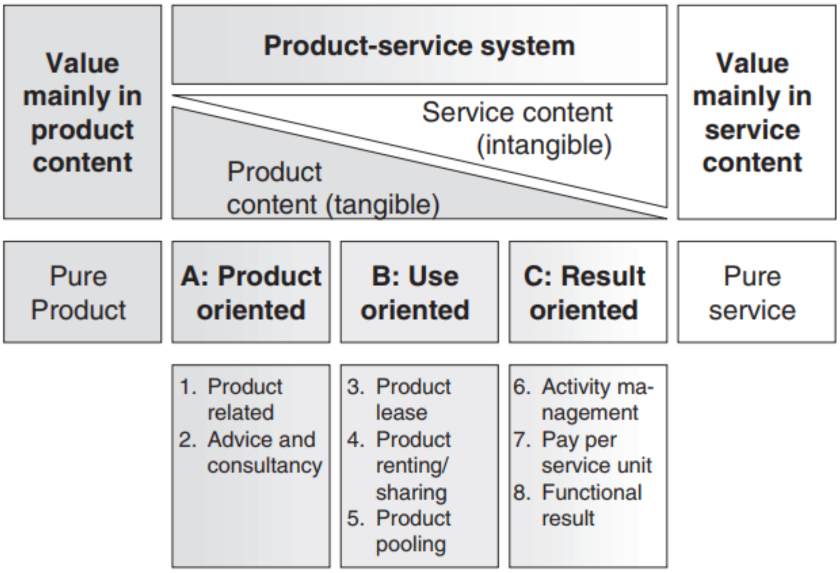


Figure 2.6: *Main and subcategories of PSS)Tukker, 2004(*

The differences of these three categories are mentioned as follows:

- **Product-oriented services** are business models that are still generally on product based, but add some extra services. This product-oriented can be subcategorized as product related and advice and consultancy services (Tukker, 2004). For product related service business model, manufacturing firms offer not only tangible product, but also additional services in different phases of the product life cycle to serve customer needs. Examples of product related services are installation, repair and maintenance, spare parts, operation, inspection, upgrades, etc. (Gebauer, 2008; Oliva & Kallenberg, 2003) Whereas, the advice and consultancy service is a strategy that provider offers an advice as the additional services besides the product sold for the most efficient used. Most of this advice and consultancy services are knowledge-based services such as training in product usage, documentation, organization developing consulting for improving skills and competencies (Tukker, 2004).
- .**Use-oriented services** (Tukker, 2004) are business models that the traditional product is still the major part, but the ownership of this product is still on the provider's hands. Thus, the product could be available in different form, and occasionally shared by various users. Examples of use-oriented services are 1) product leasing where the

ownership of the product does not shift to the customer, the manufacturing firms still have responsible for the product maintenance, repair and control tasks; 2) product renting and sharing where the product is also owned by provider who perform maintenance, repair and control, and customer who shares has limited access pays for the use of product that consecutively used by various customers; 3) product pooling which the product is used and share by different customers simultaneously.

- **Result-oriented services** are type of PSS where product is replaced by services. This service can be subcategorized as 1) activity management and outsourcing where company outsources some part of activities to third party; 2) pay per service unit is a business model that the customer no longer buys product but pay only at the level of product used; 3) functional result where the manufacturing companies deliver a result solution, not a tangible product (Tukker, 2004).

Neely (2007) extended PSS into five categories and grouped in different perspective summarized in Figure 2.7.

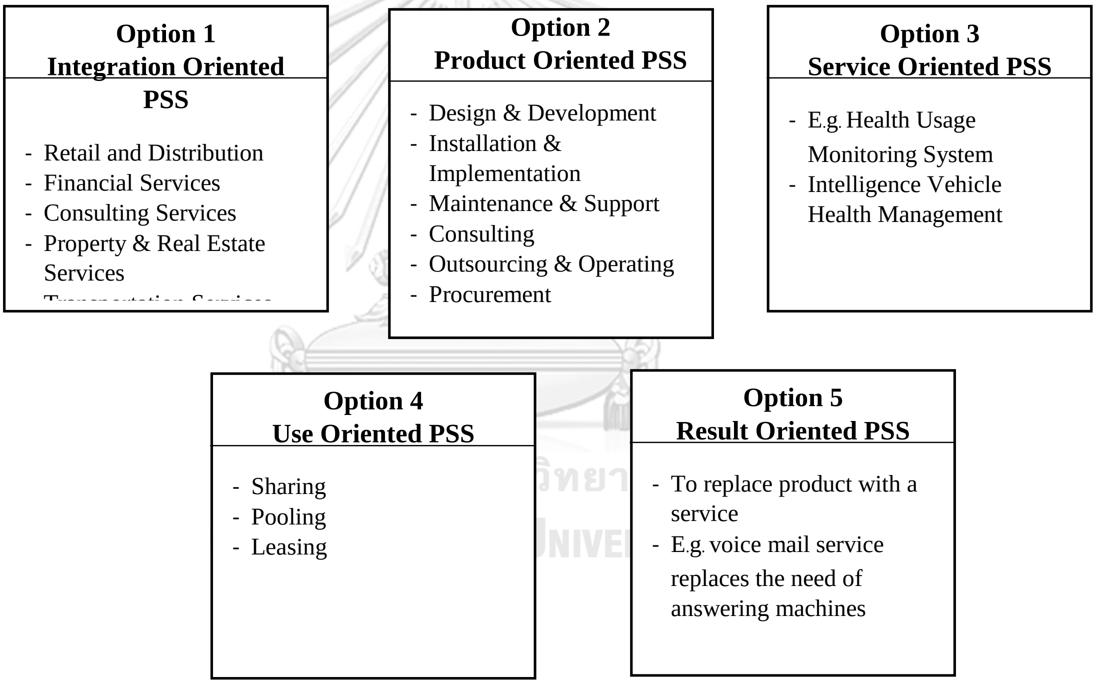


Figure 2.7: *Five options for servitization (Neely, 2007)*

- **Option 1**: Integration oriented PSS is a concept of product plus services. This business model implicates moving downstream by combining services over vertical integration. Customer holds ownership of the tangible product, whereas suppliers pursue vertical integration. Examples of the integration oriented PSS is shown in Figure 2.5.

- **Option 2:** Product oriented PSS describes a business model of tangible product with an integration of services. This means services directly related to the product are offered, and customer also hold ownership of the product.
- **Option 3:** Service oriented PSS involves a bundle package of product and service. This business model integrates services into the tangible product itself. There are additional value added services integrated with the product provided to the customer with ownership transferring.
- **Option 4:** Use oriented PSS moves concentration to the service, not the product. Customer doesn't hold ownership of the tangible product, but rather use or share the product and pay at the level they have used. Thus supplier or manufacturing firm rather hold the ownership of the product and has duty to take responsible for maintenance, repair and control.
- **Option 5:** Result oriented PSS is a strategy that substitute the product with a service. In this business model, customer no longer need the product, but the service as a result instead.

Reim et al. (2015) adopted PSS business model (Tukker, 2004) and suggested the relationships of company strategy, possible types of business models, and tactics (Figure 2.8). Tactics are described as company's strategy at the functional level after choosing which business model to implement.

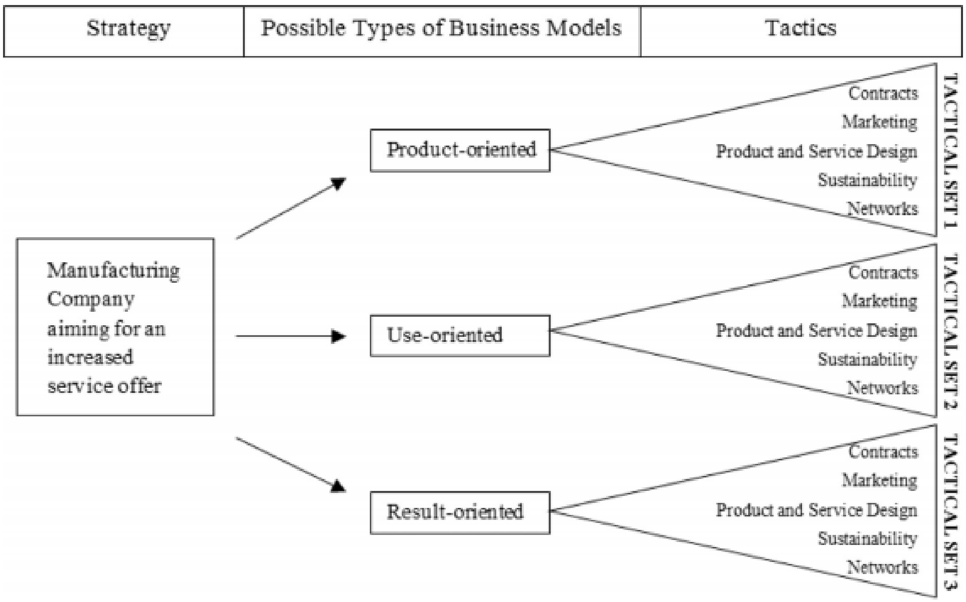


Figure 2.8: *Relationships among strategy, business models, and tactics for PSS (Reim et al., 2015)*

d. *Extended products: moving from traditional product-based to service-based*

In this global economy, competitiveness is always a major topic for markets and management (Porter, 1992). Enterprises need to adapt themselves by improving production process and products in order to survive in this dynamic markets. As a consequence, manufacturing firms collaborate with their suppliers in the supply chain to combine new processes and technologies into their operations in order to gain competitive advantage and provide new services that create value for the customer. As technology has changed in a very short period, enterprises that learn and adjust themselves fast will have competitive advantage. Thus, companies have to modify their products and services very quick to serve the market needs (Thoben et al., 2001). This product extension creates opportunity to differentiate the company's product to others. The extension is an integration of intangible services that make tangible products differ from traditional product based offering. Therefore, the extension of products consists of tangible products and additional services as an attractive combined package for the customer. There are two basic concepts for making differentiation in order to understand the customer behavior: requirement is customer needs; demand is a particular item that will satisfy the needs.

An offering of core product is not enough to the customer anymore to gain competitive advantage in today's market because the customer requests somethings beyond the tangible products i.e. other benefits not for products, convenient, fun or success (Browne, Sackett, & Wortmann, 1995). Thoben et al. (2001) suggest companies should analyze their product lifecycle and indicate new types of services for an interest of customer. The main concept is how to drive customer benefits perspective from the traditional product base perspective. Figure 2.9 and 2.10 illustrate life-cycle phases of a product and customizing products according to the life cycle phases (Thoben et al., 2001).

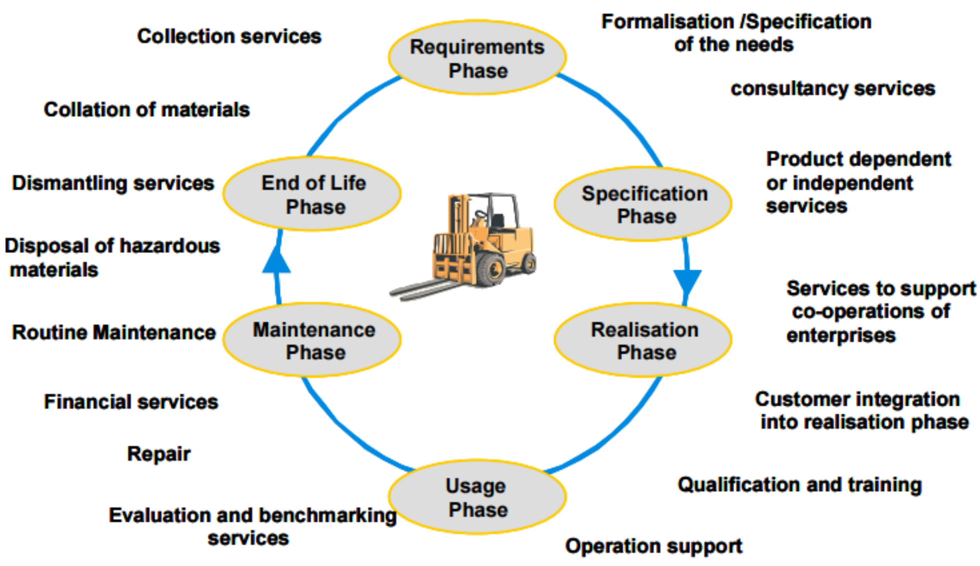


Figure 2.9: *Life-Cycle Phases of a product (Thoben et al., 2001)*

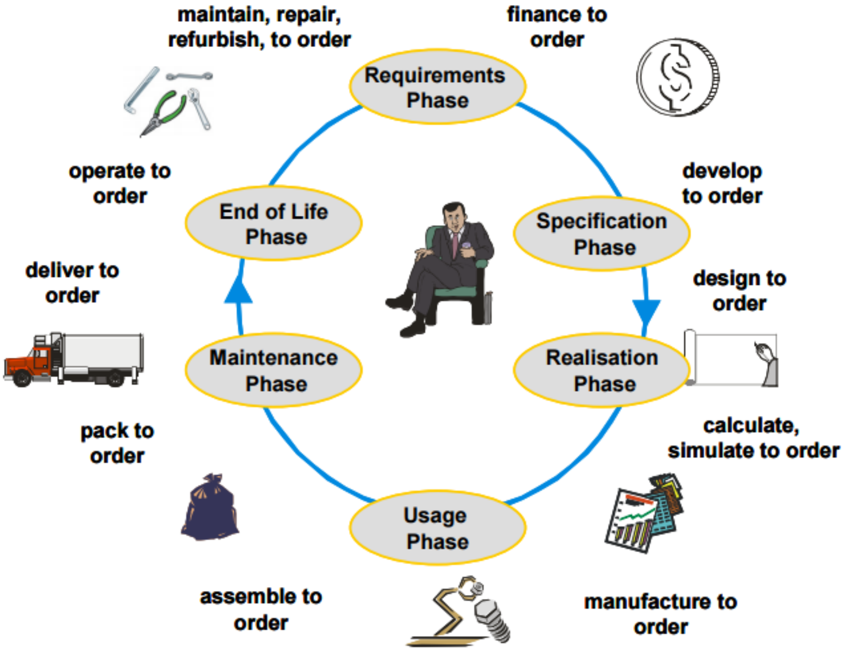


Figure 2.10: *Customizing products (Thoben et al., 2001)*

The literature also mentions about a layer model of extended product which consists of three rings as shown in Figure 2.11 and Figure 2.12. The most inside layer namely core product describes the core function(s) of the product. The second ring defines as product shell or packaging of the core products. This ring is tangible features of the product in which different manufactures or suppliers will provide different features. The third ring includes all intangible properties covering around the tangible product. In real case situations, manufacturing firms could provide identical products, but they differ by service offerings. Companies that offer more useful and attractive services could generate greater return and profits.

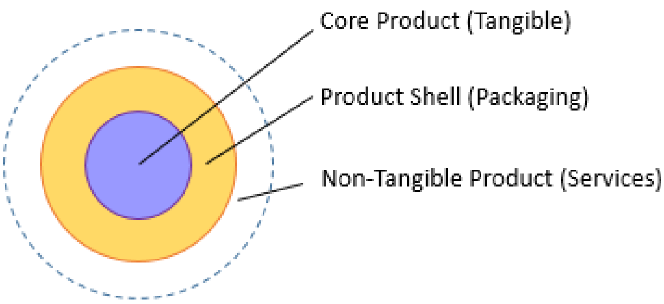


Figure 2.11: *Extended Product concept)a((Thoben et al., 2001)*

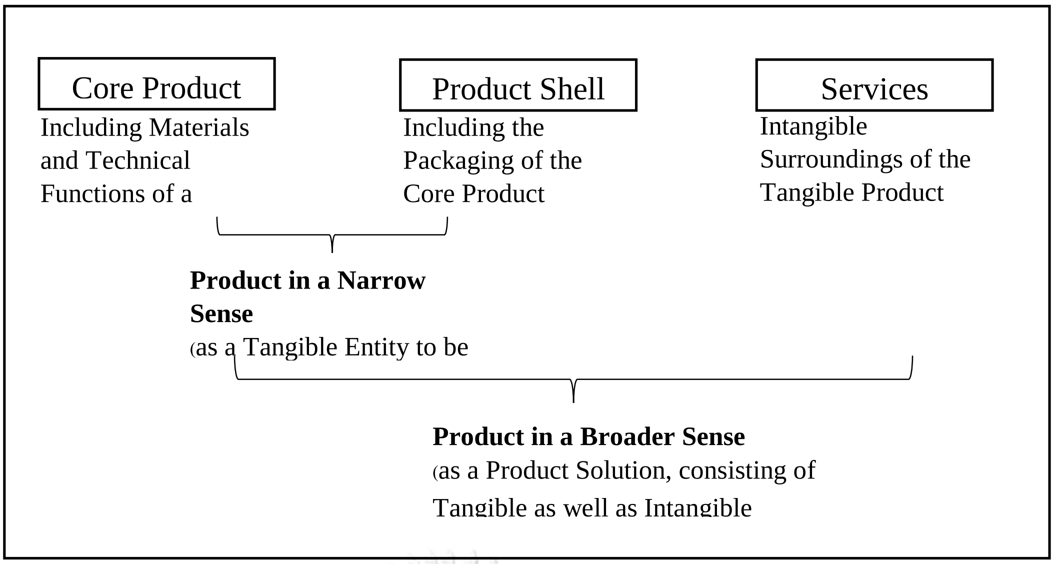


Figure 2.12: *Extended Product concept) b.(*
(Thoben et al., 2001)

The above figure explains variation of products in narrow and broader senses. The narrow sense is a consideration of tangible product itself while the broader sense focuses on the objective of the product as resolving customer's problem or gratifying the demand. Manufacturing firms apply the extended product dimension as the steps of transition from tangible product to non-tangible service offerings (Thoben et al., 2001). Figure 2.13 explains the transition process from regular tangible product to non-tangible service covering product until product as a service. This is a concept of extending tangible product to intangible services (Chen & Cusmeroli, 2015).

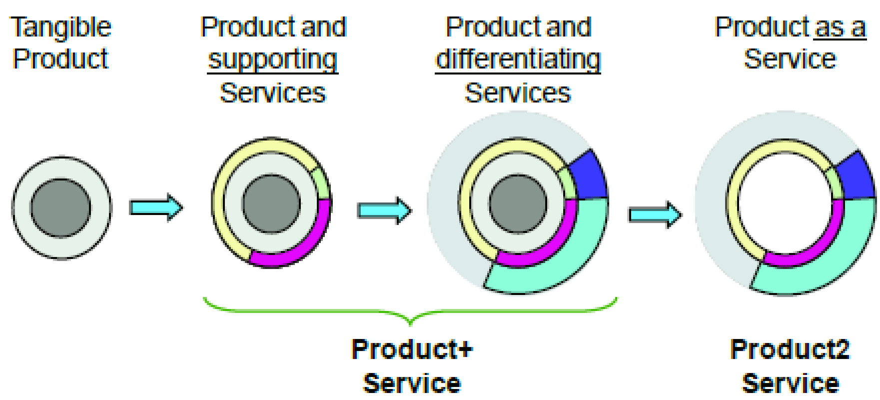


Figure 2.13: *Extended Product dimension (Chen & Cusmeroli, 2015)*

Example of the above extended product dimension is that a well-known airplane engine manufacturing traditionally sells engines (tangible product) to airplane companies. Then, the company offers some additional supporting services i.e.

maintenance and spare part supports (product + supports). Different services that are not directly correlated to tangible product may also be offered (product + differentiating services) such as consulting or financial services. Lastly, at the top level of the extended product dimension the company may provide only the services, not tangible product anymore (product as a service). Example is the engine manufacturing firm offers hours used for the engine which is a fully intangible service. Customer no longer take the responsible to hold the engine and is not in charge of maintenance or spare parts control (Chen & Cusmeroli, 2015).

a. Transition from product-based to service-based

Early time marketing focused on agricultural products and other tangible goods as an elemental concept. Before 1960, marketing was described as an ownership handover of tangible goods (Savitt, 1990) and an operation of item movement (Shaw, 1912). Marketing literatures infrequently mentioned about services, and when it did, it stated only as marketing of goods or assistance of production (Fisk, Brown, & Bitner, 1993; Vargo & Lusch, 2004). Evolution of marketing concept on the way to a new dominant logic has been discussed as Figure 2.14 (Vargo & Lusch, 2004). The leaders in marketing continuously shift away from tangible product towards dynamic exchange relationships involving with value added services. In marketing view, service-centered is an essential for customer and marketing driver. This means the service is concentrated more on customer needs. It requires cooperating and learning from customer and developing services to support dynamic requirements. In conclusion, service-center dominant logic refers to a collaboration with customer to provide more valued services instead of embedding features at the products.

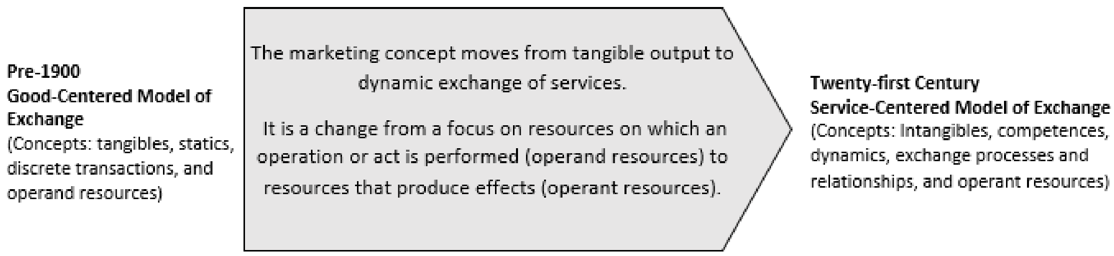


Figure 2.14: *Evolving to a New Dominant Logic for Marketing.*
(Vargo & Lusch, 2004)

Matthyssens and Vandenbempt (2010) explained how manufacturing firms shift when creating customer value by adding services, and categorized service strategies into four types which are after sales service, service partner, solution partner, and value partner (Figure 2.15). There are two dimensions in the framework; degree of customization which is typical for complex product system (Davies et al., 2007) and solutions (Mathieu, 2001), and service strategy starting from add on to the product to a solution of services as the main offerings. Merging these two dimensions generates four types of service offerings as mentioned above. Most manufacturers begin with the lower left area and often offer after sales services such as spare parts, installation, training and maintenance (Gebauer, 2008). Then companies have choices to either move up to the top left position to be service companies such as service partners (Gebauer, 2008) or shift forward to the right to be a solution partner to customize complex offerings (Davies et al., 2007). The top right area is a place of pure integrated solution as solution partners.

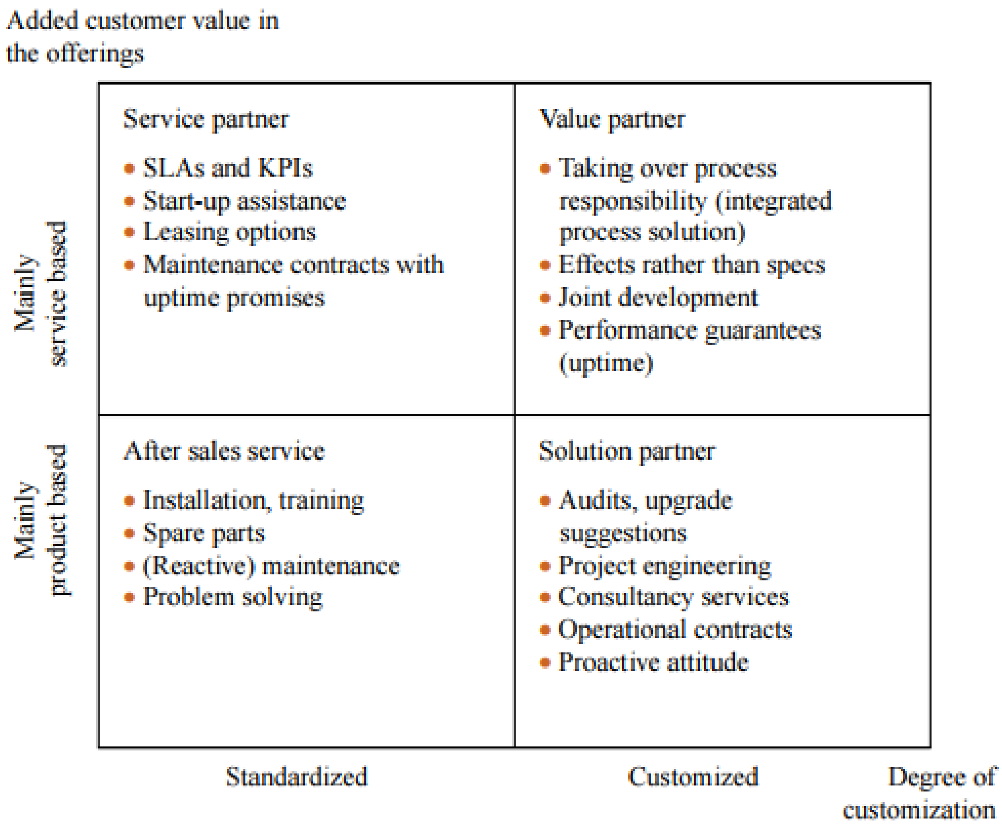


Figure 2.15: *A typology of service strategies*
(Matthyssens & Vandenbempt, 2010)

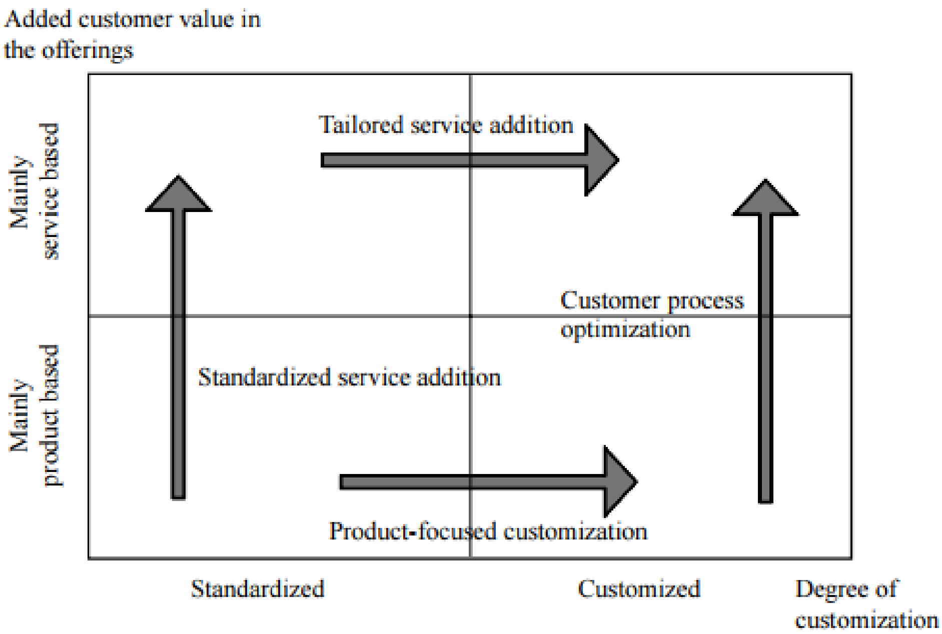


Figure 2.16: *Case companies 'evolution*
(Matthyssens & Vandenbempt, 2010)

The literature concluded that manufacturing firms find out how to improve their competencies toward customer in order to reach the value partner position as integrated solution providers. Companies shift to particular position based on their service strategies. Figure 2.16 illustrated four possible paths that can be occurred and can be combined to two combination routes; 1) additional service on standardized products followed by tailored service offerings, or 2) customized strategy followed by optimization process for customer. The final goals of these different routes are the same, at the top right quadrant.

2.2 Study in Chemical Servitization

Servitization is in the upward trend quickly because the drivers of servitization to offer services through the value chain are increasing in strength in order to ensure that business model that manufacturing firms adopting is profitable. Many industries are in maturity stage which is competing more on cost, thus manufacturing firms have to focus on value added services, not the cost. Figure 2.14 illustrates the smile curve, introduced by Shih (1992), and expresses the changing of the value chain by creating more value to customers has changed over time. The borders between products and services are blurring. Manufacturing firms perform not only making products, but also providing solutions in order to serve customers' requirements. These services could be added on services for pre-sales and after-sales services of the product, or an enclosed in the package such as product design and marketing (Veugelers et al., 2013). Thus, from the smile curve (Figure 2.17) the value chain of tangible goods has shifted by creating more value added services to the products.

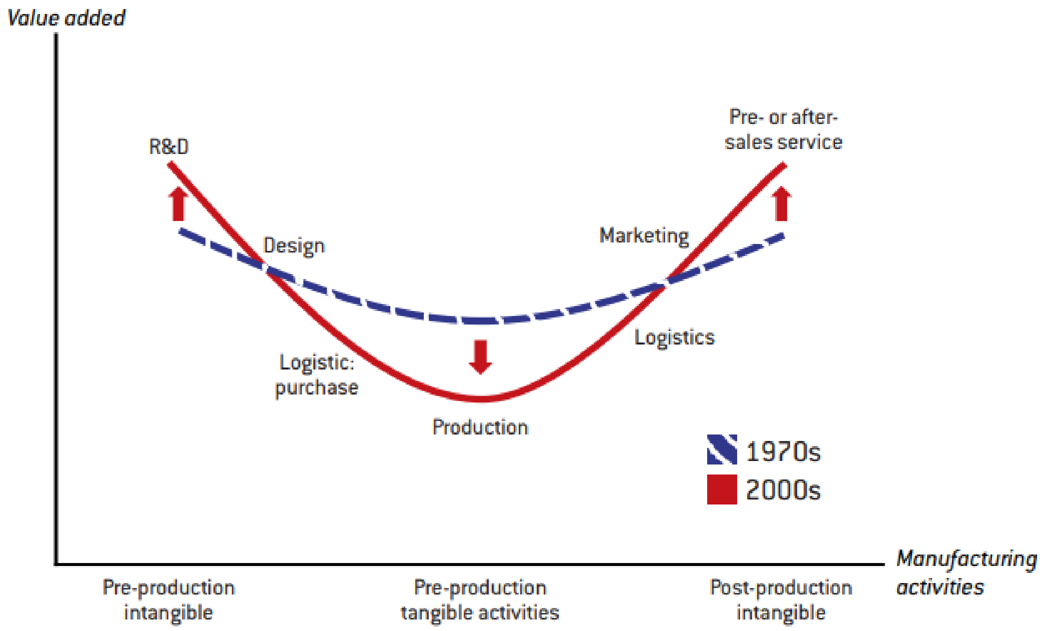


Figure 2.17: *The smile curve)Veugelers et al., (2013*

Chemical industry performs a significant role of world market manufacturing turnover. The value of chemical industry turnover was 3,360 billion Euros in 2016. The major manufacturers are located in Asia region (57% of worldwide sales) followed by NAFTA region (15.7%) which is almost equal to Europe region (15.1%). The world proportion of chemical industry is fluctuating quickly. China is now the world leading of the petroleum and chemical industry advancing on technology innovation and trade overcoming in global markets. Now Germany, the largest chemical producer in Europe, is ranking at the second place. The European countries progressively lost their market share in global chemical sales to China and Asian countries (not including Japan) throughout the duration from 2006 to 2016. The EU chemical sales were dropped from 28.0% in 2006 to 15.1% in 2016, at the total of 12.9% points. NAFTA chemical market shares were also reduced by 8.4% points, from 24.1% in 2006 to 15.7% in 2016 (CEFIC, 2017).

The European Chemical Industry Council (CEFIC, 2017) divide chemicals into three groups; base, specialty and consumer chemicals. Base chemicals, e.g., petrochemicals, basic inorganics, and polymers, are produced in large volumes and sold as raw materials for other industry hold 59.2% of total EU chemical trades in 2016. Specialty chemicals, e.g., pains, inks, solvent, crop protection chemical, electronic chemicals, lubricants, and adhesives, on the contrary to the first group, are manufactured in small volume and hold 27.2% of total EU chemical sales in 2016 (CEFIC, 2017; Kortman et al., 2006). Lastly, consumer chemicals such as soap, detergent, perfumes, and cosmetics are sold to end consumers. They hold 13.6% of total chemicals trades in 2015 (CEFIC, 2017). CEFIC (2017) also reported that the world chemical sales were in a very slow growth trend and expanded by 0.4 percent from $3,347 billion Euros in 2015 to $ 3,360 billion Euros in 2016.

Servitization is popularly adopted for innovative business model development in chemical industry to help customers avoid chemical waste. It is used as a link between physical offers and additional services provided to customers (Buschak & Lay, 2014). The innovative business models for chemical industry can be described as follows:

- Chemical product services (CPS) are business models that shifts from selling chemical products by volume to combining with some basic services to fulfill customers and suppliers' requirements (Kortman et al., 2006).
- Chemical management services (CMS) describe business models that create a long-term collaboration between customers and chemical service providers to supply and manage chemical related services (Stoughton & Votta, 2003).
- Chemical leasing is a business model that chemical companies supply specific substances and services, but hold the ownership of chemicals. This means chemical product ownership is not transferred to the customers. The customers or users will pay for the services rendered by chemical supply companies such as number of parts or pipe cleaned which is not for the volume of chemical consumed (Jakl et al., 2004).

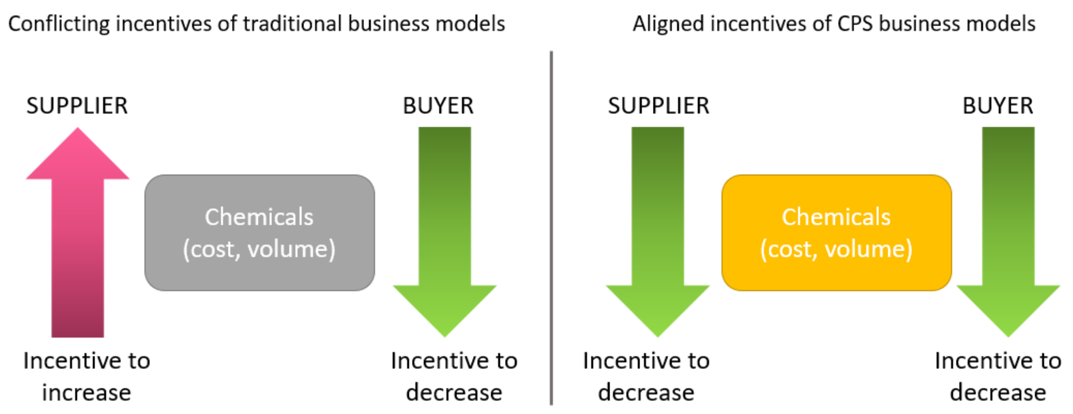


Figure 2.18: *Traditional and CPS Business Models*
(Kortman et al. 2006)

a. Chemical Product Service (CPS)

In previous days, traditional business models that focused on selling chemical products by volume cause conflicts between customers' interest in reducing chemical costs and volumes bought and suppliers' interest in maximizing sales revenues and volumes sold (see Figure 2.18 (Kortman et al., 2006; Reiskin et al., 1999; Toffel, 2008). In contradictory, CPS business model aligns the interests of suppliers and buyers in the way that both of them get benefit of reduced material consumption from efficiency enhancement on buyer's process, not selling by chemical volume (Kortman et al., 2006; Toffel, 2008)

Business models for CPS are variety by adding some more extra services, and these services can be related to the various stages in the chemical life cycle (see Figure 2.19 (Kortman et al., 2006). Here are some recommended chemical extra services (Kortman et al., 2006):

- Chemical packaging
- Chemical management
- Chemical inventory and storage
- Chemical advice on process tuning
- Transportation
- Chemical recycling and waste treatment
- Health
- Environmental and safety programs
- Worker's training

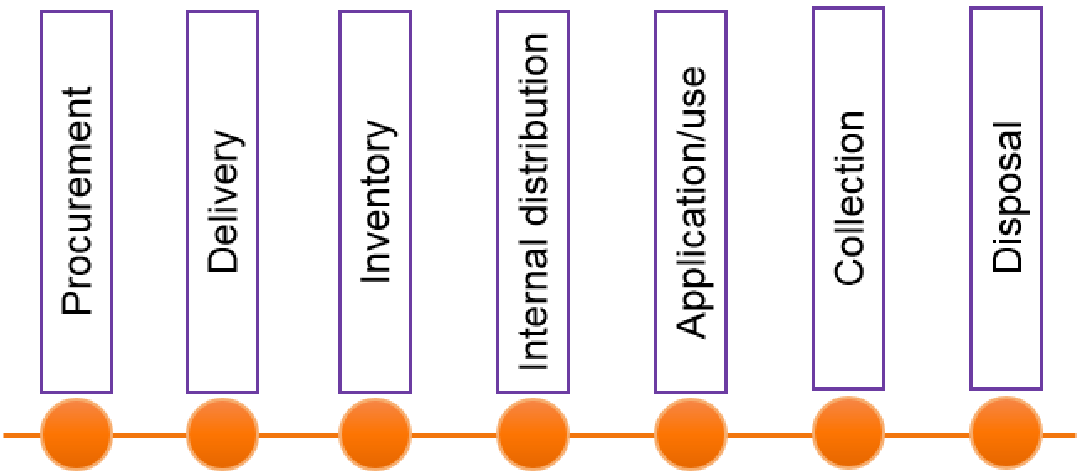


Figure 2.19: *The Chemical Life Cycle) Kortman et al .2006(*

Kortman et al. (2006) classified CPS into two different types as CPS-I and CPS-II, and summarized drivers and barriers for CPS as expressed in Figure 2.20 and 2.21.

CPS-I is a business model that manufacturers are still selling chemical products by volume. There are some additional services related to the chemical management added in order to increase value of the products. The ownership of the products transfers from suppliers to customers. Thus, the customers have full responsibility to take care of these chemicals. The suppliers responsible for product related services such as inventory, storage, and product disposal. The goal of this business model is to reduce chemicals used (See Figure 2.18).

CPS-II is a business model that chemical suppliers offer product service integrated solutions based on customers' needs instead of selling products by volume. Thus, in this business model, the suppliers still hold the ownership of the products and are responsible for cost of chemicals and chemical management.

In Figure 2.20, the transition from traditional model through CPS-I to CPS-II models is illustrated. On the left hand side of the figure, pure product is dominated in the traditional model. It is opposite to the right hand side of the figure which service components are dominated in the CPS-II model.

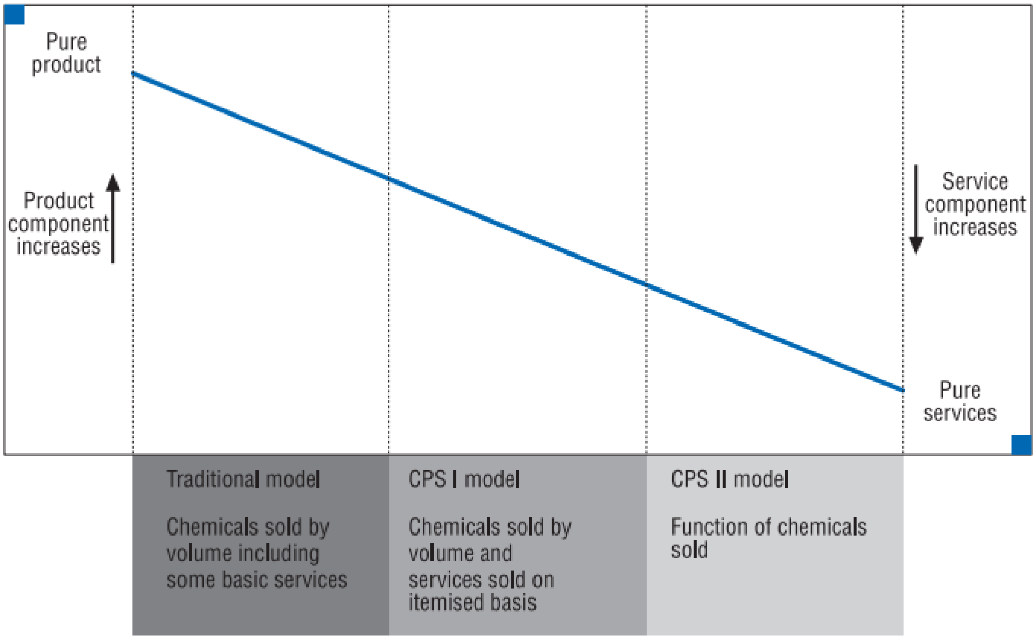


Figure 2.20: *Transition from the traditional business models to the CPS models (Kortman et al., 2006)*

	Drivers	Barriers
General	Aligned incentives for customers and suppliers Strong environmental legislation in favour of CPS Better environmental performance Partnership for innovation between customers and chemical suppliers Health and safety regulatory pressure	Contracting CPS is more complicated than selling/buying products Bilateral dependency between customer and producer Diversity in standards and administrative procedures in EU countries Transactional costs Fear of labour conflicts Lack of adequate liability allocation
Customers' point of view	Concentration on core business Efficiency improvement of production Reduce production costs Reduce chemicals costs Reduce the complexity of chemical management Limitation of liability risks Environmental, health and safety advantages	Long-term contracts: not easy to switch to other suppliers Difficulties of trust of suppliers with confidential process information Lack of visibility of total costs of chemical management Dependency on supplier
Suppliers' point of view	Consolidation of the market Development of new market niches Enhance customers loyalty More value from their human resources: expertise and know-how Survive in the declining markets Capture added value from customers	Extra investment for equipment, infrastructure and labour More fixed costs - Limited sale of chemicals by customers Dependency on the production of the customer Internal resistance to change

Figure 2.21: *Drivers and barriers for CPS*
(Kortman et al., 2006)

b. Chemical Management Services (CMS)

Most CMS cases are applied in specialty chemical products that both suppliers and customers improve and implement chemical product services together)Stoughton & Votta, (2003 as partnership concept (Reiskin et al., 1999). When chemical companies are focusing on environmental improvements as another competitive advantage, CMS offerings will be provided to customers to reduce the amount of chemical used and reduce chemical costs together. Example of this CMS is SAFECHEM, a subsidiary of The Dow chemical company providing solvent chemicals, collaborates with Pero AG, a manufacturer of metal cleaning machine, founded a new company namely Pero Innovative. The new company, a metal components cleaning machine producer, provided material logistics and room, personnel for producing machine, while SAFECHEM delivers adequate chemicals for each cleaning process as well as chemical monitoring and waste management)Buschak & Lay, (2014. Here are example of CMS services:

- Chemical supply
- Chemical quality monitoring
- Chemical adjustment
- Removal of applied chemical
- Chemical recycling
- Chemical solution network

Cost saving is the most significant reason for customes to adopt CMS, generally in life cycle costs because chemical suppliers have more relevant knowledge to handle chemicals (Mattes, Bollhöfer, & Miller, 2013). This CMS helps customers reduce chemical wastes which is more environmental friendly. There are four important advantages of CMS toward cost reductions for customers mentioned by (Buschak & Lay, 2014); 1) liability exception, 2) storage space reduction, 3) chemical workforce reduction, and 4) health and environmental danger reduction.

Other literatures (Kortman et al., 2006; Reiskin et al., 1999) give examples of the benefits when chemical service supplier and service customer companies adopting CMS. The examples of benefit to chemical service suppliers are:

- Improve relationship with customers and enhance trust
- Give financial benefits and avoid underbidded prices
- Increase growth in business from adding services on top of products
- Increase competitive advantages
- Raise up research and development (R&D) including product service improvement
- Gain loyalty and trust

Whereas, benefits of service customers are:

- Improve relationship with suppliers and enhance trust
- Receive better chemical management in controlling and processes
- Understand the real cost of chemical as well as chemical management
- Decrease amount of chemical used as well as cost of chemicals

- Reduce the management in chemical liability and disposal
- Reduce amount of waste
- Lessen risks of health and safety
- Improve chemical logistics
    - Reduce chemical management costs
    - Continue process, products, and services improvement

Johnson (2006) also recommended activities and services of CMS that could be offers in each stage of chemical product life cycle as shown in Figure 2.22.

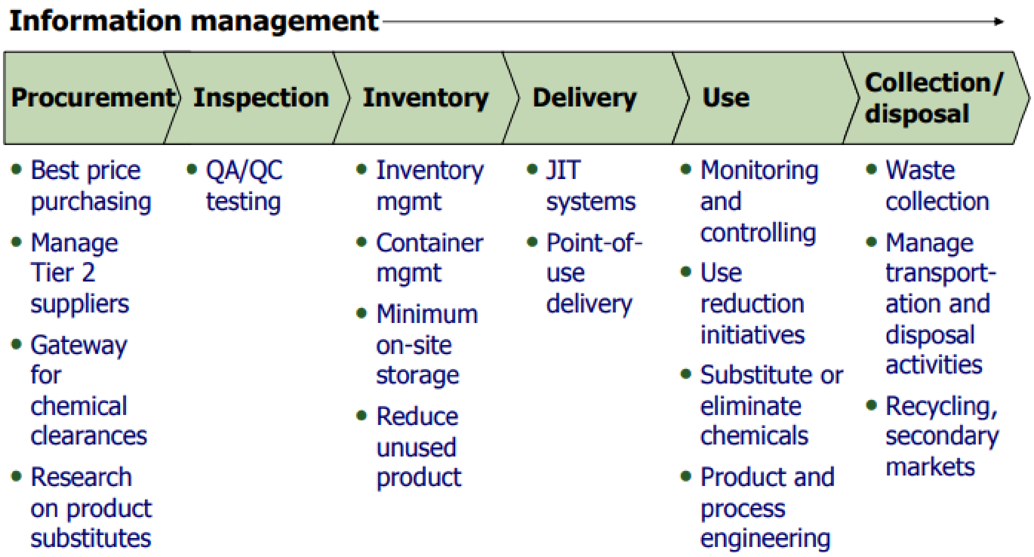


Figure 2.22: *Activities that can be included in CMS contracts (Johnson, 2006)*

c. *Chemical Leasing*

As mentioned that in chemical leasing, the ownership of chemical product is still on the suppliers, not customers. There are several benefits in chemical leasing for customers such that firstly, chemical leasing generates partnership method which the main focus is no longer on the volume of chemical product sold, but on the service offering integrated with those products. This means profit does not necessary on selling larger volume, but comes from service provided. Secondly, chemical leasing improves worker safety because the number of chemical used is dramatically reduced and the smaller amount of chemicals kept in the manufacturing firms. Thirdly, when chemical consumption is reduced, number of chemical waste and chemical containers in disposal process are decreased as well. This helps more environmental friendly. Therefore, both suppliers and customers get profit from chemical leasing as a true win-win situation (Buschak & Lay, 2014). Thus, chemical leasing is an inventive business model that express a considerable opportunity to grow into the sustainable chemical management implementation as world-wide accepted model (F. Moser & Jakl).

Chemicals are comprised in daily life products or used for making products. Many manufacturing operations use chemicals in industry processes e.g. lubrication, cleaning, bonding of boxes, solvation, surface protection, or catalysis (Stoughton & Votta, 2003). Many chemicals are toxic and can be used as chemical arms; however, they can also be used in manufacturing process of goods (Trapp, 2008).

Chemical leasing has been stated in many literatures about its definitions, scope, and limitations of this business model. The United Nations Industrial Development Organization (UNIDO) is an organization that essential role in knowledge sharing and promoting chemical leasing business model to chemical companies. UNIDO (2011) gives definition of chemical leasing as a service-oriented business model that transform the concept from selling chemicals by volume to providing value-added solutions. There is service extension in chemical producers to manage products for the entire life cycle. Chemical leasing is win-win situation that increases the efficient use of chemicals, decreases risks, and protects health. Companies applying chemical leasing share benefits, standardize supreme quality, and generate trust and relationships.

Lozano, Carpenter, and Lozano (2013) also provide definition of chemical leasing as a business model that collaborate between two or more participants on both the suppliers and customers. The environmental impression of this chemical leasing is number of chemical use is reduced.

(Frank Moser, Karavezyris, & Blum, 2014) mention that for the chemical leasing, the following characteristics must be satisfied:

- There is no purchase, and the chemical ownership is not changed. It remains to the provider.
- Change to use-related payment from the amount of chemical used to other perspective such as per square meter material surface, or number of bottles produced. Thus, chemical consumption is reduced.
- Sustainability criteria is met.

If one or more characteristics above are not fulfilled, this kind of chemical leasing will be called Grey Chemical Leasing.

Table 2.3 summarizes chemical leasing case studies adopting by manufacturers mentioned by UNIDO (2011). The table shows information about the cases, background information about root causes of each case, situations before adopting chemical leasing and outputs after application of chemical leasing in terms of economic, environmental and social benefits.

Table 2.3: *Case studies of Chemical Leasing)UNIDO, 2011(*

Cases	Background Information	Unit of Payment Applied	Before Chemical Leasing	After Chemical Leasing
Surface protection in Egyptian metal manufacturers	Surface protection is an effective way to keep metal surface from atrophy or rust. However, this process was facing high costs in operation, enormous power waste, high equipment maintenance cost, and large amount of rejects due to unqualified painting quality.	Before chemical leasing: pounds per kg of powder coating bought. After chemical leasing: pounds per m^2 of coated surface.	• Consumption of 140 metric tons of powder coating used per year. • Rejection rate at 2% per month • High powder losses (12% of powder used become waste) per month. • High energy costs. • Environmental and safety concerns.	**Economic benefits** • Saving about $68,000. • Rejects and reworks reduced to 0% per month. • Establishing long-term relationship. **Environmental benefits** • Powder waste reduced to 4-5% per month. • Powder coating consumption reduced by 20%. • Energy consumption reduced by 30%. **Social benefits** • Know-how sharing. • Develop environmental and safety awareness. • Increase quality of workplace.
Conveyor lubrication in beverage operations in Serbia	Wet lubrication is toxic and used in beverage industry at the conveyor belts to reduce resistance so bottles can move easily down the production line. The major problem is beverage manufacturers use old equipment which consume numerous of lubricant as well as water for the lubrication of	Before chemical leasing: per liter or kilogram of lubricant purchased. After chemical leasing: per liter or bottles produced.	• High chemical and water consumption • High volume of contaminated water • Consumption of 6,000 kg of hazardous lubricant per year.	**Economic benefits** • Saving EUR 5,700 per year per packaging line. • Cost reduction in chemical used • More efficient operation.

	conveyer belts and cleaning glass bottles. Moreover, the wet lubricant made operation floor slippery. With chemical leasing, manufacturers work together Ecolap, the supplier, by replacing new equipment and use non-hazardous dry lubricant instead of the wet lubricant.		• Risk of slippery floor	**Environmental benefits** • No required water. • 30% reduction of chemical used. **Social benefits** • Improve worker safety and health as well as risk of injuries. • Improve working environment.
Bonding of boxes in Serbian food operation	Adhesives are used in food packaging substantial. Using adhesives could badly affect food, food quality, and could be harmful to health. A Serbian food company adopted chemical leasing to improve packaging processes by replacing the old adhesives with the new one that helps the company reduce packaging cost as well as relief environmental concerns.	Before chemical leasing: per kilo of adhesive After chemical leasing: per bounded box	• Adhesive was put manually into the machine. • Melting adhesive caused badly smell. • Melting adhesive needed high temperature (160°C). • High energy cost. • High maintenance cost.	**Economic benefits** • Saving EUR 4,000 per year. • Reduction in energy and maintenance costs. **Environmental benefits** • Reduction in chemical consumption (more than 30%). • Operation temperature reduced to 130°C. **Social benefits** • Using automatic system reduced burning injuries. • Improve working environment. • Improve quality of work.

2.3 Study in Servitization Transition

Concept of a continuum from tangible product manufacturers to product related service providers was mentioned by many researchers (Gebauer & Friedli, 2005; Oliva & Kallenberg, 2003) as shown in the Figure 2.23. Previous literatures state that the transition moves from tangible goods to services because the tangible goods are a small part of value proposition and generate less profit than services. There are two extreme points of the continuum transition (Gebauer & Friedli, 2005). The first extreme point happened when manufacturing firms produce tangible goods with add-on services as a product differentiation in marketing strategy. Revenue and profits are mainly from the tangible goods; however, the revenue, profits and customer satisfaction of the service offerings are relatively low. The second extreme point of the continuum is a situation that manufacturing firm become a service provider which tangible goods is an add-on to the services. The profit is mainly from service part, and the product is hold only small protion of the profit. The product-service transition is started from a small number of product related services to a large number of provided services.

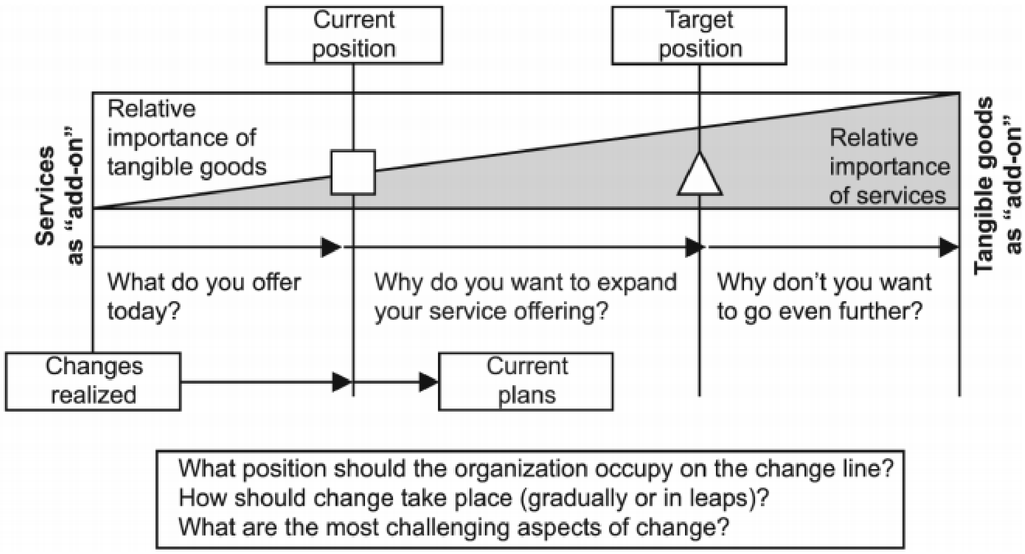


Figure 2.23: *The product service continuum*
(Oliva & Kallenberg, 2003)

Oliva and Kallenberg (2003) state that three rationales for the product service integration processes are economic argument, customer demanding, and competitive argument. Later on, Gebauer and Friedli (2005) mention the similar rationales but in different names of financial opportunities, marketing opportunities and strategic opportunities. For the financial benefits, possible revenue from services generates greater margin and also more stable than the revenue from selling tangible goods. Next, marketing opportunities are known as greater service offerings for selling more tangible goods (Mathe & Shapiro, 1993). The last item is strategic opportunities such as competitive arguments based on service competitiveness or services as barriers for entering the market (Anderson & Narus, 1995; Oliva & Kallenberg, 2003). Services become sustainable competitive advantage, and more importantly company will earn prospective maximum margins by including innovation and technology, quality of products, customer responsiveness, cost leadership and distribution time to the services (Gebauer & Friedli, 2005).

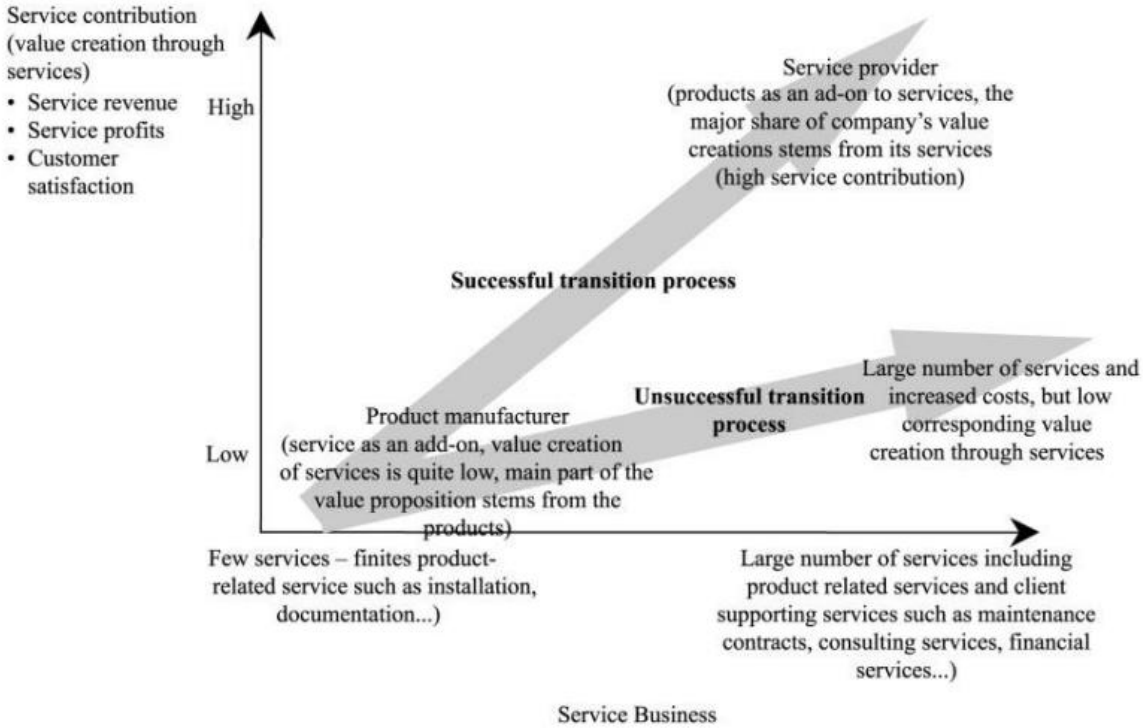


Figure 2.24: *Transition from product manufacturer to service provider (Gebauer & Friedli, 2005)*

Gebauer and Friedli (2005) mention in their research that most service transitions fail and manufacturing companies find it is tremendously difficult to implement the transition successfully. Most of the time transitions cause the companies increase costs but the return is not as high as expected. Thus in case of unsuccessful transition process, costs of transition are increased with no-corresponding returns (Figure 2.24). Successive goal of the company is to be a successful service provider that will achieve service contributions of service revenue, profits, and customer satisfaction. The literature also indicates seven behavioral processes playing as important keys for service transition which are risk aversion, economic potential of services, fundamental attribution error, setting up structures and processes, first- and second-order structural change, employee perceptions of transition, and adequate objectives.

The literature summarizes characteristics of behavioral processes of successful companies that managers and staff of service companies should have the following characteristics:

- Agree to take the risk of transition, but management position may less risk averse
- Trust in financial probable of services
- Inspire company staff and develop suitable processes of service expansion
- Authorize employee and add service capacity to conquer short and long-term results of a decrease in quality
- Prepare second-order structural changes

The literature also summarize characteristics of unsuccessful companies as follows:

- Managers concern too much about risk
- Managers do not trust in financial probable of services
- Managers force staff to sell more services
- Managers do not conquer short and long-term results of a decrease in quality
- Managers focus on only first-order changes (for example sunk costs)
- No employee-pull arises
- Managers have uncleaned objectives of the transition

Later literature (Baines et al., 2007) discusses the state-of-the-art of PSS and explains the evolution of the PSS concept as presented in the Figure 2.25. The researchers explain that manufacturing firms traditionally considered products and services separately. Servitization of products and productization of services are recently introduced in literatures. Servitization of products is a transition of a product that becomes material component attached to the service system. Likewise, productization of services is a transition of services component attached to a product. The final path of servitization of products and productization of services is an integration of product and service offering as a single solution.

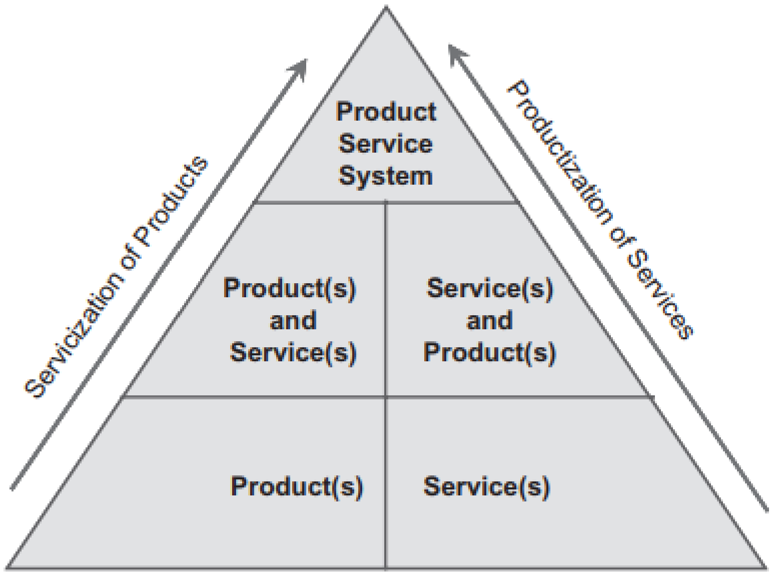


Figure 2.25: *Evolution of the PSS concept*
(Baines et al., 2007)

In traditional business mode, product is sold by suppliers or producers and ownership of the asset is transferred to customers. Thus, the customers will have full responsibilities for spare parts and maintenance issues. However, with a PSS, the ownership is not transferred to the customers. The suppliers or producers will provide the services including use of product, an installation, related equipment, maintenance, product monitoring, documentary, and waste and disposal.

2.4 Theoretical Frameworks

1. Product Service System Frameworks

Traditionally, manufacturers consider services as harmful necessity (Mathieu, 2001). Services are now recognized as value-added sources for manufacturing firms because companies are no longer sell only tangible products but they rather offer more valuable of PSS to serve customer needs instead. PSS transition is exhibited in Figure 2.26 representing the changed of product ownership under the PSS business model. In the new model (the right picture) demonstrates that product ownership is not transferred to the customers, and responsibilities in maintenance and disposal are belong to service providers.

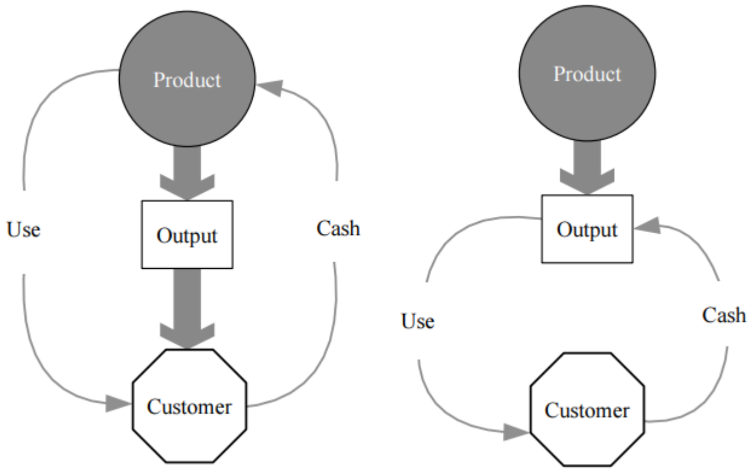


Figure 2.26: *Transition of product ownership under PSS model.*
Pawar, Beltagui, and Riedel ((2009 adapted from Baines et al. (2009)

Thus, PSS is a business model that products and services are integrated in packages as bundle or systems (Vandermerwe & Rada, 1988). This concept was termed servitization and was described as the direction to becoming combination of bundle service solutions as shown in Figure 2.27 (Pawar et al., 2009).

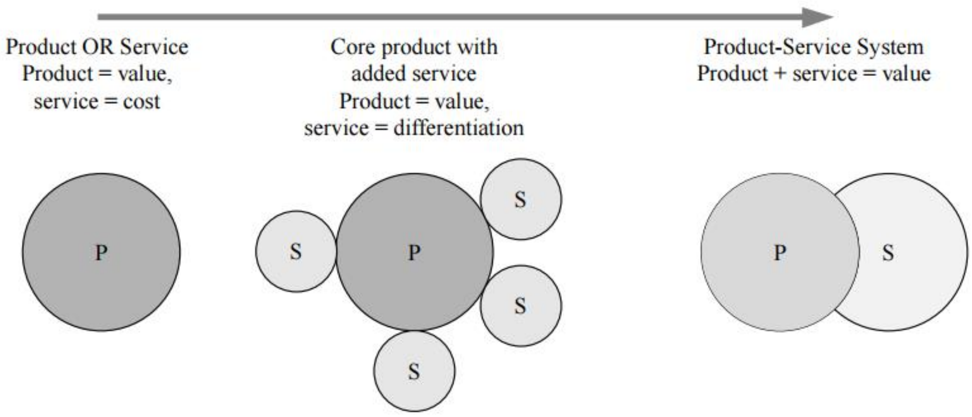


Figure 2.27: *The servitzation of manufacturing.*
)Pawar et al. ((2009, based on Vandermerwe and Rada (1988)

As mentioned above that PSS can be categorized into three types of product oriented, use oriented, and result oriented (Reim et al., 2015; Tukker, 2004). Later, PSS is divided into five options which are integration oriented, product oriented, service oriented, use oriented and result oriented (Neely, 2007). Similarly, Fan and Zhang (2010) identify five different types of PSS as follows:

- Product oriented PSS (PPSS) is add-on product related services such as maintenance and support services, installation and implementation services which customer is the owner of the products.
- Application oriented PSS (APSS) is a business model that suppliers or producers sell a function or an application instead of tangible products and the ownership of the product is not transferred to the customers. Examples of APSS are such as sharing, pooling and leasing systems.
- Result oriented PSS (RPSS) is similar to APSS that the suppliers or producers hold the ownership of the tangible products. With RPSS, tangible products will be replaced by services e.g. directories are replaced by web based information, answering machine is replaced by voicemail system.
- Integrated oriented (IPSS) involves moving downstream of the value chain by adding more services to vertical integration. Examples of IPSS are retail and distribution, financial services, and transportation services.
- Service oriented PSS (SPSS) explains a bundle package of product and service. This business model integrates services into the tangible product itself. The ownership of products is transferred to the customers. Examples of SPSS are Health Usage Monitoring System and Intelligence Vehicle Health Management.

Fan and Zhang (2010) also mention that these five categories of PSS can be placed into four different area of a matrix which is divided by competitive intensity on the x-axis and market/technological turbulence on the y-axis as presented in Figure 2.28.

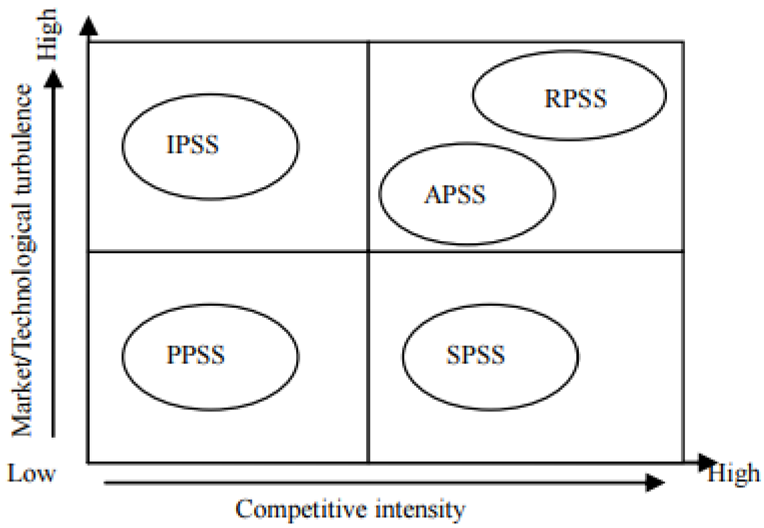


Figure 2.28: *The theoretical framework allocating PSSs with market contexts. (Fan and Zhang, 2010)*

A. Low in both competitive intensity and market/technological turbulence

Under this circumstance of low in both competitive intensity and market/technological turbulence, customers have quite constant demand, and they don't have many choices to choose. The services offered are all product-related services to support tangible products such as spare parts, maintenance, repair, re-use, and recycling. Thus, PPSS is located in this area.

B. High competitive intensity and low market/technological turbulence

Under high market competition, manufacturing firms are trying to offer more services in order to make differentiate their companies from competitors. SPSS is used by manufacturing firms to make barriers to block competitors and lock out their customers. For example, Apple Inc. developed, promoted music download service (iTunes) and bundled this application with their innovative Apple devices.

C. Low competitive intensity and high market/technological turbulence

With high market/technological turbulence, customer preferences and behaviors can be changed rapidly and unexpected. In addition, manufacturers and suppliers may also suffer from bullwhip effect influenced by the delay and misunderstanding in customers' demands. Thus, IPSS should be located in this area to help manufacturers and suppliers move down the supply chain on retail and distribution. For example, Ford Motors acquired the control of dealer stores in several regions in the U.S.

D. High in both competitive intensity and market/technological turbulence

In case of high competitive market with many selective options, customers do not have to stick with particular producers. They prefer to use product at just the amount they want, and they don't want to take risk of holding high volume of products. In this situation, APSS or RPSS are an appropriate option. Famous example is Roll-Royce offer "power by the hour" service to its customers to pay for hours of engine used, not the engine they buy. Customers are no longer own the engines and do not have any burdens for spare parts and maintenance.

Recently, service-oriented business models (BMs) framework has been proposed (Adrodegari, Saccani, & Kowalkowski, 2016) to indicate the main BM components which are related to PSS essentials. The literature mentions that in this global economy, manufacturing firms have to adjust their BMs from the traditional ones which are focusing on the product sales, to service oriented BMs which are a concept of selling either usage or application. The proposed framework started from the Business Model Canvas (BMC) (Osterwalder & Pigneur, 2010) for mapping and analyzing new BMs implementation for companies to be supported new PSS (Gelbmann & Hammerl, 2015). Figure 2.29 represents major BMC elements that should be integrated for PSS BM. These key BMC components are value proposition, key resources, key activities, customers, partnerships, and revenues and costs.

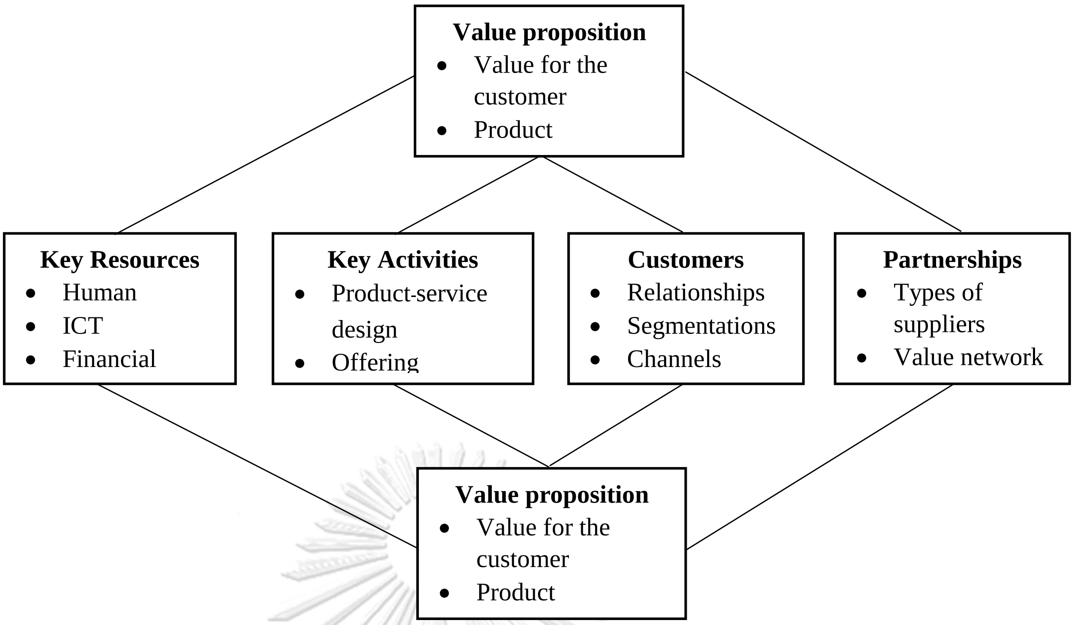


Figure 2.29: *Key elements of PSS business model (Adrodegari et al., 2016)*

The above framework expresses a construction of service oriented BMs for companies to understand the key elements of the transformation to PSS BMs. However, the framework does not give an instruction of the processes to transform from product base to the product service integration. Thus, several literature reviews are required in order to draw a roadmap of servitization.

In many literatures, PSS is identified in similar ways that elements of PSS are tangible product, service, and supporting infrastructure and networks, and goals of PSS are to have competitive advantages with highest customer value, as well as less environmental collision (Manzini & Vezzoli, 2003; Tukker, 2004).

Service dimension of PSS that covers product life cycle and integrates with product service life cycles has been mentioned and shown in Figure 2.30 (Adrodegari et al., 2016; Aurich, Schweitzer, & Fuchs, 2007; Manzini & Vezzoli, 2003). The efficient PSS performance has been driven by extensive aspects of the total life cycle of service. The service dimension is a component on product service life cycle study and service transition starting from the fundamental services (for example installation, maintenance, consultation, distribution, etc.) to the total services (for example integrated service solutions (Adrodegari et al., 2016).

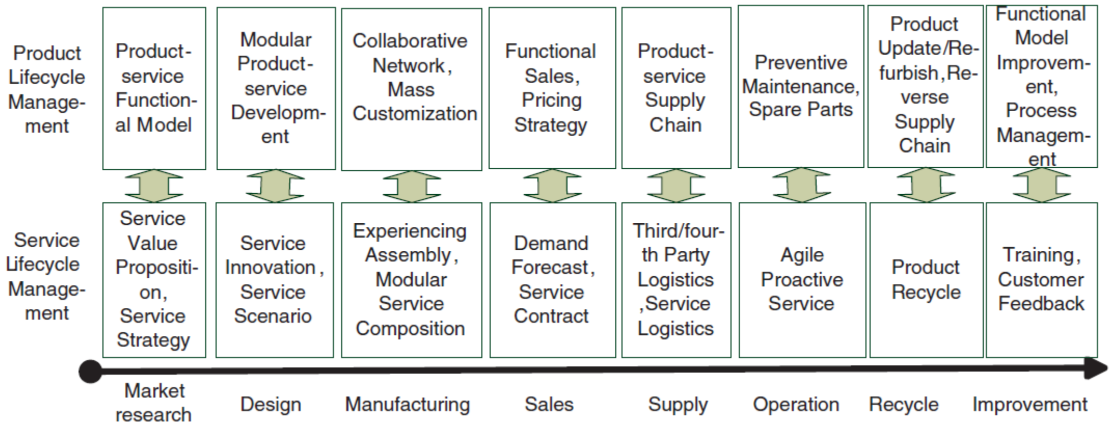


Figure 2.30: *Product service life cycle management.*
(Adrodegari et al., 2016; Aurich et al., 2007; Manzini & Vezzoli, 2003)

Transition roadmap is illustrated in Figure 2.31 showing two transition paths for manufacturing firms to change from fundamental services to the life cycle services (Gebauer, Friedli, & Fleisch, 2006; Oliva & Kallenberg, 2003). The first route is a path to transform product-oriented service to customer-oriented service in order to increase value of customers. The second route is a path to transform transaction-based service to relationship-based service in order to increase value of services. Service process is necessary for the service transition because it is related to customer requirements and production planning. This process is performed by organization teams which they need to work with both internal departments and external organizational boundaries. The service process needs to be adjustable in order to serve changes in customer requirements and production plan (Bask, Lipponen, Rajahonka, & Tinnilä, 2010; Yu, Zhang, Meier, Logistics, & Informatics, 2008).

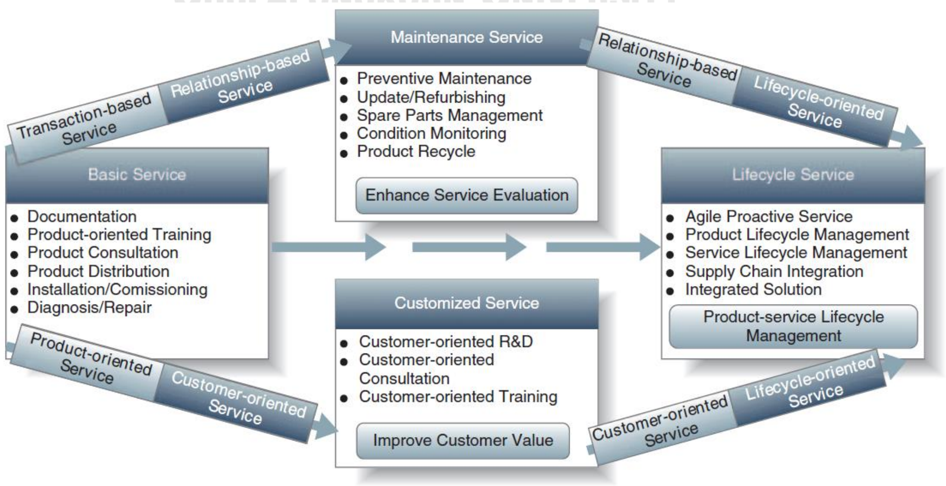


Figure 2.31: *Roadmap of service transformation. (Adrodegari et al., 2016)*

2.5 Servitization Frameworks

Rabetino, Kohtamäki, and Gebauer (2017) developed strategy map of servitization for solution provider. This framework is a tool for standardizing and implementing servitization system as well as reducing long-term value establishment and allocation processes. The strategic map is composed of four levels as follows (Figure 2.32):

1) Financial perspective level has focused on greater profit margins, more stable revenues, and superior chances to grow in markets as major financial drivers for servitization in such mature industries that have been increasing in severe competition for years (Gebauer et al., 2005; Oliva & Kallenberg, 2003). There are two components in this level which are strategic aims that firstly enlarging profitability over the short-term by improving operations and processes, cutting down expenses, arranging offerings, and increasing asset utilization; secondly readjusting service offerings in order to support product related services that vary on product lifecycle in long-term relationship (Rabetino et al. (2017).

2) Customer perceive level explains customers in different segments have different value propositions on different aspects that requires changes from tangible product base to product service for customized customer processes and from short-term activities to long-term and relational transactions (Oliva & Kallenberg, 2003).

3) Process for crafting a customer-centric value proposition in servitization is internal processes for company to generate and provide service offering in the value proposition for each customer segment. There are three processes in this level which are 1) operational processes are the crentral processes that integrate manufacturing activities such as supply chain, cost efficiency, service processes, service network, and service delivery (Baines et al., 2009); 2) the customer management processes are dealing with creating long-term relationship with customer (Gebauer et al., 2005); and 3) the innovation processes are the processes to understand customer needs and develop new offerings in value added dimensions (Baines et al., 2009).

4) Intangible assets in servitization are important intangible assets that can drive the companies for success (Rabetino et al. (2017). The first stage is companies handling with their organizational capital by setting a service strategy that involved with management strategy and organizational culture (Mathieu, 2001), and arranging new organizational structures that support new product service offerings. The companies must balance values of tangible product and service-oriented offerings (Gebauer et al., 2005).

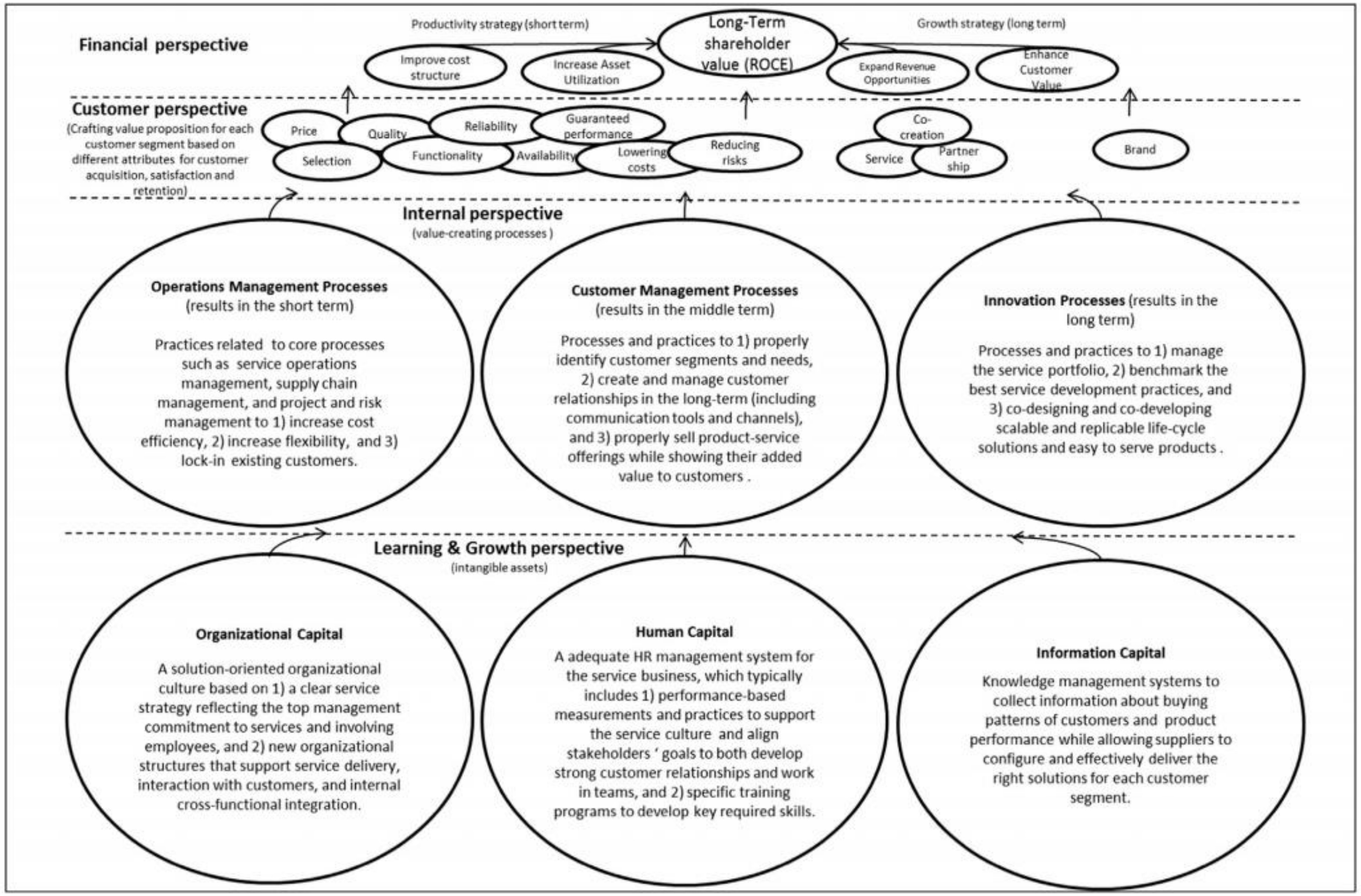


Figure 2.32: *Servitization study map of key levels, processes and activities.*
)Rabetino et al) .2017(

The second component is human capital which is dealing with implementing human resource management for service-oriented business (Gebauer et al., 2005; Mathieu, 2001) by recruiting staff who have relevant skills and experience to provide particular services successfully. Because companies must use customer records in order to create value added service offering, this customized value proposition involves greater customer information.

Recently, Weeks and Benade (2015) develop servitization systems framework (Figure 2.33).

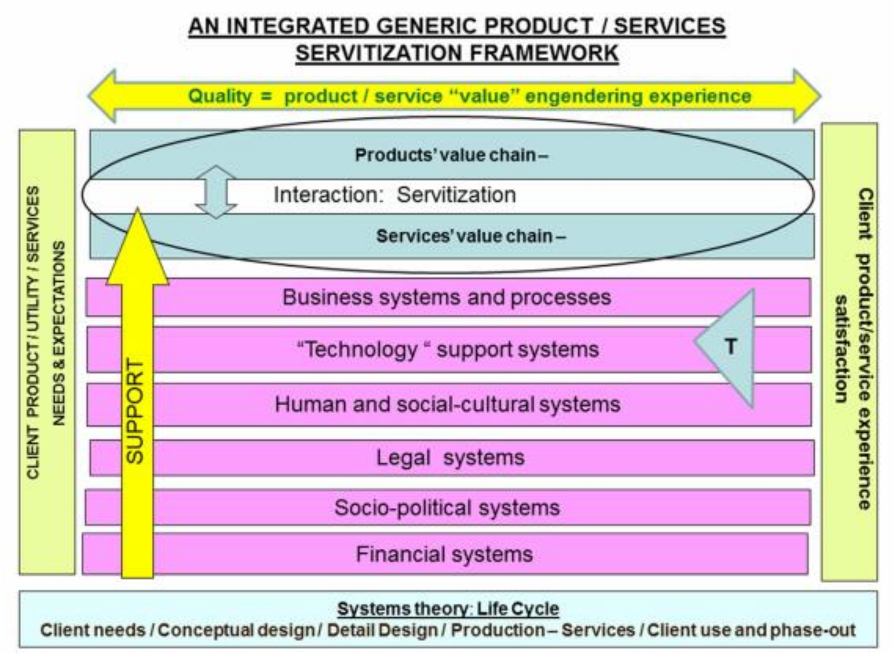


Figure 2.33: *Servitization framework.*
(Weeks and Benade, 2015)

One of the most well-known servitization framework is the process model for implementing installed base service proposed by Oliva and Kallenberg (2003) (Figure 2.34). The researchers developed process for product service transition by dividing the big picture into four stages of consolidating product-related services, entering the installed base service market, expanding the installed base service offerings, and taking over the end-user's operation.

As many manufacturing firms are already in business of product-related services, but they separate the service units in different department in the organization and consider services as unprofitable obligation in product selling. Thus, in the first layer consolidating product-related services is a process to combine the existing services into one unit in the firm. The goal of this stage is to enhance the service performance driven by ambition to sell more products because services are a major factor on customer satisfaction.

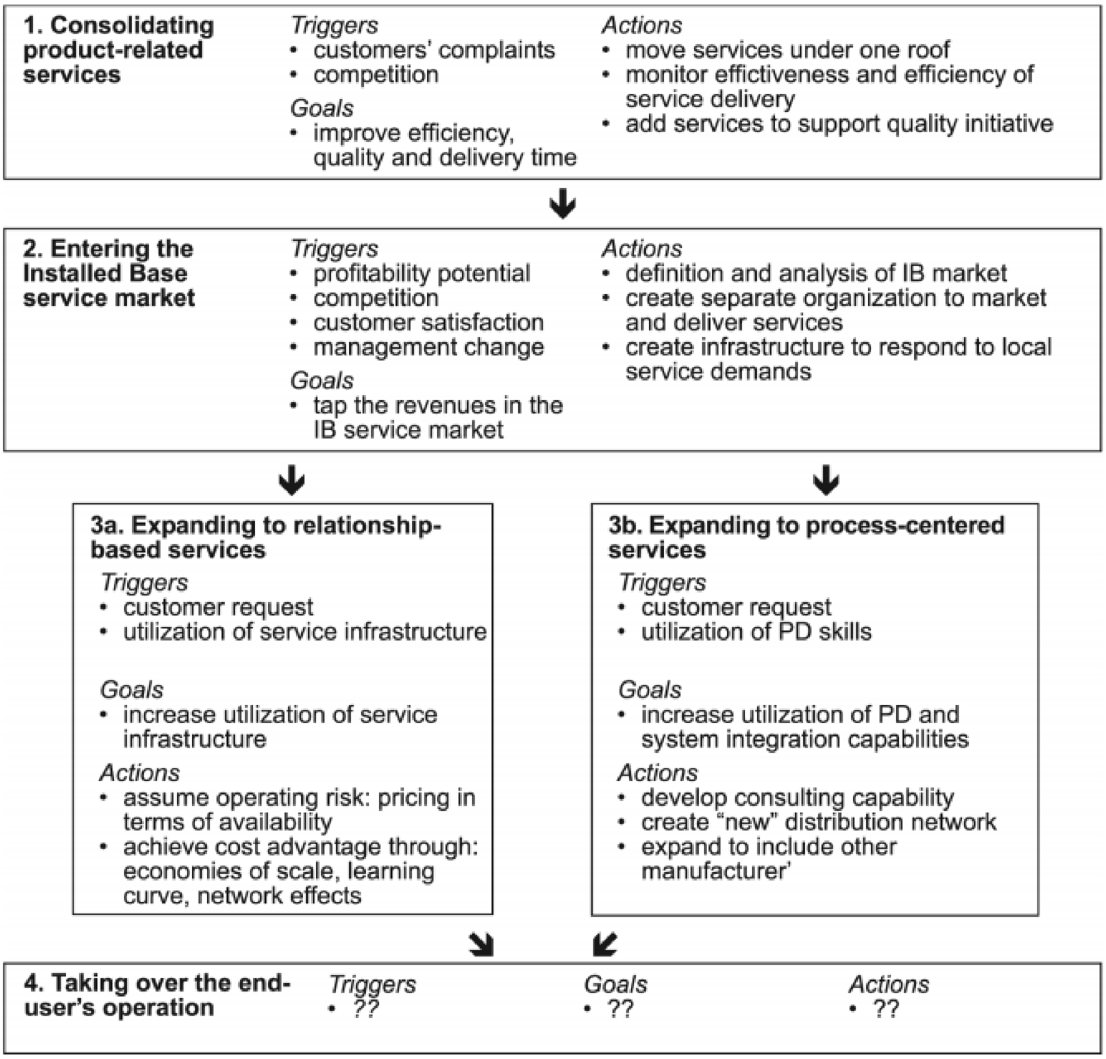


Figure 2.34: *Process model for developing installed base service.*
(Oliva & Kallenberg, 2003)

The second part of the framework is the process of entering the installed base service market which the main actions are to determine profit event and to setup the structures and achievement processes. The researchers mentioned that there are two major difficulties when a firm entering the installed base service which are the difficulty in required cultural change on the transition from product- to service oriented and the difficulty to invest in service infrastructure on investment decision, operation level, and the network.

The third part of the framework is the expanding the installed base offering which can be classified into two different transitions. The first transformation is the changes the focus from transaction based to relationship based. And the second transformation is the changes the focus from product volume to efficiency and effectiveness for customer's processes. In this transition, products become a part of service offering, not the main objective.

Finally, the last part of the framework is taking over the end-user's operations that transform the firm to pure service organization.

Another useful servitization framework is constructed from the fundamental foncept that successful servitized companies should focus on the target markets in application with internal competencies implemented for product offerings proposed by Meyer and Arthur (1999) with proficient process platform to develop new product service integration business model. There are three major parts in this framework which are target markets, service platforms, and competencies combining together in order to implement successful business (Figure 2.35). The first part is company's markets separated into segments. This part is examined from the structure of the market distinguished by customers to understand customer needs and give direction for the company to focus on precise markets. The middle part is the company's product platforms which are common design basis and machines, parts and productions. Efficient product platforms can greatly reduce production costs as well as accelerate development of cost performance. The last part of the model expresses company's core competencies which consists of market insights, product technologies and design processes, production process and technologies, and support capabilities. These competencies vary from business to business, and among companies in the same business industry.

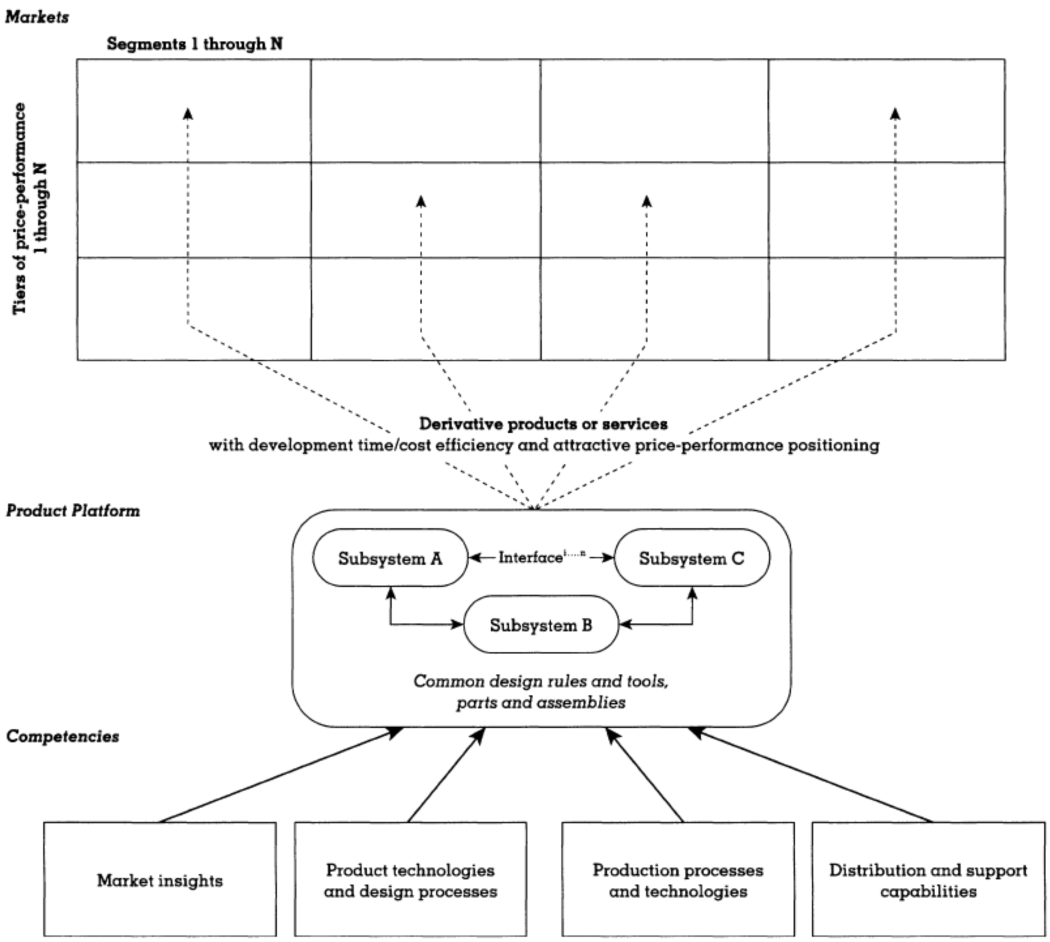


Figure 2.35: *Integrative Model of Markets, Product Platform, and Competencies. (Meyer & Arthur, 1999)*

World economy has become service industrialized as manufacturing firms change their business model from product- to service-oriented businesses. Chemical providers also adopt servitization concept and apply to their business for sustainable source of revenues. Ryu, Rhim, et al. (2012a) adopted (U. Karmarkar & U. Apte, 2007) matrix categorizing industries based on two dimensions namely End Market which can also be divided into material and information blocks, and Material Delivery Form which is split to products and services as shown in Figure 2.36. This matrix is divided into four quadrant which are Material-Product, Material-Services, Information-Product, and Information-Services and can be noted in shorten ways as M-P (physical products), M-S (physical services), I-P (digital products), and I-S (information services) respectively. It is obviously seen that chemicals are in the M-P sector which is traditionally sold by volume. Data of researches examined Korea GDP by Choi (2006) and Ryu, Rhum, Park, and Kim (2009) shows that the proportion of M-P sector is constantly decreased from 29.44% in 1990 to 19.55% in 2005, while the I-S sector is persistently increased from 40.9% in 1990 to 49.68% in 2005.

Delivery Form		Product	Services
End Product	Material	Chemical, Steel, Cement Automotive, Aerospace, Industrial equipment	Transportation, Construction, Maintenance and repair, Hospitality and tourism, Retailing
	Information	Computers, Optical fiber, TV sets, Radios, PDAs, Books, CDs, DVDs, Music, Software (packaged), Databases	Telecommunications, Broadcast services, Financial services, Professional services, Education

Figure 2.36: *Matrix to classify major industry sectors.*
(U. S. Karmarkar & U. M. Apte, 2007; Ryu, Rhum, Park, & Kim, 2012)

s

Figure 2.37 illustrates another servitization framewok proposed by (Ryu, Rhim, et al., 2012a) and adapted from Meyer and Arthur (1999). This framework composed of three components which are markets, product-service-knowledge system (PSKS), and competencies in the supply chain. The top part of the framework characterizes market segments which the horizontal axis is divided by characters or behavior of customers and the vertical axis is divided by levels of servitization. This part helps the company to understand characteristics of customers and the needs of each segment in order to provide better services or solutions to serve specific requirements than other competitors (Meyer & Arthur, 1999). The vertical axis of the customer segment is three steps of servitization processes which the researchers adopted from process model of Oliva and Kallenberg (2003) which are product-related, installed base, and platform services. Product-related services are additional services that add on to tangible products to assure that the product performs correctly. For the install base services, there is transition from traditional product selling to product service integrated offerings which products are only process for delivery and the main offerings are services. The last stage is platform service which represents the transition from product selling to service solutions business models. In this stage, tangible products are only an element of the solutions and services are dominant and value added with long-term relationships that require co-created collaboration in a network. The middle part of the framework is the PSKS which is an integration process of all supply chain competencies from the network generating new value added offerings to serve customers in each market segment. The bottom part is competencies in the supply chain which is more efficient than considering on only internal core competencies of a single firm.

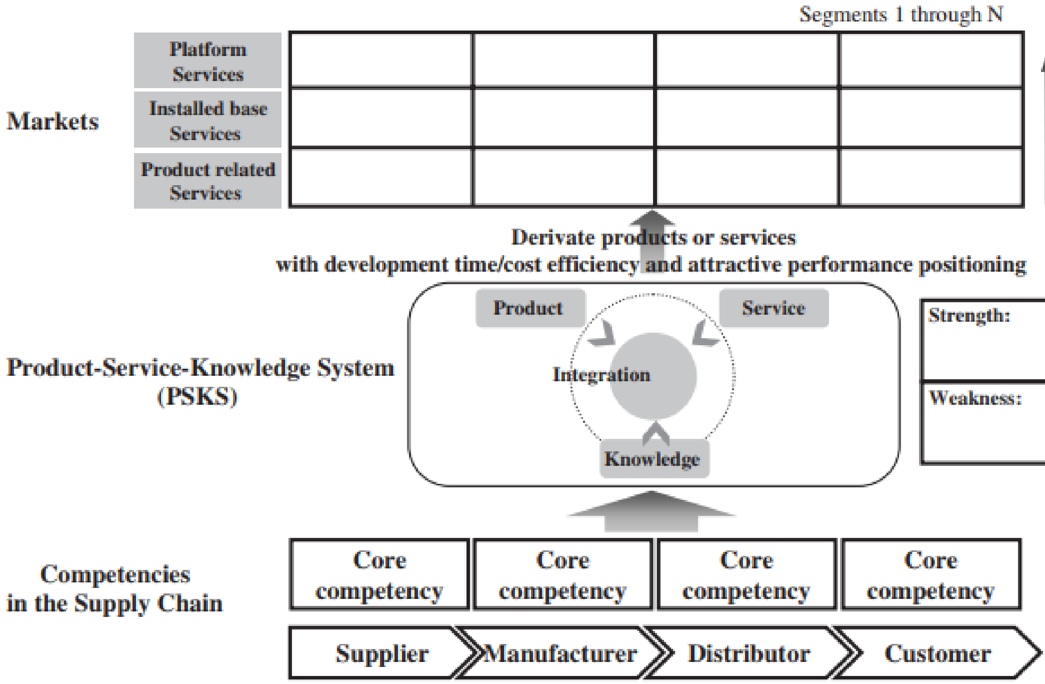


Figure 2.37: *A Servitization framework of markets, product-service-knowledge system, and competencies in the supply chain (Ryu, Rhum, et al., 2012)*

Another literature (Figure 2.38 (Thoben et al., 2001)) mentioned than to have advantages in competitive global market, manufacturers and suppliers have to integrate their core products with additional services to make their products more valuable and attractive. This concept is defined as Extended Product, which consists of three layers. The first layer is kernel which is an illustration of the core and functionalities of product (tangible). The second layer describing the product shell including packaging of the core product (packaging). Finally, the outer layer is representing all the intangible assets of the offer (services).

A combination of core product and the product shell is called products in a narrow sense which tangible products are offered to the market, whereas a blending between product shell and non-tangible product is named product in a broader sense as a product solution that both tangible and intangible products are integrated together (Thoben et al., 2001). Figure 2.39 illustrates dimension of migration process based on the expended product concept transforming from tangible product to intangible services and finally service as product (Chen & Cusmeroli, 2015).

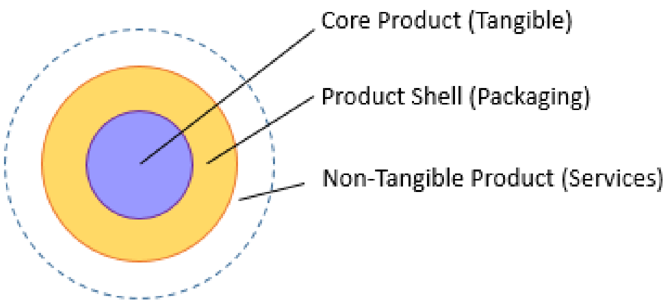


Figure 2.38: Extended Product concept (Thoben et al., 2001).

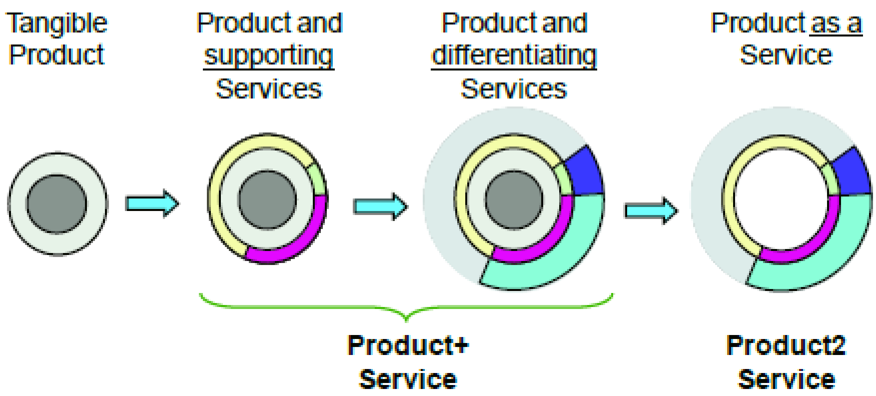


Figure 2.38: *Extended Product dimension (Chen & Cusmeroli, 2015)*

Chen and Gusmeroli (2015) proposed a framework for manufacturing servitization which combine three dimensions as follows:

1) **The x-axis** represents types of servitization which are process oriented, portfolio oriented, customer oriented, and knowledge oriented. Process oriented drives process-focused services, for example transportation which do not have variety services and also not many contact intensities. Portfolio oriented is sometimes called "Flexibility-focused services" such as repair and maintenance services which are composed of variety problems solved by repair services, but low in contact intensity. Customer oriented generates customer-focused services such as training do not have much variety, but high contact intensity. Knowledge oriented drives knowledge-focused services such as consulting services have variety services and high contact intensity.

2) **The y-axis** represents stages of product extension that start from product only, service added to the product, service differentials the product, and service is the product.

3) **The z-axis** is illustrated service innovation which are single enterprise, supply chain, value network, and innovation ecosystem.

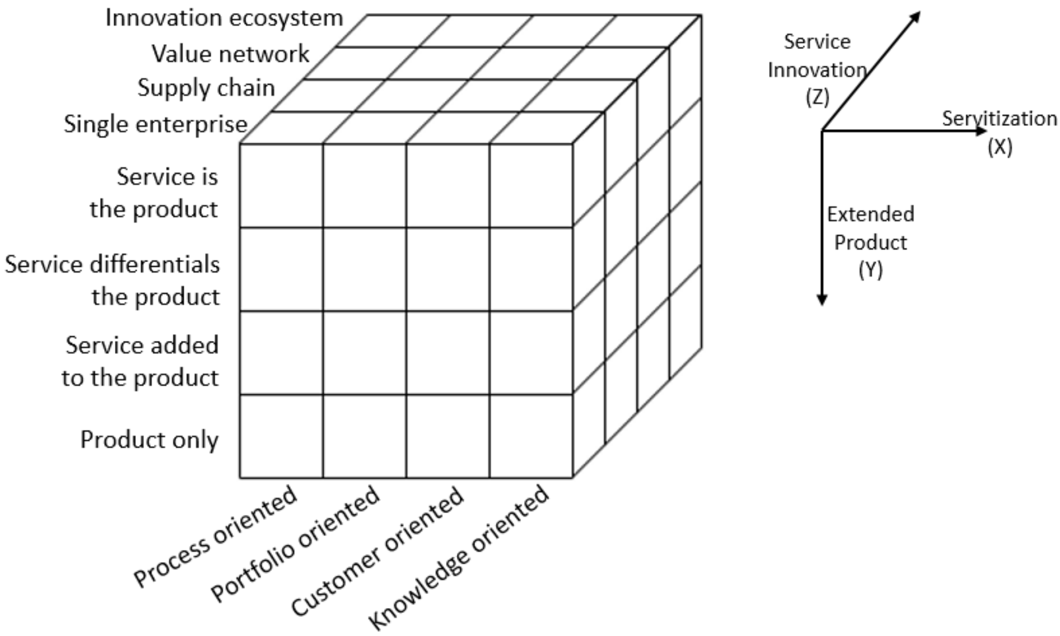


***Figure 2.39:** Framework for Manufacturing Servitization (Chen & Gusmeroli, 2015)*

All the axis is combined together as presented in figure 2.40 with total of 64 components in the cube. Each component (an intersection of the tree axes) classifies a particular situation for a company based on its business model. For example, the traditional manufacturing companies which are focusing on selling on product plus other related services i.e. transportation will be located at the bottom left corner, while manufacturing companies with collaborated networks which provide service offerings that integrate service solutions with product as the add on components will be located at the top right corner and cross over with the ecosystem.

2.6 Chemicals: chemical suppliers and application

Industry Background

The chemical suppliers in this study are Thai chemical producers and distributors who provides chemical products domestically and globally export. Chemical products provided by these companies are classified into three groups which are hydrocarbon solvents, chemical solvents, and others and they are listed at the table 2.4.

Table 2.4: *Chemical products*

Products
Hydrocarbon Solvents
Cyclohexane
Hexane
Hexane Extraction
Isopentane
Pentane 60/40
Pentane 80/20
Polymer
Toluene
TOPSol 2046
TOPSol 60/145
TOPSol A100
TOPSol A150
TOPSol A150ND
TOPSol BF
TOPSol X2000
WS 200
Xylene

Products
Other Chemicals
Acetone Butyl Acetate
Butyl Glycol Ether
Ethyl Acetate
Isopropanol
Methanol
Methyl Ethyl Ketone
Methyl Isobutyl Ketone
Methylene Chloride
S-Butyl Acetate
TOPSol PM
TOPSol PMA
Other Chemicals

Chemical products can also be classified by application uses as presented in the Table 2.5.

Table 2.5: *Chemicals by application*

Products
Biodiesel
Methanol
Lubricant
WS200
TOPSol 2046
Mining
TOPSol 2046
Household Product
TOPSol 60/145
TOPSol BF
IPA
BGE
TOPSol PM
Rubber Industry
TOPSol X2000
TOPSol 60/145
TOPSol BF

Products
Agrochemcal
Toluene
Xylene
TOPSol A100
TOPSol A150
TOPSol A150ND
WS200
Blowing Agent
Pentane 80/20
Pentane 60/40
Isopentant
Adhesive
TOPSol X2000
TOPSol 60/145
TOPSol BF
Hexane
Toluene

Toluene
Printing Ink
Toluene
Xylene
WS200
Methanol
IPA
Acetone
MEK
MIBK
EA
BA
SBA
TOPSol PM
TOPSol PMA
BGE
Textile
WS200
Intermediate Chemical
Isopentane
Hexane Polymer
Cleaning &Degreasing
Hexane
TOPSol 60/145
TOPSol BF
IPA
TOPSol PM
BGE
Methylene Chloride

Xylene
IPA
Acetone
Mek
MIBK
EA
BA
SBA
TOPSol PM
Paint & Coating
Toluene
Xylene
TOPSol A100
TOPSol A150
TOPSol A100ND
WS200
Methanol
IPA
Acetone
MEK
MIBK
EA
BA
SBA
TOPSol PM
TOPSol PMA
BGE
Methylene Chloride

2.7 Problems in Chemical Industry

Chemical industry is in maturity stage and high competition with emerging countries e.g. China and other Asian countries. Figure 2.41 illustrates world chemical sales by region comparing the data between 2006 and 2016 (CEFIC, 2017).

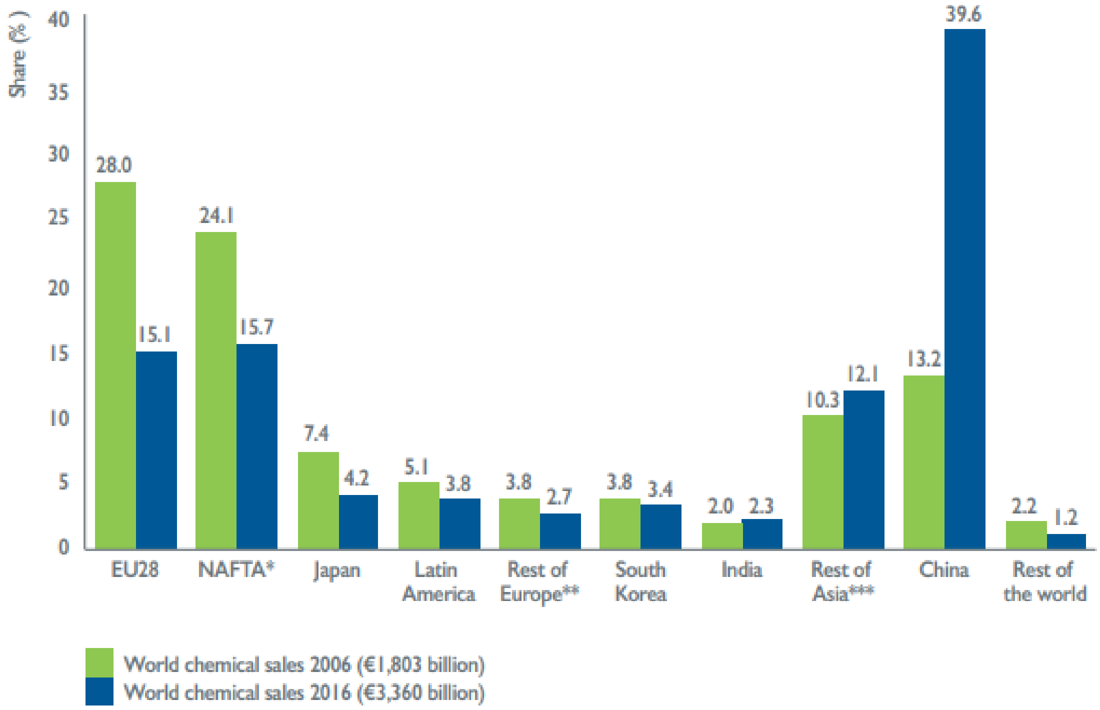


Figure 2.40: *World chemical sales by region (CEFIC, 2017)*

The above chart showing that number of chemical sales from developed countries dramatically decreased from 2006 to 2016. For example, the chemical sales of EU countries decreased from 28% in 2006 to 15.1% in 2016 with the total of 13% decreasing and the chemical sales of NAFTA countries reduced from 24.1% in 2006 to 15.7% in 2016 with the total of 8.4% drcreasing. Whereas the chemical sales from china increased triple times from 13.2% in 2006 to 39.6% in 2016 which is 26% increasing (CEFIC, 2017).

When taking a look at three major groups of world leading chemical producers, it is found that the total chemical sales of Asian countries increased by 28% from 2006 to 2016, while the chemical sales of EU and NAFTA countries reduced by 13% and 8% respectively. Figure 2.42 represents the major chemical producers focusing on Asia, EU, and NAFTA countries only (CEFIC, 2017).

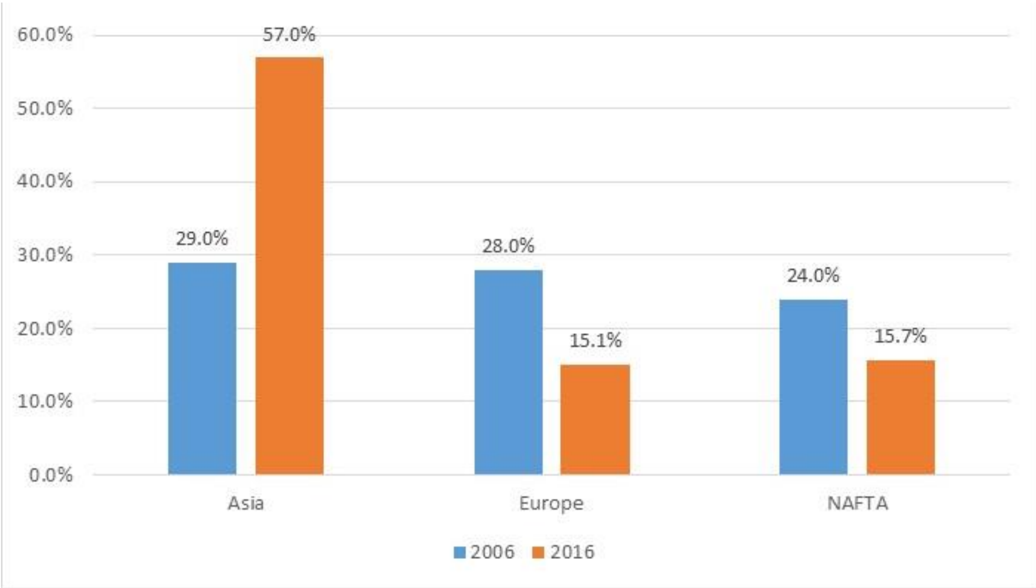


Figure 2.41: *Major chemical producers (CEFIC, 2017)*

Problems of chemical providers

- **Competitiveness markets**: As mentioned above that the chemical industry is high competitive. There are many chemical providers both domestics and foreigners especially China.
- **Price sensitivity**: Chemical producers are beaten by price. Chemical manufactures who offer the cheaper price will take the market share, while the manufacturers who charge higher price will lose the market share.
- **Volume based selling with low margin**: Most chemical products are selling by volume and many times cannot be charge as high price. This means the company may sell bulk of chemicals but they receive very low margin in return.
- **Limited services with low value**: Most manufacturing companies provide very limited services which are basically involved with products, and these services are classified as low value services. The chemical providers may give free chemical training service to their customers who buy big volume. This service is a painful of the company.
- **Business model**: The current business model which is focusing on selling tangible product in big volume might not be suitable for chemical providers anymore. The companies should look for new business model that is more attractive to their customers and can create more value to their products.

Possible way out for chemical providers

- **Smile curve shifting**: Chemical producers should shift the position in the smile curve (Shih, 1992) from the production to pre- and post-production stage of the products in order to increase value added.
- **Service-oriented business model**: Chemical producers should change their focus from focusing on selling products by volume to providing product service integrated solutions which business model changing is needed.
- **Servitization**: The concept of servitization is to create more value to the product by combinding product and services as bundle solution (Vandermerwe & Rada, 1988). According to the service-oriented business model, chemical manufacturers propose new or customized services in order to serve the customer needs.

Chemical Services

Based on the servitization framework introduced by Ryu, Rhim, et al. (2012a), the services are separated into areas that are related to servitization integration parts as follows:

1. Product
    a. Chemical products only
    b. Chemical blending
    c. Chemical packaging
2. Service
    a. Chemical management/ document/ license
    b. Chemical inventory
    c. Chemical storage
    d. Chemical recycling
    e. Chemical waste treatment
    f. Transportation
3. Knowledge
    a. Chemical advice on process tuning
    b. Chemical health risk assessment
    c. Environmental and safety programs
    d. Worker's training
4. Others
    a. Chmical leasing

The above services are gathered from the chapter 2 literature review that chemical servitization can be classified as chemical product service (CPS) (Kortman et al., 2006), chemical management service (CMS) (Stoughton & Votta, 2003), and chemical leasing (Jakl et al., 2004).

2.8 Proposed Framework

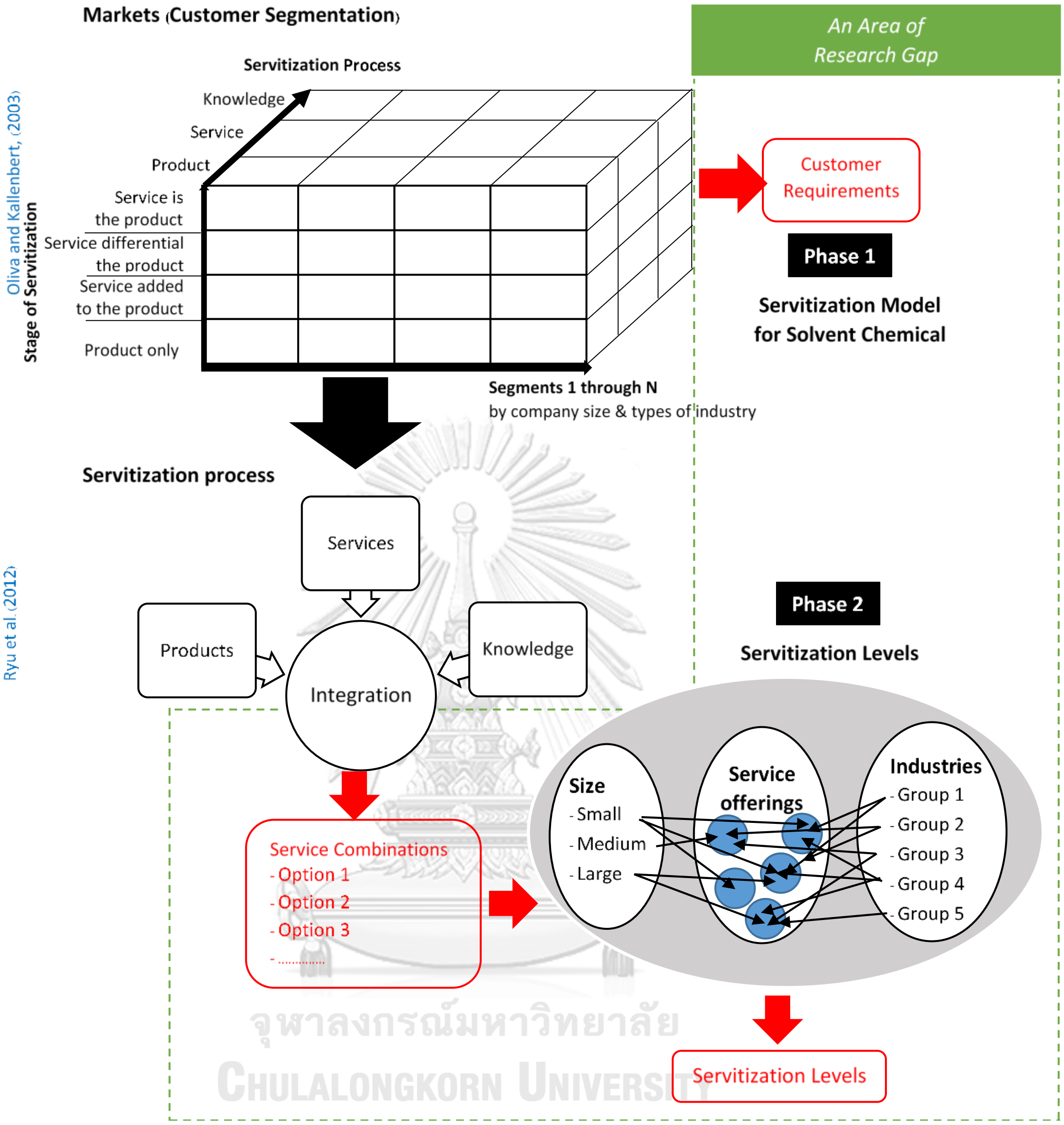


Figure 2.42: Proposed Framework

2.9 Importance of Proposed Framework

Eventhough the researchers found several servitization frameworks; however, none of these proposed guidance or solutions on servitization process. Those proposed only the theoretical frameworks, not applicable steps to follow. This study proposed new servitization framework adapted from the previous studies and illustrated as Figure 2.42. The first part of the framework begins with Chen and Gusmeroli (2015) framework, and ends with Ryu, Rhim, Park, and Kim (2012b) in the second part. Chen and Gusmeroli (2015), Oliva and Kallenberg (2003) proposed a framework for manufacturing servitization which combined three dimensions; 1) the x-axis represents servitization process; 2) the y-axis represents stages of product extension; 3) the z-axis is illustrated service innovation. Ryu, Rhim, et al. (2012b) proposed servitization framework adapted from Meyer and Arthur (1999). This framework composed of three components which are markets, product-service-knowledge system (PSK), and competencies in the supply chain.

The framework from Chen and Cusmeroli (2015) expaned the extended product theory from Thoben et al. (2001) and explained servitization levels for chemical industry in similar ways as in other manufacturing industries. This fulfilled our goal on chemical servitization levels that starts from pure manufacturer traditionally provide chemical in large volume. The next level is chemical suppliers offer some product related services. Then chemical suppliers may also provide other dirrerent services not directly related to the chemical product. Finally, chemical suppliers focus on intangible service with the add on tangible product (Buschak & Lay, 2014; Chen & Cusmeroli, 2015; Kortman et al., 2006).

After that the researchers ageed to combined the extended product elements from Chen and Cusmeroli (2015) with PSK (Product, Service, and Knowledge) System proposed by Ryu, Rhim, et al. (2012b) because it refers to chemical services that the chemical suppliers could provide to their customers.

Thus, the proposed framework helps chemical suppliers measure the servitization levels for their customers and finally provide guidance for the product service integration. This will benefit them for the steps to improve their services.

CHAPTER 3
RESEARCH METHODOLOGY

This chapter investigates how this study is manipulated. Essentially, the research methodology is established from the theories, previous literature about product transition concepts, and servitization processes discussed in Chapter 2. Simultaneously, the methodology is related to the research objectives and questions as mentioned in Chapter 1. Thus, this chapter is composed of 3 major parts namely, research process, population and sampling technique, and data collection.

3.1 Research Process

The process of this study is divided by the research phases mentioned in Chapter 1. The details of each steps are explained in the below section.

1. Research phase 1

   a. The underlying parameters

As mentioned in Chapter 1, the first two objectives of this research is to develop servitization model for chemical industry in Thailand to find product transition ways for chemical companies to change their business models from product- to service based. The related parameters have to be involved with servitization model for Thai chemical industry which are customer segments, servitization process namely product, service and knowledge, and the servitization levels. Parameters in the model are defined by the 3-axis direction they belong to (Figure 3.1).

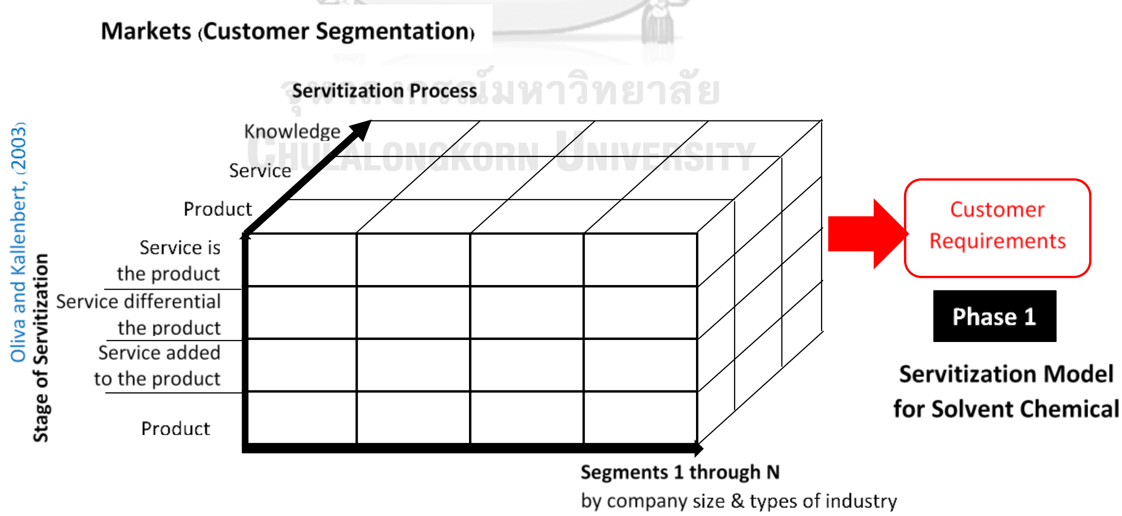


Figure 3.1: *Servitization model for chemical*

- X-axis: this independent parameter is customer segments which classified by 3 different company sizes and 5 types of the industry, totally 15 groups.

Company size

- Small: < 50 employees
- Medium: 50 – 200 employees
- Large: > 200 employees

Respondents in this research are separated by types of industry which can be divided into five groups of:

1) Adhesive, ink, paint, coating, thinner, and other related industries that use chemicals as raw materials in production.
2) Petrochemicals, resin, tyre (wheel), product packaging and other related industries
3) Cosmetics, food, pharmaceutical, and other consumer product industries
4) Traders and wholesalers
5) Others

- Y-axis: this dependent parameter contains 4 different types of servitization levels.

Servitization levels

1) Product only
2) Service added to the product
3) Service differential the product
4) Service is the product

- Z-axis: the independent parameter of servitization processes. Items in each parameter are from literature reviews. Self-declare in the questionnaire is the method to define the servitization process.

Servitization processes

- Product
  - Chemical products only
  - Chemical blending
  - Chemical packaging
  - Chemical storage
  - Chemical container recycling
  - Transportation
- Service
  - Chemical documentation and license
  - Chemical inventory
  - Chemical waste treatment
- Knowledge
  - Chemical health risk assessment
  - Environmental and safety programs
  - Worker's training

b. Method

To answer the research question 1 and 2 of what are servitization models for chemical company and what is the servitization framework for chemical firms to select the proper servitization level to serve the customer needs. The researcher studied several servitization models proposed in previous studies. The servitization model is developed from combining few servitization frameworks that are appropriate to represent the servitization model for chemical in Thailand. The research tools for this phase is questionnaire survey distributed to respondents via face to face or interview. The questionnaire will use 10-point Likert scale to employ the questions and scale responses in the survey.

2. Research Phase 2

a. The underlying parameters

Corresponding to the research phase 2 and on the objective 3 and 4, the purpose is to apply and provide the guidance about the servitization framework of the service level for different chemical suppliers in Thailand (Figure 3.2). Parameters for this framework are gathered from the study of previous literature, namely customer segment, servitization processes, and servitization levels (Figure 3.1). The dependent parameters are classified in order of servitization levels which are product only, service added to the product, service differential the product, and service is the product.

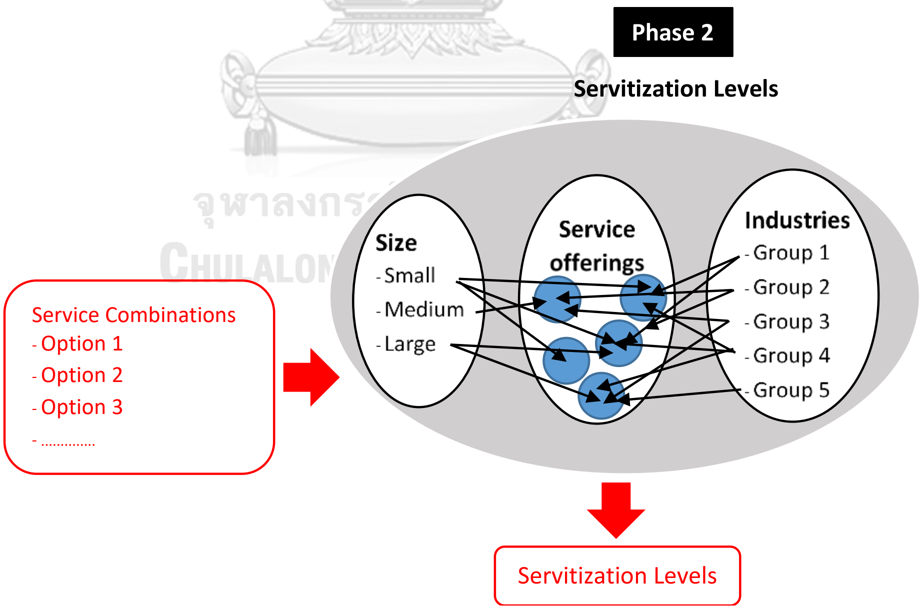


Figure 3.2:*Servitization levels for chemical*

b. Method

The dependent variables are categorized by servitization levels namely product only, service added to the product, service differential the product, and service is the product. The independent variables are company size, types of industry, and servitization process: product, service, and knowledge. Multinomial logistic model was adopted as a statistical tool to analyze relationships between the independent and dependent variables. Figure 3.3 represents illustrated relationship of both independent and dependent variables.

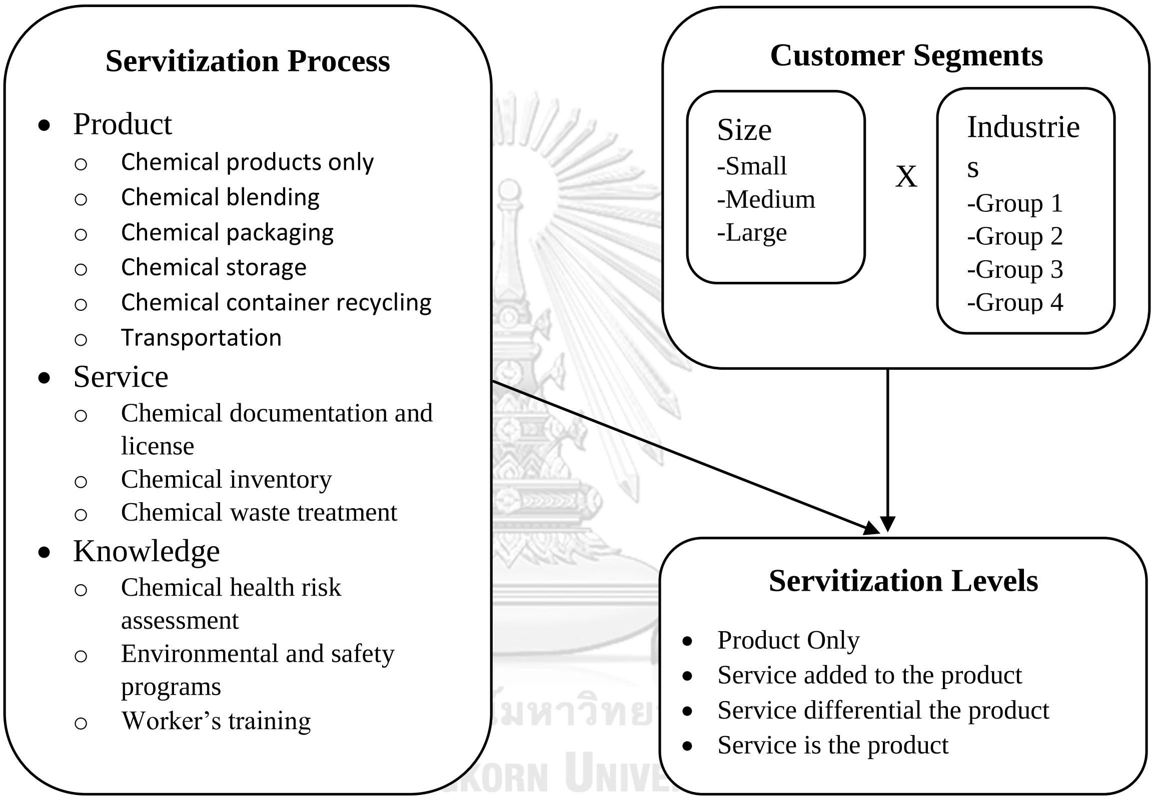


Figure 3.3: Relationship between independent and dependent variables

3.2 Population and Sampling Technique

The target population of the study is all customers of the tier-3 chemical distributor (Figure 3.4). Respondents are the customers of tier-3 chemical distributor who are tier-2 dealers or wholesalers, tier-1 suppliers or sub-dealers, and the end-users who are manufacturers will be distributed questionnaires. Sample frame is the list of customers from chemical suppliers. Thus the samples are the customers located in tier-2, tier-1 and manufacturers ranging along the chemical supply chain (Figure 3.4). Number of sample size is 200.

3.3 Data Collection

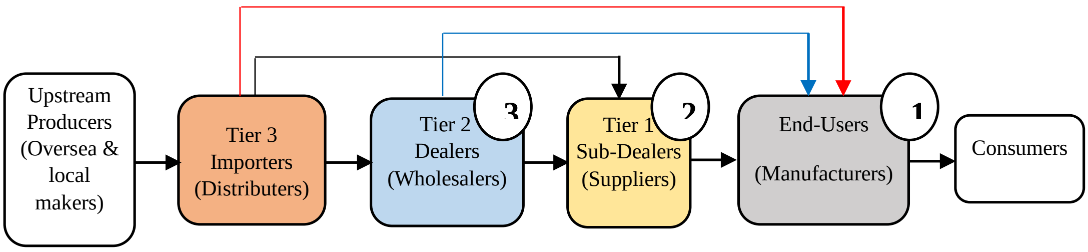


Figure 3.3: *Chemical Supply Chain*

Figure 3.4 represents chemical supply chain of the chemical industry. In this study, the chemical supply chain starts from the upstream producers selling chemical products to distributors (Tier-3). The distributors have three types of customers: tier-2 dealers (wholesalers), tier-1 sub-dealers (suppliers), and end-users (manufacturers). Consumers of the manufacturers are located at the end of the chain.

In the research phase 1, the required data for composing questionnaire is assembled from literature reviews and discussion with the staff of chemical distributor and also their customers, whereas the mandatory information for data analysis is collected from the survey. Customers' names are obtained from the distributor's databases. The distributor assigned staff who were in charge of distributing questionnaires. Face to face and phone call interview were used in this data collection for respondents to fill in the questionnaire. One company could be a customer for more than one supplier. This means these three major suppliers may have the same customers and they may or may not buy the same products from the suppliers. A person who is in charge of answering questionnaire is an experienced procurement staff who directly deals with chemical suppliers or a middle management level staff that is working in material resource planning team assigned by procurement manager.

The required data for phase 2 is collected from respondents in phase 1 and will be used for data analysis of servitization levels.

3.4 Data Analysis

To accomplish the research objectives, several data analysis techniques are used including descriptive statistics, Multiple Regression Model, Multinomial Logit Model, and One-Way ANOVA. The dependent variables are unordered choices of 4 servitization levels which will be compared by the customers acquired by Analytical Hierarchy Process (AHP) with pairwise comparison. Research variables are acquired from literature review and can be defined as shown in Table 3.1.

Table 3.1: *Variable Coding*

No.	Variables	Variable Type	Measurement	Definition
1	LnY2Y1	Dependent	Ratio Scale	Natural logarithm of the probability of Y = 2 compared to Y = 1
2	LnY3Y1	Dependent	Ratio Scale	Natural logarithm of the probability of Y = 3 compared to Y = 1
3	LnY4Y1	Dependent	Ratio Scale	Natural logarithm of the probability of Y = 4 compared to Y = 1
4	Y1	Dependent	Ratio Scale	Probability of an event Y = 1, Product Only
1	Y2	Dependent	Ratio Scale	Probability of an event Y = 2, Service added to the product
2	Y3	Dependent	Ratio Scale	Probability of an event Y = 3, Service differential the product
3	Y4	Dependent	Ratio Scale	Probability of an event Y = 4, Service is the product
4	MeanPCP	Independent	Ratio Scale	Average score of chemical product only
5	MeanPCB	Independent	Ratio Scale	Average score of chemical blending
6	MeanPCK	Independent	Ratio Scale	Average score of chemical packaging
7	MeanPCS	Independent	Ratio Scale	Average score of chemical storage
8	MeanPCC	Independent	Ratio Scale	Average score of chemical container recycling
9	MeanPCT	Independent	Ratio Scale	Average score of chemical transportation
10	MeanSCD	Independent	Ratio Scale	Average score of chemical documentation
11	MeanSCI	Independent	Ratio Scale	Average score of chemical inventory
12	MeanSCW	Independent	Ratio Scale	Average score of chemical waste treatment
13	MeanKCH	Independent	Ratio Scale	Average score of chemical health risk assessment
14	MeanKES	Independent	Ratio Scale	Average score of environmental and safety program
15	MeanKWT	Independent	Ratio Scale	Average score of worker’s training
16	Seg	Independent	Nominal	Segment type
17	Type	Independent	Nominal	Company type
18	Size	Independent	Nominal	Company size

3.5 Questionnaire

The research tools for this study is questionnaire survey distributed to respondents via face to face or an interview. The questionnaire composed of 3 sections; 1) company background, 2) attitude towards product or service needed driven by 10-point Likert scale from 0 to 10 to employ the questions and scale responses in the survey, and 3) comparison attitude towards servitization levels constructed by Analytical Hierarchy Process (AHP) using the pairwise comparison between 4 service levels. In the questionnaire design process, required data for composing questionnaire is assemble from literature reviews and discussion with the staff of chemical distributor. The company agreed to use Thai version questionnaire to distribute to their customers. Two team meetings were arranged during January and February, 2020 for the questionnaire revision.

Index of Item-Objective Congruence (IOC) was used to analyze the content validity. The questionnaire was reviewed by five experts including two chemical management officers, and three academic experts. The reliability of the questionnaire was examined in order to confirm that the collected responses were reliable and consistent. The researcher distributed 30 pilot questionnaires to staff of the chemical distributor company to ask their customers excluded from the sample group. For the pilot data reliability test, Cronbach's Alpha score of each question was greater than 0.9. This can be assumed that the questionnaire was highly reliable. The chemical distributor company has almost 250 customers in Thailand in various locations, and the sample size for this study is 200. The survey was started from May to September 2020 through phone interview only according to COVID-19 situation until the sample size was achieved. The collected data is sufficient enough to do the data analysis and estimate parameters of this study.

The next section is the Thai version questionnaire used in this research study. As mentioned the questionnaire composed of 3 sections as follows:

1) Company Background: type of industry, size, age, and location of the company
2) Attitude towards product or services: servitization process according with product, service and knowledge
3) Comparison attitude towards servitization levels: six pairwise comparisons of product only vs. service added to the product, product only vs. service differential the product, product only vs. service is the product, service added to the product vs. service differential the product, service added to the product vs. service is the product, and service differential the product vs. service is the product.

Part 1: Company Background

1) ประเภทธุรกิจ

ธุรกิจอุตสาหกรรม

☐ กาว

- ☐ หมึก
- ☐ บรรจุภัณฑ์และหีบห่อ
- ☐ สี
- ☐ ปิโตรเคมี
- ☐ เรซิน
- ☐ ทินเนอร์
- ☐ ยางและล้อรถยนต์
- ☐ อื่นๆ (กรุณาระบุ)________________________________

ธุรกิจสินค้าอุปโภคบริโภค

- ☐ เครื่องสำอางค์
- ☐ อาหาร
- ☐ ยา
- ☐ อื่นๆ (กรุณาระบุ)________________________________

ธุรกิจทรัพยากร

- ☐ สินแร่
- ☐ อื่นๆ (กรุณาระบุ)________________________________

ธุรกิจเทคโนโลยี

- ☐ อิเลคโทรนิคส์
- ☐ อื่นๆ (กรุณาระบุ)________________________________

อื่นๆ (กรุณาระบุ)________________________________

2) ขนาดของบริษัท

- ☐ ขนาดเล็ก (จำนวนพนักงาน 1 - 49 คน)
- ☐ ขนาดกลาง (จำนวนพนักงาน 50 – 199 คน)
- ☐ ขนาดใหญ่ (จำนวนพนักงาน 200 คนขึ้นไป)

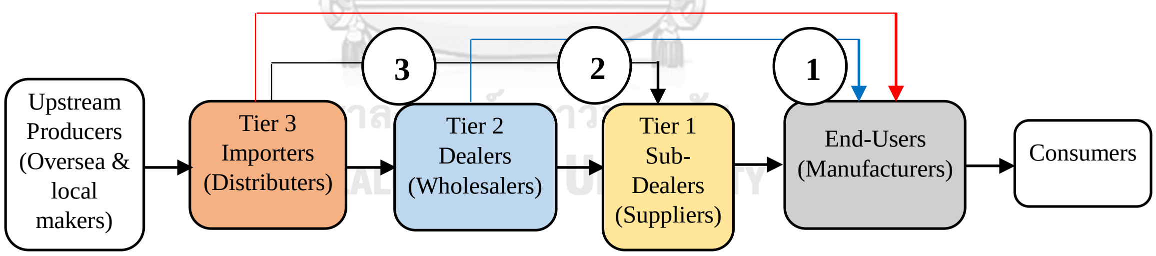
3) อายุของบริษัท

- ☐ 0 – 5 ปี
- ☐ 6 – 10 ปี
- ☐ 11 – 15 ปี
- ☐ เกินกว่า 15 ปี

4) ที่ตั้งของบริษัท

- ☐ กรุงเทพมหานคร และปริมณฑล (กรุงเทพฯ สมุทรปราการ สมุทรสาคร นนทบุรี นครปฐม ฉะเชิงเทรา และปทุมธานี)
- ☐ ภาคกลาง
- ☐ ภาคตะวันออก
- ☐ ภาคเหนือ
- ☐ ภาคตะวันออกเฉียงเหนือ
- ☐ ภาคตะวันตก
- ☐ ภาคใต้

5) กรุณาระบุตำแหน่งของบริษัทของท่านตามหมายเลขด้านล่าง (สามารถเลือกได้มากกว่า 1 หมายเลข)



สัดส่วนของ**ธุรกิจหลัก** _____%

(เลือก 1 หมายเลข)

- ☐ หมายเลข 1) End-Users (Manufacturers)
- ☐ หมายเลข 2) Tier 1 Sub-Dealers (Suppliers)
- ☐ หมายเลข 3) Tier 2 Dealers (Wholesalers)

สัดส่วนของ**ธุรกิจอื่นๆ** _____%

(เลือกได้มากกว่า 1 หมายเลข)

- ☐ หมายเลข 1) End-Users (Manufacturers)
- ☐ หมายเลข 2) Tier 1 Sub-Dealers (Suppliers)
- ☐ หมายเลข 3) Tier 2 Dealers (Wholesalers)

Part 2: Attitude Towards Product /or Service Need

เป็นไปได้**น้อยที่สุด**ที่จะซื้อสินค้าหรือบริการ ☹	0	1	2	3	4	5	6	7	8	9	10	เป็นไปได้**มากที่สุด**ที่จะซื้อสินค้าหรือบริการ ☺

Servitization Process: Product (ด้านสินค้า)

Servitization Process ที่เกี่ยวข้องกับสินค้า	ระดับของความต้องการ เริ่มต้นจาก 0 (เป็นไปได้น้อยที่สุด) ถึง 10 (เป็นไปได้มากที่สุด)										
	0	1	2	3	4	5	6	7	8	9	10
Chemical Product Only (สินค้าเคมีเท่านั้น ไม่รวมบริการ) 1. คุณต้องการซื้อสินค้าเคมีเท่านั้น											
2. คุณต้องการซื้อสินค้าเคมีซึ่งเป็นสินค้าประเภท commodity product											
3. คุณต้องการสินค้าเคมีที่มีมาตรฐานเดียวกันทั่วโลก เท่านั้น											
4. ความต้องการของคุณคือการซื้อสินค้าเคมีโดยสั่งซื้อเป็นปริมาณมาก											
5. คุณซื้อสินค้าเคมีจากผู้ขายที่นำเสนอขายในราคาที่ถูกกว่า											
Chemical Blending (การผสมสารเคมี) 1. คุณต้องการซื้อสินค้าเคมีที่มีการให้บริการผสมสารเคมี											
2. ความต้องการของคุณคือสินค้าเคมีแบบผสม ที่นอกเหนือไปจากสินค้าเคมีบริสุทธิ์แบบทั่วไปตามปกติ											
3. คุณต้องการให้ผู้ขายนำเสนอบริการการผสมสารเคมีในแบบต่างๆ ตามที่คุณต้องการ											
4. คุณต้องการความปลอดภัยจากปฏิกิริยาเคมีโดยคุณหลีกเลี่ยงการผสมสารเคมีเอง											
5. คุณยินดีจ่ายค่าบริการเพิ่มขึ้นในการซื้อสินค้าเคมีที่ให้บริการด้านการผสมสารเคมี											

Servitization Process ที่เกี่ยวข้องกับสินค้า	ระดับของความต้องการ เริ่มต้นจาก 0 (เป็นไปได้น้อยที่สุด) ถึง 10 (เป็นไปได้มากที่สุด)										
	0	1	2	3	4	5	6	7	8	9	10
Chemical Packaging (บรรจุภัณฑ์ทางเคมี) 1. คุณต้องการสินค้าเคมีที่มีบรรจุภัณฑ์ที่ปลอดภัย											
2. คุณต้องการสินค้าเคมีที่มีบรรจุภัณฑ์ที่ปลอดภัยในขนาดต่างๆ											
3. คุณต้องการสินค้าเคมีที่มีบรรจุภัณฑ์ที่สะดวก											
4. คุณต้องการบรรจุภัณฑ์ที่ทำให้สารเคมีดูมีมูลค่าเพิ่มขึ้น											
5. คุณต้องการบรรจุภัณฑ์สารเคมีที่ห่วงใยสิ่งแวดล้อม											
6. คุณยินดีจ่ายค่าบริการเพิ่มขึ้นในการซื้อสินค้าเคมีที่ให้บริการด้านบรรจุภัณฑ์ในขนาดต่างๆ											
Chemical Storage (พื้นที่จัดเก็บสินค้าเคมี) 1. คุณต้องการให้สินค้าเคมีอันตรายถูกเก็บอย่างปลอดภัย											
2. คุณต้องการให้สินค้าเคมีถูกเก็บอย่างดีโดยมีการหกหรือรั่วน้อยที่สุด											
3. คุณต้องการพื้นที่เก็บสินค้าเคมีชั่วคราวจากผู้ขายสินค้า											
4. คุณต้องการพื้นที่เก็บสินค้าเคมีที่มีประสิทธิภาพจากผู้ขายสินค้า											
5. คุณยินดีจ่ายค่าบริการเพิ่มขึ้นในการซื้อสินค้าเคมีที่ให้บริการด้านการจัดเก็บสารเคมี											
Chemical Container Recycling (รีไซเคิลถังบรรจุสินค้าเคมี) 1. คุณต้องการให้ผู้ขายสินค้าเป็นผู้รับผิดชอบจัดการถังสารเคมี											
2. คุณปรารถนาให้ผู้ขายสินค้าเคมีเสนอบริการด้านการระบายถังบรรจุสารเคมีอันตรายให้คุณ											
3. ถังบรรจุสารเคมีต้องพร้อมใช้งานก่อนถึงมือคุณ											

Servitization Process ที่เกี่ยวข้องกับสินค้า	ระดับของความต้องการ เริ่มต้นจาก 0 (เป็นไปได้น้อยที่สุด) ถึง 10 (เป็นไปได้มากที่สุด)										
4. คุณยินดีจ่ายค่าบริการเพิ่มขึ้นในการซื้อสินค้าเคมีที่ให้บริการด้านการรีไซเคิลถังบรรจุสารเคมี											
	0	1	2	3	4	5	6	7	8	9	10
Transportation (การขนส่ง) 1. คุณปรารถนาซื้อสินค้าเคมีที่มีบริการขนส่งรวมอยู่ด้วย											
2. คุณปรารถนาให้ผู้ขายสารเคมีอันตรายขนส่งสินค้าให้คุณ											
3. สินค้าเคมีต้องได้รับการขนส่งเป็นอย่างดี											
4. ภาชนะบรรจุภัณฑ์เคมีจะต้องมีคุณภาพมาตรฐาน											
5. การขนส่งสินค้าเคมีเป็นไปตามข้อกังวลด้านความปลอดภัย											
6. การขนส่งสินค้าเคมีต้องมีการทำประกันภัย											
7. คุณยินดีจ่ายค่าบริการเพิ่มขึ้นในการซื้อสินค้าเคมีที่ให้บริการขนส่งสินค้าเคมี											

Servitization Process: Service (ด้านบริการ)

เป็นไปได้**<u>น้อยที่สุด</u>**ที่จะซื้อสินค้า หรือบริการ ☹	0	1	2	3	4	5	6	7	8	9	10	เป็นไปได้**<u>มากที่สุด</u>**ที่จะซื้อสินค้าหรือบริการ ☺

Servitization Process ที่เกี่ยวข้องกับสินค้า	ระดับของความต้องการ เริ่มต้นจาก 0 (เป็นไปได้น้อยที่สุด) ถึง 10 (เป็นไปได้มากที่สุด)										
	0	1	2	3	4	5	6	7	8	9	10
Chemical documentation and license (เอกสารทางเคมีและใบอนุญาต) 1. คุณปรารถนาการซื้อสินค้าเคมีที่มีบริการด้านเอกสารทางราชการรวมอยู่ด้วย เช่น บริการด้านเอกสารสรรพสามิต											
2. ในการซื้อขายสินค้าเคมีจำเป็นต้องใช้เอกสารราชการที่ถูกต้องสำหรับการซื้อขายสินค้า											
3. คุณปรารถนาให้ผู้ขายสินค้าเคมีเป็นผู้ดำเนินการเรื่องการทำเอกสารทางเคมีและใบอนุญาต											
4. คุณยินดีจ่ายค่าบริการเพิ่มขึ้นในการซื้อสินค้าเคมีที่ให้บริการด้านการดำเนินการทำเอกสารทางราชการ											
Chemical inventory 1. คุณปรารถนาที่จะได้รับบริการด้านระบบสินค้าคงคลัง											
2. คุณปรารถนาที่จะติดตั้งระบบติดตามตำแหน่งของสารเคมีที่ใช้ในคลังสินค้า											
3. คุณปรารถนาที่จะติดตั้งระบบติดตามตำแหน่งของสารเคมีที่ใช้ในทุกๆ กระบวนการผลิตที่โรงงานของคุณ											
4. คุณปรารถนาที่จะติดตั้งระบบบริหารจัดการการใช้สารเคมีในกระบวนการผลิต											

5. คุณปรารถนาที่จะมีระบบข้อมูลสินค้าคงคลังสารเคมีที่สามารถเข้าถึงได้											
6. คุณยินดีจ่ายค่าบริการเพิ่มขึ้นในการซื้อสินค้าเคมีที่ให้บริการด้านระบบสินค้าคงคลัง											
Chemical waste treatment 1. คุณมีความต้องการพิเศษด้านการจัดการของเสียทางเคมี											
2. กระบวนการบำบัดของเสียทางเคมีเป็นความจำเป็นที่ต้องมี											
3. คุณต้องการบำบัดของเสียทางเคมี เนื่องด้วยสารเคมีก่อให้เกิดปัญหามลภาวะและสุขภาพ											
4. คุณต้องการการบำบัดของเสียเนื่องจากของเสียทางเคมีสามารถติดไฟได้											
5. คุณยินดีจ่ายค่าบริการเพิ่มขึ้นในการซื้อสินค้าเคมีที่ให้บริการด้านการบำบัดของเสียทางเคมี											

Servitization Process: Knowledge (ความรู้)

เป็นไปได้**น้อยที่สุด**ที่จะซื้อสินค้า หรือบริการ ☹	0	1	2	3	4	5	6	7	8	9	10	เป็นไปได้**มากที่สุด**ที่จะซื้อสินค้า หรือบริการ ☺

Servitization Process ที่เกี่ยวข้องกับสินค้า	ระดับของความต้องการ เริ่มต้นจาก 0 (เป็นไปได้น้อยที่สุด) ถึง 10 (เป็นไปได้มากที่สุด)										
	0	1	2	3	4	5	6	7	8	9	10
Chemical health risk assessment (การประเมินความเสี่ยงของสารเคมีต่อสุขภาพ) 1. คุณต้องการคำแนะนำเกี่ยวกับความเสี่ยงของสารเคมีต่อสุขภาพ											
2. คุณต้องการให้พนักงานในบริษัทของคุณได้รับความปลอดภัยอันเกิดจากอันตรายที่เป็นผลกระทบจากการใช้สารเคมีในที่ทำงาน											
3. คุณต้องการให้พนักงานของคุณเข้าใจปัญหาสารเคมีที่เป็นอันตรายได้ดีขึ้น											
4. คุณต้องการวิเคราะห์ความเสี่ยงจากการสัมผัสสารเคมี											
5. คุณต้องการประเมินความเสี่ยงของสารเคมีในการผลิตต่อสุขภาพ											
6. คุณยินดีจ่ายค่าบริการเพิ่มขึ้นในการซื้อสินค้าเคมีที่ให้บริการด้านการประเมินควาเสี่ยงของสารเคมีต่อสุขภาพ											
Environmental and safety programs (โปรแกรมด้านสิ่งแวดล้อมและความปลอดภัย) 1. คุณต้องการมีความรู้ด้านสิ่งแวดล้อมและความปลอดภัยสำหรับสินค้าเคมี											
2. คุณต้องการปรับปรุงวัฒนธรรมด้านความปลอดภัยในโรงงาน											
3. คุณต้องการให้มีการจัดกิจกรรมคอร์สอบรมระยะสั้นเพื่อสร้างความรู้ด้านสิ่งแวดล้อมและความปลอดภัยสำหรับสินค้าเคมี											

4. บริษัทของคุณจำเป็นต้องรายงานข้อมูลด้านสิ่งแวดล้อมต่อหน่วยงานของรัฐบาล											
5. บริษัทของคุณต้องการให้ปรับปรุงประสิทธิภาพด้านสิ่งแวดล้อม											
6. คุณยินดีจ่ายค่าบริการเพิ่มขึ้นในการซื้อสินค้าเคมีที่ให้บริการอบรมด้านสิ่งแวดล้อมและความปลอดภัย											
Workers' training (การฝึกอบรมผู้ปฏิบัติงาน) 1. คุณต้องการให้มีการฝึกอบรมผู้ปฏิบัติงานด้านอันตรายของสารเคมี											
2. คุณคิดว่าการฝึกอบรมผู้ปฏิบัติงานเป็นกิจกรรมสำคัญ											
3. คุณคิดว่าการฝึกอบรมผู้ปฏิบัติงานจะช่วยลดตัวเลขความเสี่ยงในที่ทำงาน											
4. คุณคิดว่าการฝึกอบรมผู้ปฏิบัติงานควรจะมุ่งเน้นถึงการรับรู้ให้ผู้ใช้สารเคมีสามารถนำไปปฏิบัติได้ในสถานการณ์ฉุกเฉิน											
5. คุณคิดว่าการฝึกอบรมของผู้ปฏิบัติงานควรจัดเป็นห้องเรียน											
6. คุณยินดีจ่ายค่าบริการเพิ่มขึ้นในการซื้อสินค้าเคมีที่ให้บริการด้านการฝึกอบรมผู้ปฏิบัติงาน											

Part 3: Comparison Attitude Towards Servitization Levels

แบบสอบถามในส่วนนี้เป็นการเปรียบเทียบระดับของการให้บริการลูกค้าโดยจะทำการเปรียบเทียบเป็นคู่ จุดประสงค์ของแบบทดสอบในส่วนนี้คือการวัดความสำคัญของระดับการให้บริการลูกค้าที่สอดคล้องต่อความต้องการของลูกค้า

คำนิยามของการให้บริการในแต่ละระดับ:

Product Only (สินค้าเท่านั้น) หมายถึงการเสนอขายสินค้าที่จับต้องได้ให้กับลูกค้า เช่นการขายสินค้าเคมีเท่านั้น ไม่รวมบริการ

Service Added to the Product (บริการที่เพิ่มเข้าไปในสินค้า) หมายถึงลูกค้าซื้อสินค้าที่มีบริการที่เกี่ยวข้องหรืออุปกรณ์เสริมที่จับต้องได้ที่มากับการซื้อสินค้านั้นๆ เช่นการขายสินค้าเคมีที่มีบริการด้านการขนส่ง การให้บริการด้านการผสมสารเคมี พื้นที่จัดเก็บสินค้า การจัดการของเสียทางเคมี การดำเนินการด้านเอกสารสรรพสามิต หรือการอบรมพนักงาน

Service Differential the Product (บริการที่แตกต่างเพิ่มเข้าไปในสินค้า) หมายถึงสินค้าที่จับต้องได้นั้นถูกจำหน่ายพร้อมบริการที่แตกต่างไปจากผู้ขายรายอื่นๆ เช่นการขายสินค้าเคมีที่มีบริการด้านระบบสินค้าคงคลังเพื่อเอาไว้ตรวจสอบระดับของสินค้าและเช็คสินค้าผ่านทางระบบ application หรือระบบ automated warehouse

Service is the Product (บริการคือสินค้า) หมายถึงลูกค้าซื้อบริการที่รวมกันเป็นโซลูชั่นเพื่อตอบสนองความต้องการ ลูกค้ายังคงต้องการสินค้าที่จับต้องได้ แต่มันจะไม่ถูกขายโดยตรง มันจะถูกใช้เป็นส่วนหนึ่งสำรับการให้บริการนั้นๆ ในกรณีนี้ผู้ขายจะไม่เน้นขายสินค้าเป็นหลัก แต่จะขายบริการที่มีสารเคมีเป็นส่วนประกอบ เช่น บริการ chemical leasing ซึ่งเป็นรูปแบบธุรกิจที่เกี่ยวกับการขายสารเคมีที่แตกต่างไปจากรูปแบบสามัญที่เน้นขายสินค้าเคมีเป็นหลัก รายได้ที่เกิดขึ้นของผู้ประกอบการมาจากการให้การบริการ กล่าวคือลูกค้าซื้อ “ประโยชน์” ที่มาจากสารเคมีแทนการซื้อสารเคมี ดังนั้นรายได้ของผู้ขายสารเคมีจึงไม่ขึ้นอยู่กับปริมาณสารเคมีที่ขายได้อีกต่อไป Chemical Leasing นั้นเน้นการให้บริการมากกว่าการครอบครองสารเคมี กล่าวคือลูกค้าซื้อการให้บริการแทนการซื้อสารเคมี เช่นจ่ายตามจำนวนเครื่องจักรที่ใช้หรือได้รับการทำความสะอาด หรือจำนวนผลิตภัณฑ์ที่ได้รับการทาสี หรือบริการด้านการทำความสะอาดพื้นผิวสำหรับอุตสาหกรรมการบินและอวกาศ อุตสาหกรรมยานยนต์ อิเล็กทรอนิกส์ และอุตสาหกรรมอื่นๆ

การเปรียบเทียบความต้องการแบบคู่

วงกลมหนึ่งหมายเลขเท่านั้นต่อแถวด้านล่างโดยใช้สเกลด้านล่างดังนี้:

1 = เท่ากัน 3 = มากกว่าเล็กน้อย 5 = มากกว่า 7 = มากกว่ามาก 9 = มากกว่าที่สุด

1	สินค้าเท่านั้น	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	บริการที่เพิ่มเข้าไปในสินค้า
2	สินค้าเท่านั้น	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	บริการที่แตกต่างเพิ่มเข้าไปในสินค้า
3	สินค้าเท่านั้น	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	บริการคือสินค้า
4	บริการที่เพิ่มเข้าไปในสินค้า	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	บริการที่แตกต่างเพิ่มเข้าไปในสินค้า
5	บริการที่เพิ่มเข้าไปในสินค้า	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	บริการคือสินค้า
6	บริการที่แตกต่างเพิ่มเข้าไปในสินค้า	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	บริการคือสินค้า

3.6 Index of Item-Objective Congruence (IOC)

Index of Item-Objective Congruence (IOC) was used to analyze the content validity. The questionnaire was reviewed by five experts including two chemical management officers, and three academic experts. Four questions were revised and two questions have been deleted. Questions that have the average value greater than or equal to 0.5 indicates the valid objectives defined to be measured. The final result of IOC is shown below as Table 3.2.

Table 3.2: *IOC Final Results*

	1	2	3	4	5	Avg.
PCP1	1	1	1	-1	1	0.6
PCP2	1	1	1	0	1	0.8
PCP3	1	1	1	1	0	0.8
PCP4	1	1	0	0	1	0.6
PCP5	1	1	1	1	1	1
PCB1	1	1	1	0	1	0.8
PCB2	1	1	1	1	1	1
PCB3	1	1	1	1	1	1
PCB4	1	1	1	1	1	1
PCB5	1	1	-1	1	1	0.6

	1	2	3	4	5	Avg.
SCD1	1	1	1	1	1	1
SCD2	1	1	1	1	1	1
SCD3	1	1	1	0	1	0.8
SCD4	1	1	-1	1	1	0.6
SCI1	1	1	0	0	1	0.6
SCI2	1	1	0	0	1	0.6
SCI3	1	0	1	1	0	0.6
SCI4	1	-1	1	1	1	0.6
SCI5	1	1	0	0	1	0.6
SCI6	1	1	-1	1	1	0.6

PCK1	1	1	1	1	1	1
PCK2	1	0	1	1	1	0.8
PCK3	1	1	1	1	1	1
PCK4	1	1	0	1	0	0.6
PCK5	1	1	1	1	1	1
PCK6	1	0	0	1	1	0.6
PCS1	1	1	1	1	1	1
PCS2	0	0	1	1	1	0.6
PCS3	1	1	1	0	1	0.8
PCS4	1	0	1	0	1	0.6
PCS5	1	1	-1	1	1	0.6
PCC1	1	1	1	-1	1	0.6
PCC2	1	1	1	1	1	1
PCC3	1	1	1	1	1	1
PCC4	1	1	-1	1	1	0.6
PCT1	1	1	1	1	1	1
PCT2	1	1	1	1	1	1
PCT3	1	1	1	1	1	1
PCT4	1	-1	1	1	1	0.6
PCT5	1	1	1	1	1	1
PCT6	1	1	1	1	1	1
PCT7	1	1	-1	1	1	0.6

SCW1	1	1	1	0	1	0.8
SCW2	1	1	1	0	1	0.8
KCH1	1	1	1	1	1	1
KCH2	1	1	1	1	1	1
KCH3	1	1	1	1	1	1
KCH4	1	1	1	0	0	0.6
KCH5	1	1	1	1	1	1
KCH6	1	1	0	1	0	0.6
KES1	1	1	0	1	1	0.8
KES2	1	1	1	1	1	1
KES3	1	1	1	1	1	1
KES4	1	1	1	1	1	1
KES5	1	1	1	1	1	1
KES6	1	1	-1	1	1	0.6
KWT1	1	1	1	1	1	1
KWT2	1	1	1	1	1	1
KWT3	1	1	1	1	1	1
KWT4	1	1	1	0	1	0.8
KWT5	1	1	1	0	1	0.8
KWT6	1	1	-1	1	1	0.6

The reliability of the questionnaire was examined in order to confirm that the collected responses were reliable and consistent. The researcher distributed 30 pilot questionnaires to staff of the chemical distributor company to ask their customers excluded from the sample group. For the pilot data reliability test, Cronbach's Alpha score of each question was greater than 0.9. This can be assumed that the questionnaire was highly reliable.

3.7 Reliability

A common and useful technique to measure internal consistency is Cronbach's alpha ranging from zero to one. Greater positive values on Cronbarch's alpha mean stronger internal consistency and better reliability (Wilson & Joye, 2017). An acceptable level of reliability is from the value of Cronbach's alpha .70 or higher.

Table 3.3: *Cronbach's Alpha Scores' Levels ("Encyclopedia of Survey Research Methods," 2008)*

Cronbach's Alpha	Internal Consistency
α is greater than or equal to 0.9	Excellent
0.8 ≤ α < 0.9	Good
0.7 ≤ α < 0.8	Acceptable
0.6 ≤ α < 0.7	Questionable
0.5 ≤ α < 0.6	Poor
α is less than 0.5	Unacceptable

Table 3.4: *Cronbach's Alpha Results – Product*

Case Processing Summary

		N	%
Cases	Valid	200	100.0
	Excluded[a]	0	.0
	Total	200	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.927	28

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
PCP1	210.30	1260.058	.499	.925
PCP2	210.34	1257.882	.535	.925
PCP3	210.10	1256.277	.575	.924
PCP4	210.40	1253.647	.527	.925
PCP5	210.02	1258.924	.518	.925
PCB1	211.87	1193.926	.635	.923
PCB2	211.84	1184.778	.666	.923
PCB3	211.91	1182.800	.659	.923
PCB4	211.71	1188.973	.665	.923
PCB5	212.86	1188.084	.628	.924
PCK1	209.61	1276.661	.555	.925
PCK2	209.64	1275.508	.557	.925
PCK3	209.61	1271.626	.590	.925
PCK4	210.15	1248.195	.638	.924
PCK5	211.56	1240.911	.452	.926
PCS1	210.76	1247.661	.500	.925
PCS2	210.96	1242.707	.525	.925

PCS3	212.33	1218.602	.517	.925
PCC1	210.83	1226.916	.624	.923
PCC2	210.87	1220.580	.672	.923
PCC3	210.53	1231.255	.632	.923
PCC4	212.31	1206.868	.563	.925
PCT1	209.55	1287.918	.452	.926
PCT2	209.54	1284.572	.486	.926
PCT3	209.52	1280.683	.514	.926
PCT4	209.57	1277.825	.507	.925
PCT5	209.75	1275.867	.487	.926
PCT6	211.68	1250.168	.370	.928

Table 3.5: *Cronbach's Alpha Results – Service*

Reliability Statistics

Cronbach's Alpha	N of Items
.941	15

Case Processing Summary

		N	%
Cases	Valid	200	100.0
	Excluded[a]	0	.0
	Total	200	100.0

a. Listwise deletion based on all variables in the procedure.

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
SCD1	103.64	646.866	.366	.943
SCD2	103.57	647.694	.354	.943
SCD3	103.96	635.134	.425	.942
SCD4	105.64	608.243	.425	.945
SCI1	104.75	589.837	.766	.935
SCI2	104.85	584.956	.806	.934
SCI3	104.99	578.849	.820	.934
SCI4	105.00	574.462	.850	.933
SCI5	105.04	573.325	.862	.933
SCI6	106.39	566.330	.692	.938
SCW1	104.88	572.864	.844	.933
SCW2	104.84	571.234	.847	.933
SCW3	104.85	572.996	.858	.933
SCW4	104.95	572.384	.845	.933

SCW5	106.15	566.621	.682	.938

Table 3.6: *Cronbach's Alpha Results – Knowledge*

Case Processing Summary

		N	%
Cases	Valid	200	100.0
	Excluded[a]	0	.0
	Total	200	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.952	18

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
KCH1	135.40	631.347	.692	.950
KCH2	135.27	632.570	.751	.949
KCH3	135.27	630.781	.738	.949
KCH4	135.43	625.844	.761	.949
KCH5	135.46	625.466	.778	.948
KCH6	137.24	600.877	.584	.954
KES1	135.45	628.128	.788	.948
KES2	135.64	617.881	.826	.948
KES3	135.70	620.967	.805	.948
KES4	135.92	616.993	.769	.948
KES5	135.98	612.422	.777	.948
KES6	137.20	602.992	.584	.954
KWT1	135.48	617.919	.780	.948
KWT2	135.42	620.847	.789	.948
KWT3	135.40	624.744	.775	.948
KWT4	135.50	625.879	.764	.949
KWT5	135.75	619.274	.785	.948
KWT6	137.13	604.375	.573	.954

Table 3.7: *Cronbach's Alpha Results – Product, Service and Knowledge*

Case Processing Summary

		N	%
Cases	Valid	200	100.0
	Excluded[a]	0	.0

Reliability Statistics

Cronbach's Alpha	N of Items
.879	3

Total	200	100.0

a. Listwise deletion based on all variables in the procedure.

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
MeanProduct	16.0680	8.833	.715	.511	.879
MeanService	16.3796	6.295	.806	.667	.807
MeanKnowledge	15.9189	7.556	.813	.670	.790

The results of Cronbach's alpha of product, service, and knowledge are .927, .941, and .952 respectively. This means the internal consistency of the questions in these groups are excellent reliable. The result of Cronbach's alpha of all kinds of services is .879, which means strong internal consistency.

3.8 Analytic Hierarchy Process (AHP) with Pairwise Comparison

A very well-known method for multi criteria decision making for qualitative data is the Analytic Hierarchy Process (AHP) proposed by (Saaty, 1984). The method obtains pairwise comparison and uses a reciprocator matrix to express linguistic information. In this research, the criterial and alternatives in pairwise comparison method are accessible in pairs 200 referees, which are the respondents. The task is to evaluate every single alternative, deriving weights for the criteria and develop the rating in percentage to identify the best selection. Saaty (1984) described the consistency index (CI) as follows:

$$CI = \frac{\lambda_{max} - n}{n - 1}$$

Where λ_{max} is the principal eigenvalue.

Saaty (1984) stated that the referee is completely consistent then CI = 0. However if the referee is not completely consistent, then $\lambda_{max} > 1$. In this case the level of inconsistency must be measured. This is called consistency ratio (CR), defined by (Saaty, 1984).

$$CR = \frac{CI}{RI}$$

Where RI is the average value of CI for random matrices. Saaty (1984) explained in his study that to accept the matrix as a consistent when CR < 1. The work on the pairwise comparison matrix, eigenvalue, CI and CR spreadsheets of 200 referees are in the Appendix at the back of the paper.

Table 3.8: *Example of Consistency Ratio*

CR1 7 7 6 7 0 0.2

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.14	0.14	0.17
Y2	7.00	1.00	0.14	5.00
Y3	7.00	7.00	1.00	5.00
Y4	6.00	0.20	0.20	1.00
Sum	21.00	8.34	1.49	11.17

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.05	0.02	0.1	0.01	0.18	0.045
0.33	0.12	0.1	0.45	1	0.25
0.33	0.84	0.67	0.45	2.29	0.5725
0.29	0.02	0.13	0.09	0.53	0.1325
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average	
0.05	0.04	0.08	0.02	0.18	4.1019	
0.32	0.25	0.08	0.66	1.31	5.2371	
0.32	0.25	0.57	0.66	1.8	3.1441	
0.27	0.05	0.11	0.13	0.57	4.2792	
0.95	0.59	0.85	1.48	λmax =	4.1906	
				CI =	0.0635	
				RI =	0.9	
				CR1 =	0.0706	CR<0.1

CHAPTER 4

DATA ANALYSIS AND RESEARCH FINDING

This chapter discusses the data analysis and findings from 200 questionnaires completed by the customers of chemical distributor who are Tier-2 chemical wholesalers, Tier-1 chemical sub-dealers, and manufacturers. The purposes of this study were to construct the analytical servitization framework for chemical suppliers, to apply the framework with service levels in order to identify group of customer and servitization level according with their requirements, and to provide guidance to companies in chemical industry to implement product service system.

4.1 Data Analysis

To accomplish the research objectives, few data analysis techniques are used including descriptive statistics, Multiple Linear Regression Model, Multinomial Logit Model, and One-Way ANOVA. The dependent variables are unordered choices of 4 servitization levels which will be compared by the customers acquired by Analytical Hierarchy Process (AHP) with pairwise comparison. Research variables are acquired from literature review and can be defined as shown in Table 4.1.

Table 4.1: *Variable Coding*

No.	Variables	Variable Type	Measurement	Definition
1	LnY2Y1	Dependent	Ratio Scale	Natural logarithm of the probability of Y = 2 compared to Y = 1
2	LnY3Y1	Dependent	Ratio Scale	Natural logarithm of the probability of Y = 3 compared to Y = 1
3	LnY4Y1	Dependent	Ratio Scale	Natural logarithm of the probability of Y = 4 compared to Y = 1
4	Y1	Dependent	Ratio Scale	Probability of an event Y = 1, Product Only
1	Y2	Dependent	Ratio Scale	Probability of an event Y = 2, Service added to the product
2	Y3	Dependent	Ratio Scale	Probability of an event Y = 3, Service differential the product
3	Y4	Dependent	Ratio Scale	Probability of an event Y = 4, Service is the product
4	MeanPCP	Independent	Ratio Scale	Average score of chemical product only
5	MeanPCB	Independent	Ratio Scale	Average score of chemical blending
6	MeanPCK	Independent	Ratio Scale	Average score of chemical packaging
7	MeanPCS	Independent	Ratio Scale	Average score of chemical storage
8	MeanPCC	Independent	Ratio Scale	Average score of chemical container recycling
9	MeanPCT	Independent	Ratio Scale	Average score of chemical transportation
10	MeanSCD	Independent	Ratio Scale	Average score of chemical documentation
11	MeanSCI	Independent	Ratio Scale	Average score of chemical inventory
12	MeanSCW	Independent	Ratio Scale	Average score of chemical waste treatment
13	MeanKCH	Independent	Ratio Scale	Average score of chemical health risk assessment
14	MeanKES	Independent	Ratio Scale	Average score of environmental and safety program
15	MeanKWT	Independent	Ratio Scale	Average score of worker's training
16	Seg	Independent	Nominal	Segment type

17	Type	Independent	Nominal	Company type
18	Size	Independent	Nominal	Company size

Research Finding

4.2 Demographic Information

The majority of customer segment in the chemical supplier company was in industrial (68.5%) followed by consumer segment (24%), technology (6.5%), and resource (1%) varies in several types of company; for example, thinner (13%), food (13%), adhesive (11%), color (9.5%), petrochemical (9%), respectively. The size of customers was almost the same proportion between large (39.5%) and medium (36.5%) companies and the rest is small size (24%). Most of the customers' companies were located in Bangkok and perimeter (77%), and the rest is located in the East (15%), Central (5%), and others (3%) region of Thailand. Types of company are equal between thinner and food (13%) followed by adhesive (11%), color (9.5%), and petrochemical (9%). These are gathered as 55.5%, and other types are counted as 44.5%. More than half of the companies are established longer than 15 years (57.5%), followed by 10 - 15 years (17.5%), 6 - 10 years (15%), and 0 - 5 years (10%).

Table 4.2 explains customer companies by segment and size. It shows that the largest customer segment is the industrial segment dominated by large size companies (66 of 137 or 48%) followed by medium size companies (46 of 137 or 34%) and small size companies (25 of 137 or 18%).

Table 4.2: *Respondent Demographic Information by Segment and Size*

Segment / Size	**Size**			**Total**
	Small	**Medium**	**Large**	
Industrial	25	46	66	137
Consumer	21	19	8	48
Resource	0	1	1	2
Technology	2	7	7	13
Others	0	0	0	0
Total	**48**	**73**	**79**	**200**

Demographic information of respondents was described by frequency and percentage. Table 4.3 below shows respondent demographic information.

Table 4.3: *Respondent Demographic Information*

Category	Frequency	Percent (%)
Industry Segment		
Industrial	137	68.5
Consumer	48	24
Resource	2	1
Technology	13	6.5
Others	0	0
Total	**200**	**100**
Company Type		
Adhesive	22	11
Ink	8	4
Packaging	15	7.5
Color	19	9.5
Petrochemical	18	9
Resin	6	3
Thinner	26	13
Tyre (Wheel)	8	4
Others (Industrial)	16	8
Cosmetic	16	8
Food	26	13
Medicine	3	1.5
Others (Consumer)	3	1.5
Mining	0	0
Others (Resource)	1	0.5
Electronic	11	5.5
Others (Electronic)	2	1
Other Industry	0	0
Total	**200**	**100**

Category	Frequency	Percent (%)
Company Size		
Small (<50)	48	24
Medium (50-200)	73	36.5
Large (>200)	79	39.5
Total	**200**	**100**
Year		
0-5 Years	20	10
6-10 Years	30	15
10-15 Years	35	17.5
> 15 Years	115	57.5
Total	**200**	**100**
Location		
Bangkok and Perimeter	154	77
Central	10	5
East	30	15
North	4	2
West	2	1
South	0	0
Total	**200**	**100**

Table 4.4 illustrates percentage of business types. The majority type of business is the end-users or manufacturers (93.5%), followed by tier 2 or wholesalers (4%) and tier 1 or suppliers (2.5%).

Table 4.4: *Business Types*

Business Type	Frequency	Percent (%)	Cumulative Percent (%)
End-Users (Manufacturers)	187	93.5	93.5
Tier 1 (Suppliers)	5	2.5	96
Tier 2 (Wholesalers)	8	4.0	100
Total	**200**	**100**	

After using AHP technique, probability of each choice of service level is calculated by pairwise comparison from the respondents. 0.1 consistency ratio is the requirement of the qualification of data from each respondent (see Index). The independent variables are selected by adopting multiple linear regression between independent variables and log odd value of each service level compared with the base of service level. In this study, product only is performed as the base of service level comparison. For example, the variable LnY2Y1 is natural logarithm of the probability of Y = 2 (service added to the product) compared to Y = 1 (product only). Figure 4.1 to 4.9 illustrate relationship between dependent and independent variables, significant levels, coefficient values, and equations of multiple regression models.

Table 4.5: *Segment and Business Type*

		Business Type			
		End-User	**Tier-1**	**Tier-2**	**Total**
Segment	Industrial	125	5	7	137
	Consumer Industry	48	0	0	48
	Resource Industry	2	0	0	2
	Technology	12	0	1	13
Total		**187**	**5**	**8**	**200**

Table 4.5 shows data of the customers by segment and business type. The majority of the customers is the end-users (187 of 200, or 93.5%) in industrial group (125 of 187, or 66.84%), followed by consumer industry (48 of 187, or 25.67%), technology industry (12 of 187, or 6.42%), and resource industry (2 of 187, or 1.07%) respectively.

4.3 Multiple Linear Regressions

Multiple regression is used to examine the relationship between the attributes of services and the natural logarithm of the probability of dependent variable compared to based variable. In this study, Y = 1 (product only) is the based variable to be compared with Y = 2 (service added to the product), Y = 3 (service differential the product), and Y = 4 (service is the product).

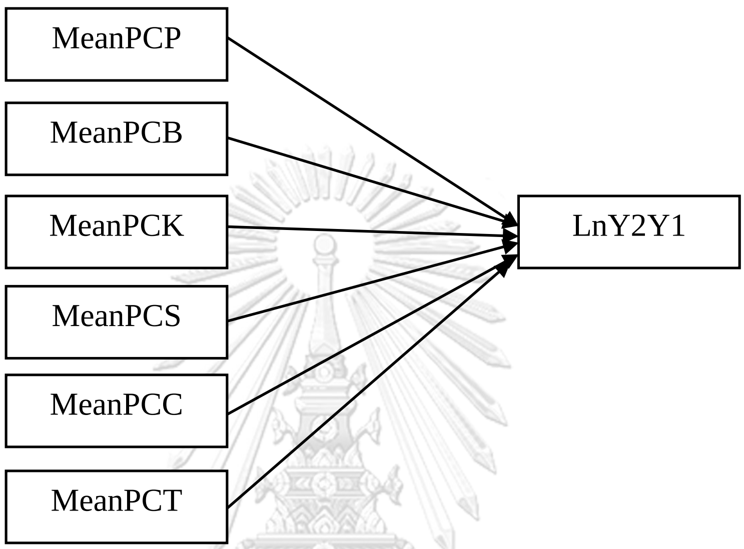


Figure 4.1: *Multiple Regression between Product Category and LnY2Y1*

Model Summary

					Change Statistics				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.238[a]	.057	.027	1.16622	.057	1.938	6	193	.077

a. Predictors: (Constant), MeanPCT, MeanPCB, MeanPCS, MeanPCC, MeanPCP, MeanPCK

Figure 4.1 illustrates multiple regression model for the independent variables of MeanPCP, MeanPCB, MeanPCK, MeanPCS, MeanPCC, and MeanPCT with the dependent variable of LnY2Y1. Based on the model summary, the significant level of this model is .077. This means at least one variable of the service under product category has an influence toward LnY2Y1 at .1 significant level. R^2 indecates how well the regression model represented the data. However, the R^2 of this model is pretty low at .057. This means 5.7% of the data fit the regression model. The result of coefficient and relationship between each variable is shown below.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B		Correlations		
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Zero-order	Partial	Part
1	(Constant)	-.379	.620		-.612	.541	-1.601	.843			
	MeanPCP	-.203	.078	-.274	-2.589	.010	-.357	-.048	-.057	-.183	-.181
	MeanPCB	-.013	.034	-.033	-.392	.696	-.081	.054	-.039	-.028	-.027
	MeanPCK	.095	.107	.108	.892	.374	-.115	.306	.092	.064	.062
	MeanPCS	.020	.046	.038	.434	.665	-.072	.112	.036	.031	.030
	MeanPCC	.042	.054	.077	.787	.432	-.064	.149	.078	.057	.055
	MeanPCT	.164	.100	.182	1.639	.103	-.033	.361	.124	.117	.115

a. Dependent Variable: LnY2Y1

The coefficient value indicates how much the value of LnY2Y1 changes given a one unit change in the left hand side variables while holding other variables unchanged. The table above shows that MeanPCP and MeanPCT variables have influence toward the dependent variable of LnY2Y1 at .05 and .1 significant levels. MeanPCP has negative impact while MeanPCT has positive impact in this model. Other variables, MeanPCB, MeanPCK, MeanPCS, and MeanPCC, that have p-values greater than the significant level of .1 can be interpreted that there is insufficient evidence to determine that there is any impact at this model. Multiple regression equation of this model can be presented below.

$$\hat{Y} = -.379 - .203PCP - .013PCB + .095PCK + .020PCS + .042PCC + .164PCT$$

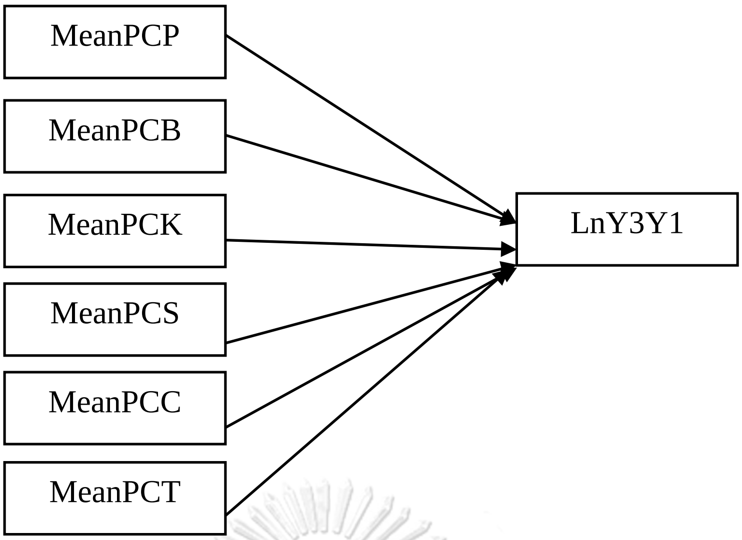


Figure 4.2: *Multiple Regression between Product Category and LnY3Y1*

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics: R Square Change	F Change	df1	df2	Sig. F Change
1	.275[a]	.076	.047	1.36776	.076	2.637	6	193	.018

a. Predictors: (Constant), MeanPCT, MeanPCB, MeanPCS, MeanPCC, MeanPCP, MeanPCK

Coefficients[a]

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.	95.0% Confidence Interval for B Lower Bound	Upper Bound	Correlations Zero-order	Partial	Part
1	(Constant)	-.334	.727		-.460	.646	-1.767	1.099			
	MeanPCP	-.329	.092	-.375	-3.585	.000	-.510	-.148	-.114	-.250	-.248
	MeanPCB	.030	.040	.062	.742	.459	-.050	.109	-.008	.053	.051
	MeanPCK	.092	.125	.089	.738	.462	-.155	.339	.053	.053	.051
	MeanPCS	.049	.055	.078	.900	.369	-.058	.157	.027	.065	.062
	MeanPCC	-.002	.063	-.004	-.038	.970	-.127	.122	.038	-.003	-.003
	MeanPCT	.267	.117	.250	2.279	.024	.036	.498	.108	.162	.158

a. Dependent Variable: LnY3Y1

Figure 4.2 illustrates multiple regression model for the independent variables of MeanPCP, MeanPCB, MeanPCK, MeanPCS, MeanPCC, and MeanPCT with the dependent variable of LnY3Y1. Based on the model summary, the significant level of this model is .018. This means at least one variable of the service under product category has an influence toward LnY3Y1 at .05 significant level. R^2 indecates how well the regression model represented the data. However, the R^2 of this model is pretty low at .076. This means 7.6% of the data fit the regression model. The result of coefficient and relationship between each variable is shown above.

The coefficient value indicates how much the value of LnY3Y1 changes given a one unit change in the left hand side variables while holding other variables unchanged. The table below shows that MeanPCP and MeanPCT variables have influence toward the dependent variable of LnY2Y1 at .01 and .05 significant levels. MeanPCP has negative impact while MeanPCT has positive impact in this model. Other variables, MeanPCB, MeanPCK, MeanPCS, and MeanPCC, that have p-values greater than the significant level of .1 can be interpreted that there is insufficient evidence to determine that there is any impact at this model. Multiple regression equation of this model can be presented below.

$$\hat{Y} = -.334 - .329PCP + .030PCB + .092PCK + .049PCS - .002PCC + .267PCT$$

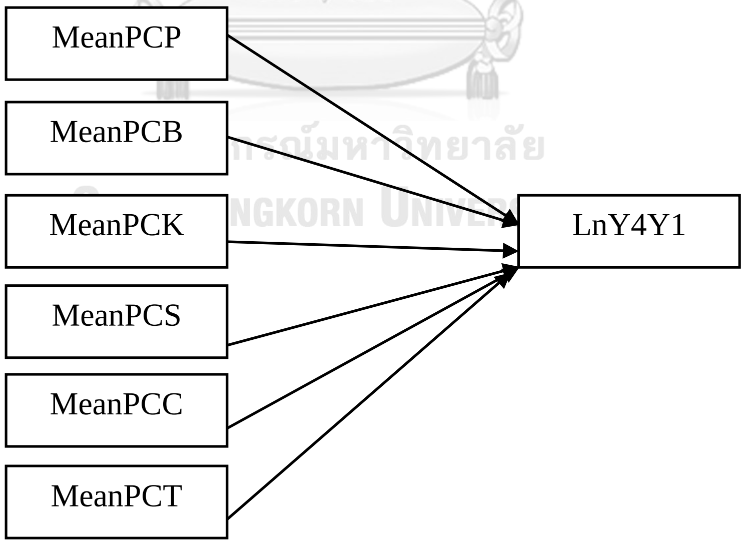


Figure 4.3: *Multiple Regression between Product Category and LnY4Y1*

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics: R Square Change	F Change	df1	df2	Sig. F Change
1	.284[a]	.081	.052	1.44780	.081	2.825	6	193	.012

a. Predictors: (Constant), MeanPCT, MeanPCB, MeanPCS, MeanPCC, MeanPCP, MeanPCK

Figure 4.3 illustrates multiple regression model for the independent variables of MeanPCP, MeanPCB, MeanPCK, MeanPCS, MeanPCC, and MeanPCT with the dependent variable of LnY4Y1. Based on the model summary, the significant level of this model is .012. This means at least one variable of the service under product category has an influence toward LnY4Y1 at .05 significant level. R^2 indicates how well the regression model represented the data. However, the R^2 of this model is pretty low at .081. This means 8.1% of the data fit the regression model. The result of coefficient and relationship between each variable is shown below.

Coefficients[a]

Model		Unstandardized Coefficients: B	Std. Error	Standardized Coefficients: Beta	t	Sig.	95.0% Confidence Interval for B: Lower Bound	Upper Bound	Correlations: Zero-order	Partial	Part
1	(Constant)	-.602	.769		-.783	.435	-2.119	.915			
	MeanPCP	-.219	.097	-.236	-2.257	.025	-.411	-.028	-.022	-.160	-.156
	MeanPCB	.099	.043	.193	2.321	.021	.015	.183	.089	.165	.160
	MeanPCK	-.047	.133	-.043	-.356	.722	-.309	.214	.025	-.026	-.025
	MeanPCS	.162	.058	.241	2.800	.006	.048	.275	.132	.198	.193
	MeanPCC	-.141	.067	-.204	-2.103	.037	-.273	-.009	.000	-.150	-.145
	MeanPCT	.312	.124	.275	2.511	.013	.067	.556	.100	.178	.173

a. Dependent Variable: LnY4Y1

The coefficient value indicates how much the value of LnY4Y1 changes given a one unit change in the left hand side variables while holding other variables unchanged. The table above shows that MeanPCP, MeanPCB, MeanPCS, MeanPCC and MeanPCT variables have influence toward the dependent variable of LnY4Y1 at .05 level. MeanPCP and MeanPCC have negative impact while MeanPCB, MeanPCS, and MeanPCT have positive impact in this model. The other variable, MeanPCK, that has p-values greater than the significant level of .1 can be interpreted that there is insufficient evidence to determine that there is an influence at this model. Multiple regression equation of this model can be presented below.

$$\hat{Y} = -.602 - .219PCP + .099PCB - .047PCK + .162PCS - .141PCC + .312PCT$$

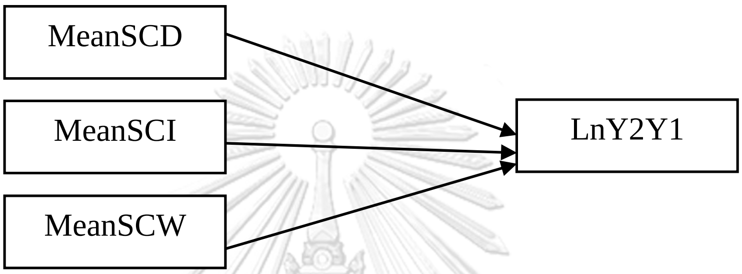


Figure 4.4: *Multiple Regression between Service Category and LnY2Y1*

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics: R Square Change	F Change	df1	df2	Sig. F Change
1	.190[a]	.036	.021	1.16996	.036	2.439	3	196	.066

a. Predictors: (Constant), MeanSCW, MeanSCD, MeanSCI

Figure 4.4 illustrates multiple regression model for the independent variables of MeanSCD, MeanSCI, and MeanSCW with the dependent variable of LnY2Y1. Based on the model summary, the significant level of this model is .066. This means at least one variable of the service under service category has an influence toward LnY2Y1 at .1 significant level. R^2 indecates how well the regression model represented the data. However, the R^2 of this model is pretty low at .036. This means 3.6% of the data fit the regression model. The result of coefficient and relationship between each variable is shown below.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B		Correlations		
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Zero-order	Partial	Part
1	(Constant)	-.671	.551		-1.219	.224	-1.757	.415			
	MeanSCD	.178	.066	.203	2.693	.008	.048	.308	.181	.189	.189
	MeanSCI	-.005	.056	-.010	-.098	.922	-.116	.105	.018	-.007	-.007
	MeanSCW	-.026	.053	-.052	-.497	.620	-.130	.078	.013	-.035	-.035

a. Dependent Variable: LnY2Y1

The coefficient value indicates how much the value of LnY2Y1 changes given a one unit change in the left hand side variables while holding other variables unchanged. The table above shows MeanSCD variable has influence toward the dependent variable of LnY2Y1 at .05 significant level. MeanSCD has positive impact in this model. Other variables, MeanSCI and MeanSCW, that have p-values greater than the significant level of .1 can be interpreted that there is insufficient evidence to determine that there is any impact at this model. Multiple regression equation of this model can be presented below.

$$\hat{Y} = -.671 + .178SCD - .005SCI - .026SCW$$

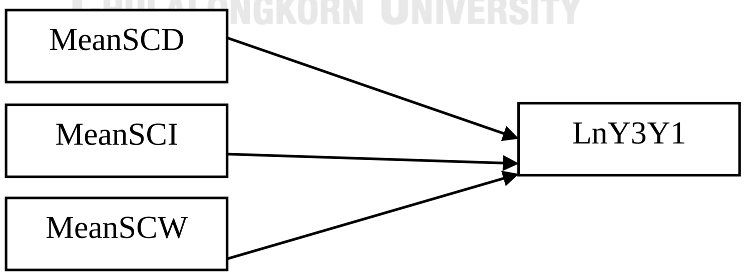


Figure 4.5: *Multiple Regression between Service Category and LnY3Y1*

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics: R Square Change	F Change	df1	df2	Sig. F Change
1	.230[a]	.053	.038	1.37405	.053	3.639	3	196	.014

a. Predictors: (Constant), MeanSCW, MeanSCD, MeanSCI

Figure 4.5 illustrates multiple regression model for the independent variables of MeanSCD, MeanSCI, and MeanSCW with the dependent variable of LnY3Y1. Based on the model summary, the significant level of this model is .014. This means at least one variable of the service under service category has an influence toward LnY3Y1 at .1 significant level. R^2 indicates how well the regression model represented the data. However, the R^2 of this model is pretty low at .053. This means 5.3% of the data fit the regression model. The result of coefficient and relationship between each variable is shown below.

Coefficients[a]

Model		Unstandardized Coefficients: B	Unstandardized Coefficients: Std. Error	Standardized Coefficients: Beta	t	Sig.	95.0% Confidence Interval for B: Lower Bound	95.0% Confidence Interval for B: Upper Bound	Correlations: Zero-order	Correlations: Partial	Correlations: Part
1	(Constant)	-1.068	.647		-1.652	.100	-2.344	.207			
	MeanSCD	.246	.078	.237	3.172	.002	.093	.399	.213	.221	.221
	MeanSCI	-.071	.066	-.111	-1.078	.282	-.201	.059	-.007	-.077	-.075
	MeanSCW	.021	.062	.035	.336	.737	-.101	.143	.038	.024	.023

a. Dependent Variable: LnY3Y1

The coefficient value indicates how much the value of LnY3Y1 changes given a one unit change in the left hand side variables while holding other variables unchanged. The table above shows MeanSCD variable has influence toward the dependent variable of LnY3Y1 at .05 significant level. MeanSCD has positive impact in this model. Other variables, MeanSCI and MeanSCW, that have p-values greater than the significant level of .1 can be interpreted that there is insufficient evidence to determine that there is any impact at this model. Multiple regression equation of this model can be presented below.

$$\hat{Y} = -1.068 + .246SCD - .071SCI - .021SCW$$

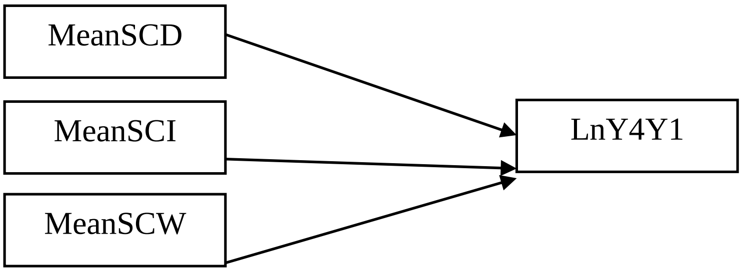


Figure 4.6: *Multiple Regression between Service Category and LnY4Y1*

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics: R Square Change	F Change	df1	df2	Sig. F Change
1	.242[a]	.059	.044	1.45375	.059	4.079	3	196	.008

a. Predictors: (Constant), MeanSCW, MeanSCD, MeanSCI

Figure 4.6 illustrates multiple regression model for the independent variables of MeanSCD, MeanSCI, and MeanSCW with the dependent variable of LnY4Y1. Based on the model summary, the significant level of this model is .008. This means at least one variable of the service under service category has an influence toward LnY4Y1 at .1 significant level. R^2 indecates how well the regression model represented the data. However, the R^2 of this model is pretty low at .059. This means 5.9% of the data fit the regression model. The result of coefficient and relationship between each variable is shown below.

Coefficients[a]

Model		Unstandardized Coefficients: B	Unstandardized Coefficients: Std. Error	Standardized Coefficients: Beta	t	Sig.	95.0% Confidence Interval for B: Lower Bound	95.0% Confidence Interval for B: Upper Bound	Correlations: Zero-order	Correlations: Partial	Correlations: Part
1	(Constant)	-1.600	.684		-2.339	.020	-2.949	-.251			
	MeanSCD	.240	.082	.218	2.918	.004	.078	.401	.237	.204	.202
	MeanSCI	.015	.070	.022	.219	.827	-.122	.153	.119	.016	.015
	MeanSCW	.022	.065	.035	.334	.739	-.107	.151	.129	.024	.023

a. Dependent Variable: LnY4Y1

The coefficient value indicates how much the value of LnY4Y1 changes given a one unit change in the left hand side variables while holding other variables unchanged. The table above shows MeanSCD variable has influence toward the dependent variable of LnY4Y1 at .05 significant level. MeanSCD has positive impact in this model. Other variables, MeanSCI and MeanSCW, that have p-values greater than the significant level of .1 can be interpreted that there is insufficient evidence to determine that there is any impact at this model. Multiple regression equation of this model can be presented below.

$$\hat{Y} = -1.600 + .240SCD - .015SCI - .022SCW$$

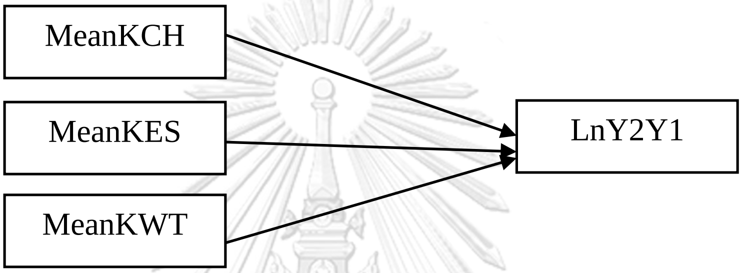


Figure 4.7: *Multiple Regression between Knowledge Category and LnY2Y1*

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.115[a]	.013	-.002	1.18372	.013	.873	3	196	.456

a. Predictors: (Constant), MeanKWT, MeanKCH, MeanKES

Figure 4.7 illustrates multiple regression model for the independent variables of MeanKCH, MeanKES, and MeanKWT with the dependent variable of LnY2Y1. Based on the model summary, the significant level of this model is .456. This means none of these variables of the service under knowledge category has an influence toward LnY2Y1 at .1 significant level. R^2 indicates how well the regression model represented the data. However, the R^2 of this model is pretty low at .013. This means 1.3% of the data fit the regression model. The result of coefficient and relationship between each variable is shown below.

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	95.0% Confidence Interval for B Lower Bound	95.0% Confidence Interval for B Upper Bound	Correlations Zero-order	Correlations Partial	Correlations Part
1	(Constant)	.244	.497		.491	.624	-.735	1.223			
	MeanKCH	-.055	.083	-.071	-.662	.509	-.219	.109	.036	-.047	-.047
	MeanKES	.122	.084	.168	1.444	.150	-.045	.289	.101	.103	.102
	MeanKWT	-.016	.076	-.022	-.209	.834	-.165	.133	.052	-.015	-.015

a. Dependent Variable: LnY2Y1

The coefficient value indicates how much the value of LnY2Y1 changes given a one unit change in the left hand side variables while holding other variables unchanged. The table above shows MeanKES variable has influence toward the dependent variable of LnY2Y1 at .1 significant level. MeanKES has positive impact in this model. Other variables, MeanKCH and MeanKWT, that have p-values greater than the significant level of .1 can be interpreted that there is insufficient evidence to determine that there is any impact at this model. Multiple regression equation of this model can be presented below.

$$\hat{Y} = .244 - .055KCH + .122KES - .016KWT$$

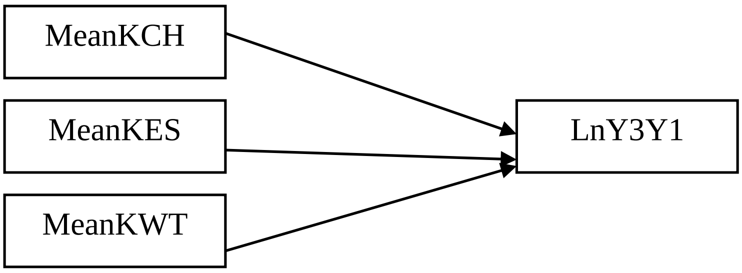


Figure 4.8: *Multiple Regression between Knowledge Category and LnY3Y1*

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.116[a]	.014	-.002	1.40221	.014	.896	3	196	.444

a. Predictors: (Constant), MeanKWT, MeanKCH, MeanKES

Figure 4.8 illustrates multiple regression model for the independent variables of MeanKCH, MeanKES, and MeanKWT with the dependent variable of LnY3Y1. Based on the model summary, the significant level of this model is .444. This means none of these variables of the service under knowledge category has an influence toward LnY3Y1 at .1 significant level. R^2 indecates how well the regression model represented the data. However, the R^2 of this model is pretty low at .014. This means 1.4% of the data fit the regression model. The result of coefficient and relationship between each variable is shown below.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B		Correlations		
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Zero-order	Partial	Part
1	(Constant)	.242	.588		.412	.681	-.918	1.403			
	MeanKCH	-.036	.098	-.039	-.367	.714	-.230	.158	.045	-.026	-.026
	MeanKES	.151	.100	.176	1.511	.132	-.046	.348	.100	.107	.107
	MeanKWT	-.056	.090	-.066	-.627	.531	-.233	.121	.034	-.045	-.044

a. Dependent Variable: LnY3Y1

The coefficient value indicates how much the value of LnY3Y1 changes given a one unit change in the left hand side variables while holding other variables unchanged. The table above shows MeanKES variable has influence toward the dependent variable of LnY3Y1 at .1 significant level. MeanKES has positive impact in this model. Other variables, MeanKCH and MeanKWT, that have p-values greater than the significant level of .1 can be interpreted that there is insufficient evidence to determine that there is any impact at this model. Multiple regression equation of this model can be presented below.

$$\hat{Y} = .242 - .036KCH + .151KES - .056KWT$$

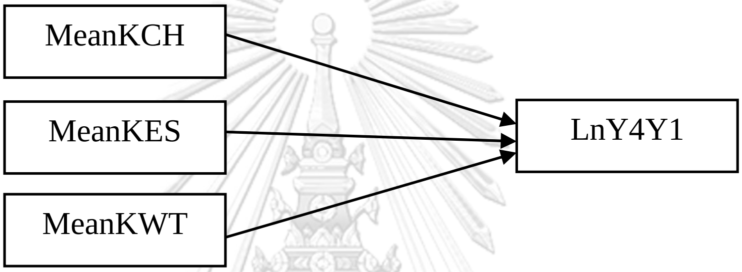


Figure 4.9: *Multiple Regression between Knowledge Category and LnY4Y1*

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.181[a]	.033	.018	1.47370	.033	2.213	3	196	.088

a. Predictors: (Constant), MeanKWT, MeanKCH, MeanKES

Figure 4.9 illustrates multiple regression model for the independent variables of MeanKCH, MeanKES, and MeanKWT with the dependent variable of LnY4Y1. Based on the model summary, the significant level of this model is .088. This means at least one variable of the service under service category has an influence toward LnY4Y1 at .1 significant level. R^2 indecates how well the regression model represented the data. However, the R^2 of this model is pretty low at .033. This means 3.3% of the data fit the regression model. The result of coefficient and relationship between each variable is shown below.

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	95.0% Confidence Interval for B Lower Bound	95.0% Confidence Interval for B Upper Bound	Correlations Zero-order	Correlations Partial	Correlations Part
1	(Constant)	-.633	.618		-1.024	.307	-1.853	.586			
	MeanKCH	.021	.103	.021	.200	.842	-.183	.224	.141	.014	.014
	MeanKES	.150	.105	.165	1.428	.155	-.057	.358	.180	.101	.100
	MeanKWT	.000	.094	.000	.003	.997	-.186	.186	.132	.000	.000

a. Dependent Variable: LnY4Y1

The coefficient value indicates how much the value of LnY4Y1 changes given a one unit change in the left hand side variables while holding other variables unchanged. The table above shows MeanKES variable has influence toward the dependent variable of LnY4Y1 at .1 significant level. MeanKES has positive impact in this model. Other variables, MeanKCH and MeanKWT, that have p-values greater than the significant level of .1 can be interpreted that there is insufficient evidence to determine that there is any impact at this model. Multiple regression equation of this model can be presented below.

$$\hat{Y} = -.633 + .021KCH + .150KES + .000KWT$$

4.4 Multiple Linear Regression Summary

From the Figure 4.1 to 4.9, multiple linear regression models of each log odd comparison were used to measure the significant level of the influence of independent variables. Only independent variables that meet the criteria of significant level will be carried further to calculate marginal effect in multinomial logit model in order to see the changes caused by these variables. As we have 3 groups of independent and dependent variables, 9 multiple regression models were run for the results. Independent variables from product, service and knowledge categories were plugged-in the model with dependent variables of natural logarithm of the probability of service added to the product compared to product only level (LnY2Y1), natural logarithm of the probability of service differential the product compared to product only level (LnY3Y1), and natural logarithm of the probability of service is the product compared to product only level (LnY4Y1) separately one at a time. Table 4.6 shows the result of 9 regression models. As the result, independent variables that have significant level less than .05 or .1 were selected and carried further in the MNL models to find the marginal effect of the independent variables toward those four dependent variables.

Table 4.6: *Results of 9 Multiple Regression Models*

Model	LnY2Y1		LnY3Y1		LnY4Y1	
	B	Std. Error	B	Std. Error	B	Std. Error
(Constant)	-.379	.620	-.334	.727	-.602	.769
MeanPCP	-.203**	.078	-.329**	.092	-.219**	.097
MeanPCB	-.013	.034	.030	.040	.099**	.043
MeanPCK	.095	.107	.092	.125	-.047	.133
MeanPCS	.020	.046	.049	.055	.162**	.058
MeanPCC	.042	.054	-.002	.063	-.141**	.067
MeanPCT	.164*	.100	.267*	.117	.312**	.124
	*R^2 = .238, Adjusted R^2 = .057, Sig. = .077**		*R^2 = .275, Adjusted R^2 = .076, Sig. = .018***		*R^2 = .284 , Adjusted R^2 = .081 , Sig. = .012***	

Model	LnY2Y1		LnY3Y1		LnY4Y1	
	B	Std. Error	B	Std. Error	B	Std. Error
(Constant)	-.671	.551	-1.068	.647	-1.600	.684
MeanSCD	.178**	.066	.246**	.078	.240**	.082
MeanSCI	-.005	.056	-.071	.066	.015	.070
MeanSCW	-.026	.053	.021	.062	.022	.065
	*R^2 = .190 , Adjusted R^2 = .036 , Sig. = .066**		*R^2 = .230 , Adjusted R^2 = .053 , Sig. = .014***		*R^2 = .242 , Adjusted R^2 = .059 , Sig. = .008***	

Model	LnY2Y1		LnY3Y1		LnY4Y1	
	B	Std. Error	B	Std. Error	B	Std. Error
(Constant)	.244	.497	.242	.588	-.633	.618
MeanKCH	-.055	.083	-.036	.098	.021	.103
MeanKES	.122*	.084	.151*	.100	.150*	.105
MeanKWT	-.016	.076	-.056	.090	.000	.094
	R^2 = .115 , Adjusted R^2 = .013 , Sig. = .456		*R^2 = .116 , Adjusted R^2 = .014 , Sig. = .444*		*R^2 = .181 , Adjusted R^2 = .033 , Sig. = .088**	

From the 1st to the 3rd multiple regression models, the independent variables that are considered statistically significant are MeanPCP and MeanPCT and have beta value of .203 and .164 respectively in the first model, .329 and .267 in the second model, and MeanPCP, MeanPCB, MeanPCS, MeanPCC, and MeanPCT have beta value of .219, .099, .162, .141, and .312 respectively in the third model. The adjusted R^2 value for the first to the third model was .057, .076, and .081 respectively meaning that less than 10% of the probability of service added to the product was explained by six predictors under product category.

In the 4th to the 6th multiple regression models, the independent variable that is considered statistically significant is MeanSCD and has beta value of .178, .246, and .240 in the fourth, fifth, and sixth model, respectively. The adjusted R^2 value for the first to the third model was .036, .053, and .059 respectively meaning that less than 10% of the probability of service differential the product was explained by three predictors under service category.

While the 7th and 9th multiple regression models, the independent variable that is considered statistically significant is MeanKES and has beta value of .122, .151, and .150 in the seventh, eighth, and ninth model, respectively. The adjusted R^2 value for the first to the third model was .013, .014, and .033 respectively meaning that less than 10% of the probability of service differential the product was explained by three predictors under knowledge category.

4.5 Multinomial Logit Model (MNL)

The discrete choice model or multinomial logit model was developed by McFadden (1973) and applied in the study of travel mode choices, for example; the choice between bus, car, train, or airplane. The objective is to estimate probability of choosing each of the four modes and to calculate the odds ratios for choice of different modes. The simple MNL can be written as:

$$U_{nj} = \beta x_{nj} + \varepsilon_{nj} \qquad (1)$$

Where

U_{nj} = the utility of alternate j to individual n,

x_{nj} = J-vector of observed attributes of alternative j

β = a vector of utility weights

ε_{nj} = an error

n = 1, …, N

j = 1, …, J

The probability that person n chooses alternative j is given by:

$$\Pr(j \mid x_n) = \frac{e^{\beta x_{nj}}}{\sum_{k=1}^{J} e^{\beta x_{nk}}} = \frac{e^{g_j(x)}}{\sum_{k=1}^{J} e^{g_k(x)}} \qquad (2)$$

In this research study, the dependent variables are categories of servitization level: 1 = product only, 2 = services added to the product, 3 = service differential the product, and 4 = service is the product. For each choice of dependent variable, assume that p covariates and has a constant term, denoted by the vector x, of length $p + 1, where\ x_0 = 1$, the multinomial logit model with the value of dependent variable Y = 1 as a reference outcome can be expressed as:

$$g_1(x) = ln\left[\frac{\Pr(Y=2|x)}{\Pr(Y=1|x)}\right]$$

$$= \beta_{10} + \beta_{11}\chi_1 + \beta_{12}\chi_2 + \cdots + \beta_{1p}\chi_p$$

$$= x'\beta_1 \qquad (3)$$

$$g_2(x) = ln\left[\frac{\Pr(Y=3|x)}{\Pr(Y=1|x)}\right]$$

$$= \beta_{20} + \beta_{21}\chi_1 + \beta_{22}\chi_2 + \cdots + \beta_{2p}\chi_p$$

$$= x'\beta_2 \qquad (4)$$

$$g_3(x) = ln\left[\frac{\Pr(Y=4|x)}{\Pr(Y=1|x)}\right]$$

$$= \beta_{30} + \beta_{31}\chi_1 + \beta_{32}\chi_2 + \cdots + \beta_{3p}\chi_p$$

$$= x'\beta_3 \qquad (5)$$

Then the conditional probabilities of each outcome category are:

$$\Pr(Y=1|x) = \frac{1}{1+e^{g_1(x)}+e^{g_2(x)}+e^{g_3(x)}}, \quad (6)$$

$$\Pr(Y=2|x) = \frac{e^{g_1(x)}}{1+e^{g_1(x)}+e^{g_2(x)}+e^{g_3(x)}}, \quad (7)$$

$$\Pr(Y=3|x) = \frac{e^{g_2(x)}}{1+e^{g_1(x)}+e^{g_2(x)}+e^{g_3(x)}}, \quad (8)$$

$$\Pr(Y=4|x) = \frac{e^{g_3(x)}}{1+e^{g_1(x)}+e^{g_2(x)}+e^{g_3(x)}} \quad (9)$$

By taking the log and applying the fact that $\sum \Pr(j|x_n) = 1$, all these four equations are associated by consuming the same denominator and by:

$$\Pr(Y=1|x) + \Pr(Y=2|x) + \Pr(Y=3|x) + \Pr(Y=4|x) = 1 \quad (10)$$

Thus

$$\frac{\partial \Pr(Y=1|x)}{\partial x} + \frac{\partial \Pr(Y=2|x)}{\partial x} + \frac{\partial \Pr(Y=3|x)}{\partial x} + \frac{\partial \Pr(Y=4|x)}{\partial x} = 0 \qquad (11)$$

In this study, the outcome of Y = 1, product only, is the reference outcome. Marginal effect describes the average effect of changes in independent variables on the changes in the probability of dependent variables in multinomial logit model.

$$\frac{\partial \Pr(Y=2|x)}{\partial x}$$

$$= \Pr(Y = 2|x)\,(1 - \Pr(Y = 2|x))\beta_1 - \Pr(Y = 2|x)\Pr(Y = 3|x)\,\beta_2 - \Pr(Y = 2|x)\Pr(Y = 4|x)\,\beta_3 \quad (12)$$

$$\frac{\partial \Pr(Y = 3|x)}{\partial x}$$

$$= \Pr(Y = 2|x)\,(Y = 3|x)\beta_1 - \Pr(1 - \Pr(Y = 3|x))\Pr(Y = 3|x)\,\beta_2 - \Pr(Y = 3|x)\Pr(Y = 4|x)\,\beta_3 \quad (13)$$

$$\frac{\partial \Pr(Y = 4|x)}{\partial x}$$

$$= \Pr(Y = 2|x)\,(Y = 4|x)\beta_1 - \Pr(Y = 3|x)(Y = 4|x)\,\beta_2 - \Pr(1 - \Pr(Y = 4|x))\Pr(Y = 4|x)\,\beta_3 \quad (14)$$

$$\frac{\partial \Pr(Y = 1|x)}{\partial x}$$

$$= -\left(\frac{\partial \Pr(Y = 2|x)}{\partial x} + \frac{\partial \Pr(Y = 3|x)}{\partial x} + \frac{\partial \Pr(Y=4|x)}{\partial x}\right) \quad (15)$$

Based on the result of nine multiple regression models, 7 significant factors of the 4-category service levels are MeanPCP, MeanPCB, MeanPCS, MeanPCC, MeanPCT, MeanSCD, and MeanKES. These variables were used for finding the average marginal effects. The Average Marginal Effects (AMEs) was combined and convenient way to compute marginal effect of each dependent variable at every observed value of independent variable and average through the estimation of resulting effects (Leeper, 2017). Findings based upon the estimated equation (11) to (14) can be generated that 7 attributes were significant as presented in Table 4.7. This data indicates and distinguishes the 4-category service levels. The work on the average marginal effect from the total 200 data sets is presented in the Appendix part.

Table 4.7: *Logit Average Marginal Effects of Significant Factors of Four Categories Service Levels*

No.	Significant Attributes	Logit average marginal effects			
		Product Only	**Service Added to the Product**	**Service Differential the Product**	**Service is the Product**
1	MeanPCP: Chemical Product Only	0.054	0.0003	-0.015	-0.039
2	MeanPCB: Chemical Blending	-0.008	-0.006	-0.006	0.020
3	MeanPCS: Chemical Storage	-0.013	-0.010	-0.009	0.033
4	MeanPCC: Chemical Container Recycling	0.012	0.009	0.008	-0.029
5	MeanPCT: Transportation	0.115	-0.008	-0.069	-0.069
6	MeanSCD: Chemical Documentation	-.066	-.008	.039	.035

7	MeanKES: Chemical Environmental and Safety Programs	-.005	-.024	.015	.014

Data shown in Table 4.7 is the result of the average marginal effect of 7 significant factors calculated from equation (11) to (14). The 7 significant variables from 4-category service levels illustrated in Table 4.6 were chemical product only, chemical blending, chemical storage, chemical container recycling, transportation, chemical document, and environmental and safety programs.

The marginal effect of the first variable, chemical product only, toward 4-category service levels shows that product only level is the service level that customers who focus on purchasing chemical product only should basically be concentrated compared to the others 3 service levels of service added to the product, service differential the product, and service is the product level. The marginal effect of 0.054 indicates that if there is an increase in the demand of chemical product only by one unit, the service of product only will be more likely to be selected at 5.4%. This research finding was consistent with the study of Eder, Delgado, Kortman, and Studies (2006). In terms of chemical product, traditional business models are focusing on selling chemical product by volume. Chemical suppliers do not have incentive to provide additional services, but they earn money by selling more amount of chemicals.

Secondly, for the chemical blending, service is the product was the preferable service customers want. The marginal effect of 0.02 can be explained that if there is an increase in the demand of chemical blending by one unit, the service level of service is the product will be more likely to be chosen by 2%. On the contrary, the marginal effect of the service level of product only is -0.008, this means the service level of product only will be less likely to be chosen by 0.8% if the demand of chemical blending increases by one unit. Moreover, the service level of service added to the product and service differential the product is also less likely to be selected by 6% if the level of chemical blending demand is increased by one unit because the marginal effect is -0.06. The good evident to support this finding is that chemical suppliers in developed countries, not only world leading companies for example Dow chemical but also local suppliers in North America, Europe, and Japan provide chemical blending service to their customer as bundle solution. They are concerning about safety and setting the highest priority when blending chemicals. With their highly equipped and experiences, this service is provided as custom solution to meet their customer requirement.

The third significant variable is chemical storage. The marginal effect shows that chemical supplier should provide service level of service as the product for customers who has requirement on chemical storage. The marginal effect of .033 indicates that when the demand of chemical storage increases by one unit, the service level of service is the product is more likely to be selected by 3.3%. This is opposite to the other three service levels that have negative marginal effects. From the result of marginal effect in table 6, it can be interpreted that when the demand of chemical storage increases by one unit, the service levels of chemical only, service added to the product, and service differential the product are less likely to be chosen by 1.3%, 1%, and 0.9%, respectively.

The next significant variable is chemical container recycling. The 0.012 marginal effect of product only level indicates that if the customer demand of chemical container recycling raises up one unit, the service level of product only is more likely to be selected at 1.2% of probability. Other two service levels are also having positive effects. Service added to the product and service differential the product are also more likely to be preferred at 0.8% and 0.9% respectively when the demand of chemical container recycling increases by one unit.

Transportation is another significant factor to be considered. The marginal effect of 0.115 can be explained that if the demand of transportation moves up one unit, the service level of product only is more likely to be chosen by 11.5%. While the other three service levels have negative marginal effect. Service added to the product, service differential the product, and service is the product are less likely to be select by 0.8%, 6.9% and 6.9%, respectively, when the demand of transportation from customer shifts up one unit.

The sixth significant factor is chemical documentation. The positive value of the marginal effect relates to a positive impact of this factor toward service level of service differential the product and service is the product. This means service differential the product and service is the product are more likely to be selected with the probability of 3.9% and 3.5% respectively. This can also be explained that the product only, and service added to the product service levels have negative impact by -6.6% and -0.8% of probability respectively when the demand of chemical documentation increases by one unit. Therefore, customers are more intended to require differential services and service solution when they have more demand of chemical documentation.

The last significance for 4-category service level is chemical environmental and safety programs. The marginal effect sign explains that both service differential the product and service is the product will respond the request of customer on chemical environmental and safety programs. With marginal effect of 0.15 and 0.14, this implies that service differential and service is the product are more likely to be selected with probability of 1.5% and 1.4% respectively if the customer demand of chemical environmental and safety programs rises up one unit.

4.6 Differences in the Average Demand for each Customer Segment

The next step is to analyze the differences between each segment toward seven significant service offerings obtained from the previous section. Those significant variables are MeanPCP, MeanPCB, MeanPCS, MeanPCC, MeanPCT, MeanSCD, and MeanKES. Customers are classified into four segments which are industrial, consumer, resource, and technology. Analysis of variance (ANOVA) is the statistical method to investigate observed variables classified by three or more groups of data for the relationship with dependent variable. The independent variable, in this study is segment, has 4 groups, while dependent variable is ratio scale (Vanichbuncha, 2006). The objective of this ANOVA analysis is to examine variance of the dependent variable whether it depends on group of independent variable or not. If the mean scores variance of dependent variable of each group are not the same, we can conclude that the value of dependent variable does not depend on customer segment.

This section uses ANOVA as a tool test relationship between segment and significant service offerings.

1. Test the difference of the average demand of customer in chemical only service (MeanPCP) for each customer segment.

Figure 4.10: *One-Way ANOVA of Segment and MeanPCP*

The objective is to test whether average MeanPCP depends on segment or not. The first step is examining the average variance of MeanPCP of each segment at the significant level of Sig. = .05.

$$H_0: \sigma_1^2 = \sigma_2^2 = \cdots = \sigma_k^2, k = 4$$

$$H_1: at\ least\ one\ pair\ of\ \ \sigma_i^2 \neq \sigma_j^2, i\ \neq j$$

The result of the test is shown below in Table 4.8. The value of Sig. = .000 can be interpreted that H_0 is rejected and H_1 is accepted. The meaning of this Sig. = .000 is that there is at least one pair of customer segments has different value of the average variance in MeanPCP variable.

Table 4.8: *Homogeneity of Variances of MeanPCP for each Segment*

Test of Homogeneity of Variances

MeanPCP

Levene Statistic	df1	df2	Sig.

8.993	3	196	.000

Next, the researcher used Welch's statistic to test the average value of MeanPCP in each segment by setting the following hypothesis:

$$H_0: \mu_1^2 = \mu_2^2 = \cdots = \mu_k^2, k = 4$$

$$H_1: at\ least\ one\ pair\ of\ \ \mu_i^2 \neq \mu_j^2, i\ \neq j$$

The result of Welch's statistic test is shown in Table 4.9

Table 4.9: *Equality of Means in MeanPCP for each Segment*

Robust Tests of Equality of Means

MeanPCP

	Statistic[a]	df1	df2	Sig.
Welch	5.995	3	4.749	.045

a. Asymptotically F distributed.

Based on the result in Table 4.9, Welch's statistic = 5.995 and p-value or Sig. = .045 < .05, null hypothesis (H_0) is rejected and accept H_1. This can be interpreted that there is at least one pair of customer segments has different average value of MeanPCP. The test concludes that the degree of purchase demand for chemical only service depends on the customer segments. The next step is to examine which segment has different demand of chemical only service. Table 4.10 expresses the result of mean value for each segment.

Table 4.10: *Multiple Comparisons of MeanPCP in each Segment*

Multiple Comparisons

Dependent Variable: MeanPCP

Dunnett T3

(I) Seg	(J) Seg	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Industrial	Consumer Industry	1.38750*	.30629	.000	.5560	2.2190
	Resource Industry	.50000	.70831	.945	-16.0843	17.0843

	Technology	-.46154	.42500	.848	-1.7498	.8267
Consumer Industry	Industrial	-1.38750*	.30629	.000	-2.2190	-.5560
	Resource Industry	-.88750	.75638	.795	-11.0508	9.2758
	Technology	-1.84904*	.50102	.006	-3.2727	-.4254
Resource Industry	Industrial	-.50000	.70831	.945	-17.0843	16.0843
	Consumer Industry	.88750	.75638	.795	-9.2758	11.0508
	Technology	-.96154	.81174	.788	-8.0844	6.1613
Technology	Industrial	.46154	.42500	.848	-.8267	1.7498
	Consumer Industry	1.84904*	.50102	.006	.4254	3.2727
	Resource Industry	.96154	.81174	.788	-6.1613	8.0844

*. The mean difference is significant at the 0.05 level.

From the result in Table 4.10, the data shows that there is no difference in the average demand of customers for chemical only service in industrial, resource, and technology segments. However, the average demand of customers for chemical only service in industrial segment is greater than the average demand of customers in consumer industry segment by 1.39 points. Moreover, the average demand of customers for chemical only service in technology industry segment is greater than the average demand of customers in consumer industry segment by 1.85 points. Conclusion, the average demand of customers for chemical only service in industrial, resource industrial, and technology industry segments is greater than the average demand of customers for chemical only service in consumer industry segment (industrial = resource = technology > consumer).

2. Test the difference of the average demand of customer in chemical packaging service (MeanPCB) for each customer segment.

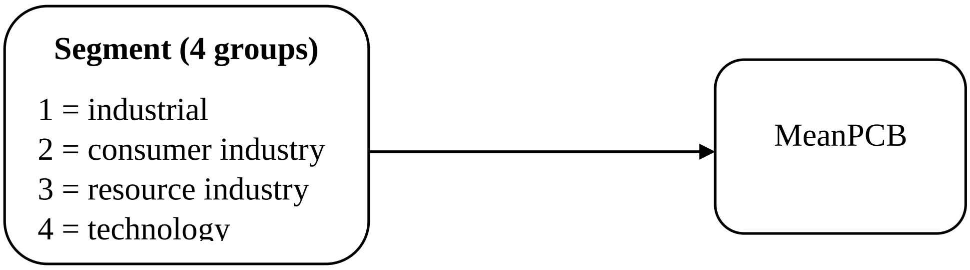


Figure 4.11: *One-Way ANOVA of Segment and MeanPCB*

The objective is to test whether the average MeanPCB depends on segment or not. The first step is examining the average variance of MeanPCB of each segment at the significant level of Sig. = .05.

$$H_0: \sigma_1^2 = \sigma_2^2 = \cdots = \sigma_k^2, k = 4$$

$$H_1: at\ least\ one\ pair\ of\ \ \sigma_i^2 \neq \sigma_j^2, i \neq j$$

The result of the test is shown below in Table 4.11. The value of Sig. = .251 < .05, this can be interpreted that H_0 is failed to reject, so H_0 is accepted. The meaning of this Sig. = .251 is that the variance of the damand of chemical blending service in each segment are the same.

Table 4.11: *Homogeneity of Variances of MeanPCB for each Segment*

Test of Homogeneity of Variances

MeanPCB

Levene Statistic	df1	df2	Sig.
1.379	3	196	.251

Next, the researcher used F-test statistic to test the average value of MeanPCB in each segment by setting the following hypothesis:

$$H_0: \mu_1^2 = \mu_2^2 = \cdots = \mu_k^2, k = 4$$

$$H_1: at\ least\ one\ pair\ of\ \ \mu_i^2 \neq \mu_j^2, i \neq j$$

The result of F-test statistic is shown in Table 4.12

Table 4.12: *F-Test Result of Means in MeanPCB for each Segment*

ANOVA

MeanPCB

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	99.046	3	33.015	4.136	.007
Within Groups	1564.702	196	7.983		
Total	1663.747	199			

Based on the result in Table 4.12, F-Test statistic = 4.136 and p-value or Sig. = .007 < .05, null hypothesis (H_0) is rejected and accept H_1. This can be interpreted that there is at least one pair of customer segments has different average value of MeanPCB. The test concludes that the degree of purchase demand for chemical blending service depends on the customer segments. The next step is to examine which segment has different demand of chemical blending service. Table 4.13 expresses the result of mean value for each segment.

Table 4.13: *Multiple Comparisons of MeanPCB in each Segment*

Multiple Comparisons

Dependent Variable: MeanPCB

LSD

(I) Seg	(J) Seg	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Industry	Consumer Industry	1.51460*	.47391	.002	.5800	2.4492
	Resource Industry	1.01460	2.01243	.615	-2.9542	4.9834
	Technology	-.77386	.81998	.346	-2.3910	.8432
Consumer Industry	Industry	-1.51460*	.47391	.002	-2.4492	-.5800
	Resource Industry	-.50000	2.03909	.807	-4.5214	3.5214
	Technology	-2.28846*	.88341	.010	-4.0307	-.5463
Resource Industry	Industry	-1.01460	2.01243	.615	-4.9834	2.9542
	Consumer Industry	.50000	2.03909	.807	-3.5214	4.5214
	Technology	-1.78846	2.14608	.406	-6.0208	2.4439
Technology	Industry	.77386	.81998	.346	-.8432	2.3910

	Consumer Industry	2.28846*	.88341	.010	.5463	4.0307
	Resource Industry	1.78846	2.14608	.406	-2.4439	6.0208

*. The mean difference is significant at the 0.05 level.

From the result in Table 4.10, the data shows that there is no difference in the average demand of customers for chemical blending service in industrial, resource, and technology segments. However, the average demand of customers for chemical blending service in industrial segment is greater than the average demand of customers in consumer industry segment by 1.59 points. Moreover, the average demand of customers for chemical blending service in technology industry segment is greater than the average demand of customers in consumer industry segment by 2.29 points. Conclusion, the average demand of customers for chemical blending service in industrial, resource industrial, and technology industry segments is greater than the average demand of customers for chemical blending service in consumer industry segment (industrial = resource = technology > consumer).

3. Test the difference of the average demand of customer in chemical storage service (MeanPCS) for each customer segment.

Figure 4.12: *One-Way ANOVA of Segment and MeanPCS*

The objective is to test whether average MeanPCS depends on segment or not. The first step is examining the average variance of MeanPCP of each segment at the significant level of Sig. = .05.

$$H_0: \sigma_1^2 = \sigma_2^2 = \cdots = \sigma_k^2, k = 4$$

$$H_1: at\ least\ one\ pair\ of\ \ \sigma_i^2 \neq \sigma_j^2, i \neq j$$

The result of the test is shown below in Table 4.14. The value of Sig. = .000 can be interpreted that H_0 is rejected and H_1 is accepted. The meaning of this Sig. = .000 is that there is at least one pair of customer segments has different value of the average variance in MeanPCS variable.

Table 4.14: *Homogeneity of Variances of MeanPCS for each Segment*

Test of Homogeneity of Variances

MeanPCS

Levene Statistic	df1	df2	Sig.
7.019	3	196	.000

Next, the researcher used Welch's statistic to test the average value of MeanPCS in each segment by setting the following hypothesis:

$$H_0: \mu_1^2 = \mu_2^2 = \cdots = \mu_k^2, k = 4$$

$$H_1: at\ least\ one\ pair\ of\ \ \mu_i^2 \neq \mu_j^2, i\ \neq j$$

The result of Welch's statistic test is shown in Table 4.15

Table 4.15: *Equality of Means in MeanPCS for each Segment*

Robust Tests of Equality of Means

MeanPCS

	Statistic[a]	df1	df2	Sig.
Welch	14.341	3	4.582	.009

a. Asymptotically F distributed.

Based on the result in Table 4.15, Welch's statistic = 14.341 and p-value or Sig. = .009 < .05, null hypothesis (H_0) is rejected and accept H_1. This can be interpreted that there is at least one pair of customer segments has different average value of MeanPCS. The test concludes that the degree of purchase demand for chemical storage service depends on the customer segments. The next step is to examine which segment has different demand of chemical storage service. Table 4.16 expresses the result of mean value for each segment.

Table 4.16: *Multiple Comparisons of MeanPCS in each Segment*

Multiple Comparisons

Dependent Variable: MeanPCS

Dunnett T3

(I) Seg	(J) Seg	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Industrial	Consumer Industry	2.34786*	.34869	.000	1.4033	3.2924
	Resource Industry	2.44161	3.00321	.915	-75.8859	80.7691
	Technology	2.94161*	.82433	.020	.4142	5.4690
Consumer Industry	Industrial	-2.34786*	.34869	.000	-3.2924	-1.4033
	Resource Industry	.09375	3.01700	1.000	-75.0042	75.1917
	Technology	.59375	.87325	.980	-2.0011	3.1886
Resource Industry	Industrial	-2.44161	3.00321	.915	-80.7691	75.8859
	Consumer Industry	-.09375	3.01700	1.000	-75.1917	75.0042
	Technology	.50000	3.10810	1.000	-57.9949	58.9949
Technology	Industrial	-2.94161*	.82433	.020	-5.4690	-.4142
	Consumer Industry	-.59375	.87325	.980	-3.1886	2.0011
	Resource Industry	-.50000	3.10810	1.000	-58.9949	57.9949

*. The mean difference is significant at the 0.05 level.

From the result in Table 4.16, the data shows that there is no difference in the average demand of customers for chemical storage service in industrial, resource, and technology segments. The average demand of customers for chemical storage service in industrial segment is also greater than the average demand of customers in consumer industry segment by 2.35 points. Moreover, the average demand of customers for chemical storage service in industrial segment is greater than the average demand of customers in technology industry segment by 2.94 points. However, the average demand of customers for chemical storage service in cosumer industry is the same as the average demand of customers of the service in technology industry. Conclusion, the average demand of customers for chemical storage service in industrial and resource industry segments is greater than the average demand of customers for chemical storage service in technology industry and consumer industry segment, respectively (industrial = resource > technology = consumer).

4. Test the difference of the average demand of customer in chemical container recycling service (MeanPCC) for each customer segment.

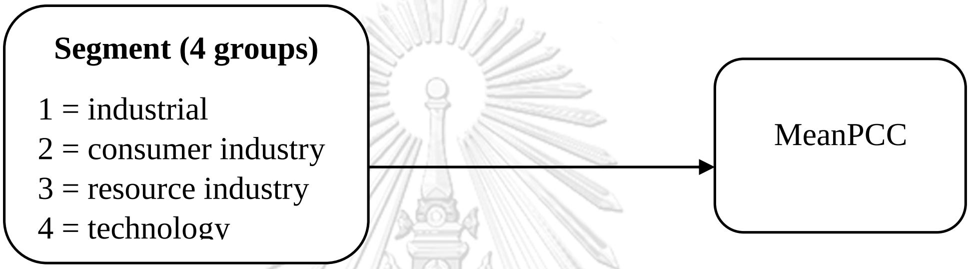


Figure 4.13: *One-Way ANOVA of Segment and MeanPCC*

The objective is to test whether the average MeanPCC depends on segment or not. The first step is examining the average variance of MeanPCC of each segment at the significant level of Sig. = .05.

$$H_0: \sigma_1^2 = \sigma_2^2 = \cdots = \sigma_k^2, k = 4$$

$$H_1: at\ least\ one\ pair\ of\ \ \sigma_i^2 \neq \sigma_j^2, i \neq j$$

The result of the test is shown below in Table 4.17. The value of Sig. = .068 < .05, this can be interpreted that H_0 is failed to reject, so H_0 is accepted. The meaning of this Sig. = .068 is that the variance of the damand of chemical container recycling service in each segment are the same.

Table 4.17: *Homogeneity of Variances of MeanPCC for each Segment*

Test of Homogeneity of Variances

MeanPCC

Levene Statistic	df1	df2	Sig.
2.408	3	196	.068

Next, the researcher used F-test statistic to test the average value of MeanPCC in each segment by setting the following hypothesis:

$$H_0: \mu_1^2 = \mu_2^2 = \cdots = \mu_k^2, k = 4$$

$$H_1: at\ least\ one\ pair\ of\ \ \mu_i^2 \neq \mu_j^2, i\ \neq j$$

The result of F-test statistic is shown in Table 4.18

Table 4.18: *F-Test Result of Means in MeanPCC for each Segment*

ANOVA

MeanPCC

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	88.339	3	29.446	6.893	.000
Within Groups	837.278	196	4.272		
Total	925.617	199			

Based on the result in Table 4.18, F-Test statistic = 6.893 and p-value or Sig. = .000 < .05, null hypothesis (H_0) is rejected and accept H_1. This can be interpreted that there is at least one pair of customer segments have different average value of MeanPCC. The test concludes that the degree of purchase demand for chemical container recycling service depends on the customer segments. The next step is to examine which segment has different demand of chemical container recycling service. Table 4.19 expresses the result of mean value for each segment.

Table 4.19: *Multiple Comparisons of MeanPCC in each Segment*

Multiple Comparisons

Dependent Variable: MeanPCC

Dunnett T3

					95% Confidence Interval	
(I) Seg	(J) Seg	Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
Industry	Consumer Industry	1.56027*	.37686	.001	.5427	2.5779
	Resource Industry	1.35888	2.17353	.962	-54.1259	56.8436
	Technology	.39734	.39307	.886	-.7518	1.5464
Consumer Industry	Industry	-1.56027*	.37686	.001	-2.5779	-.5427
	Resource Industry	-.20139	2.19241	1.000	-51.5327	51.1299
	Technology	-1.16293	.48674	.123	-2.5138	.1879
	Industry	-1.35888	2.17353	.962	-56.8436	54.1259

Resource Industry	Consumer Industry	.20139	2.19241	1.000	-51.1299	51.5327
	Technology	-.96154	2.19525	.991	-51.7177	49.7947
Technology	Industry	-.39734	.39307	.886	-1.5464	.7518
	Consumer Industry	1.16293	.48674	.123	-.1879	2.5138
	Resource Industry	.96154	2.19525	.991	-49.7947	51.7177

*. The mean difference is significant at the 0.05 level.

From the result in Table 4.19, the data shows that there is no difference in the average demand of customers for chemical container recycling service in industrial, resource, and technology segments. The average demand of customers for chemical container recycling service in industrial segment is also greater than the average demand of customers in consumer industry segment by 1.56 points. Conclusion, the average demand of customers for chemical container recycling service in industrial, resource industrial, and technology industry segments is greater than the average demand of customers for chemical container recycling service in consumer industry segment (industrial = resource = technology > consumer).

5. Test the difference of the average demand of customer in chemical transportation service (MeanPCT) for each customer segment.

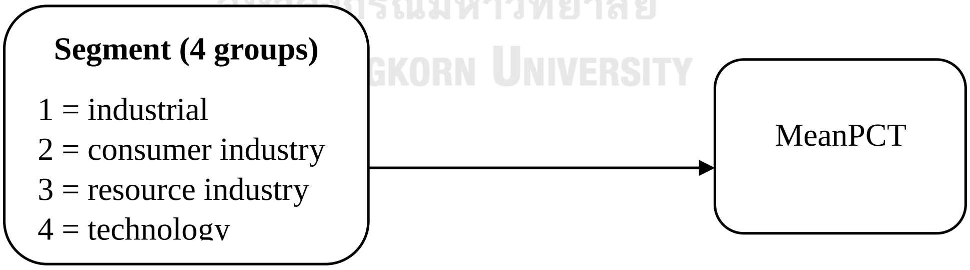


Figure 4.14: *One-Way ANOVA of Segment and MeanPCT*

The objective is to test whether average MeanPCT depends on segment or not. The first step is examining the average variance of MeanPCT of each segment at the significant level of Sig. = .05.

$H_0: \sigma_1^2 = \sigma_2^2 = \cdots = \sigma_k^2, k = 4$

$H_1: at\ least\ one\ pair\ of\ \sigma_i^2 \neq \sigma_j^2, i \neq j$

The result of the test is shown below in Table 4.20. The value of Sig. = .000 can be interpreted that H_0 is rejected and H_1 is accepted. The meaning of this Sig. = .000 is that there is at least one pair of customer segments has different value of the average variance in chemical transportation service.

Table 4.20: *Homogeneity of Variances of MeanPCT for each Segment*

Test of Homogeneity of Variances

MeanPCT

Levene Statistic	df1	df2	Sig.
72.690	3	196	.000

Next, the researcher used Welch's statistic to test the average value of MeanPCT in each segment by setting the following hypothesis:

$$H_0: \mu_1^2 = \mu_2^2 = \cdots = \mu_k^2, k = 4$$

$$H_1: at\ least\ one\ pair\ of\ \mu_i^2 \neq \mu_j^2, i \neq j$$

The result of Welch's statistic test is shown in Table 4.21.

Table 4.21: *Equality of Means in MeanPCT for each Segment*

Robust Tests of Equality of Means

MeanPCT

	Statistic[a]	df1	df2	Sig.
Welch	23.523	3	4.904	.002

a. Asymptotically F distributed.

Based on the result in Table 4.21, Welch's statistic = 23.523 and p-value or Sig. = .002 < .05, null hypothesis (H_0) is rejected and accept H_1. This can be interpreted that there is at least one pair of customer segments has different average value of MeanPCT. The test concludes that the degree of purchase demand for chemical transportation service depends on the customer segments. The next step is to examine which segment has different demand of chemical transportation service. Table 4.22 expresses the result of mean value for each segment.

Table 4.22: *Multiple Comparisons of MeanPCT in each Segment*

Multiple Comparisons

Dependent Variable: MeanPCT

Dunnett T3

(I) Seg	(J) Seg	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Industry	Consumer Industry	1.11995*	.30798	.004	.2790	1.9609
	Resource Industry	-.44672	.40526	.823	-9.8197	8.9263
	Technology	-.75441*	.09302	.000	-1.0104	-.4984
Consumer Industry	Industry	-1.11995*	.30798	.004	-1.9609	-.2790
	Resource Industry	-1.56667	.50061	.216	-4.6801	1.5467
	Technology	-1.87436*	.30827	.000	-2.7163	-1.0324
Resource Industry	Industry	.44672	.40526	.823	-8.9263	9.8197
	Consumer Industry	1.56667	.50061	.216	-1.5467	4.6801
	Technology	-.30769	.40549	.931	-9.6364	9.0210
Technology	Industry	.75441*	.09302	.000	.4984	1.0104
	Consumer Industry	1.87436*	.30827	.000	1.0324	2.7163
	Resource Industry	.30769	.40549	.931	-9.0210	9.6364

*. The mean difference is significant at the 0.05 level.

From the result in Table 4.22, the data shows that there is no difference in the average demand of customers for chemical transportation service in industrial and resource segments. The average demand of customers for chemical transportation service in industrial segment is greater than the average demand of customers in consumer industry segment by 2.35 points, but less than the average demand of customer in technology by .75 points. Moreover, the average demand of customers for chemical transportation service in technology segment is also greater than the average demand of customers in consumer industry segment by 1.87 points. Conclusion, the average demand of customers for chemical transportation service in industrial and resource industry segments is greater than the average demand of customers for chemical transportation service in consumer industry, but less than technology industry segment, respectively (technology > industrial = resource > consumer).

6. Test the difference of the average demand of customer in chemical documentation service (MeanSCD) for each customer segment.

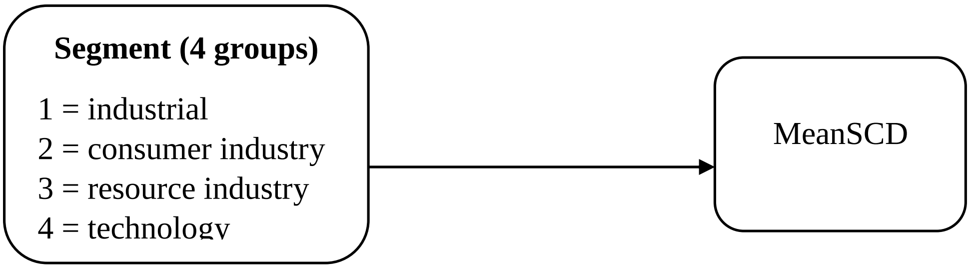


Figure 4.15: *One-Way ANOVA of Segment and MeanSCD*

The objective is to test whether average MeanSCD depends on segment or not. The first step is examining the average variance of MeanSCD of each segment at the significant level of Sig. = .05.

$$H_0: \sigma_1^2 = \sigma_2^2 = \cdots = \sigma_k^2, k = 4$$

$$H_1: at\ least\ one\ pair\ of\ \sigma_i^2 \neq \sigma_j^2, i \neq j$$

The result of the test is shown below in Table 4.23. The value of Sig. = .000 can be interpreted that H_0 is rejected and H_1 is accepted. The meaning of this Sig. = .000 is that there is at least one pair of customer segments has different value of the average variance in chemical documentation service.

Table 4.23: *Homogeneity of Variances of MeanSCD for each Segment*

Test of Homogeneity of Variances

MeanSCD

Levene Statistic	df1	df2	Sig.
33.621	3	196	.000

Next, the researcher used Welch's statistic to test the average value of MeanSCD in each segment by setting the following hypothesis:

$$H_0: \mu_1^2 = \mu_2^2 = \cdots = \mu_k^2, k = 4$$

$$H_1: at\ least\ one\ pair\ of\ \mu_i^2 \neq \mu_j^2, i \neq j$$

The result of Welch's statistic test is shown in Table 4.24.

Table 4.24: *Equality of Means in MeanSCD for each Segment*

Robust Tests of Equality of Means

MeanSCD

	Statistic[a]	df1	df2	Sig.
Welch	6.360	3	4.972	.037

a. Asymptotically F distributed.

Based on the result in Table 4.24, Welch's statistic = 6.36 and p-value or Sig. = .037 < .05, null hypothesis (H_0) is rejected and accept H_1. This can be interpreted that there is at least one pair of customer segments has different average value of MeanSCD. The test concludes that the degree of purchase demand for chemical documentation service depends on the customer segments. The next step is to examine which segment has different demand of chemical documentation service. Table 4.25 expresses the result of mean value for each segment.

Table 4.25: *Multiple Comparisons of MeanSCD in each Segment*

Multiple Comparisons

Dependent Variable: MeanSCD

Dunnett T3

(I) Seg	(J) Seg	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Industry	Consumer Industry	1.27149*	.29302	.000	.4728	2.0702
	Resource Industry	-.70073	.34206	.549	-7.7097	6.3083
	Technology	-.00842	.28395	1.000	-.8669	.8501
Consumer Industry	Industry	-1.27149*	.29302	.000	-2.0702	-.4728
	Resource Industry	-1.97222	.43713	.077	-4.3034	.3590
	Technology	-1.27991*	.39332	.014	-2.3658	-.1941
Resource Industry	Industry	.70073	.34206	.549	-6.3083	7.7097
	Consumer Industry	1.97222	.43713	.077	-.3590	4.3034
	Technology	.69231	.43109	.595	-1.7606	3.1452
Technology	Industry	.00842	.28395	1.000	-.8501	.8669
	Consumer Industry	1.27991*	.39332	.014	.1941	2.3658
	Resource Industry	-.69231	.43109	.595	-3.1452	1.7606

*. The mean difference is significant at the 0.05 level.

From the result in Table 4.25, the data shows that there is no difference in the average demand of customers for chemical transportation service in industrial, resource, and technology segments. The average demand of customers for chemical documentation service in industrial segment is greater than the average demand of customers in consumer industry segment by 1.27 points. Moreover, the average demand of customers for chemical documentation service in technology segment is also greater than the average demand of customers in consumer industry segment by 1.28 points. Conclusion, the average demand of customers for chemical documentation service in industrial, resource, and technology industry segments is greater than the average demand of customers for chemical documentation service in consumer industry. (industrial = resource = technology > consumer).

7. Test the difference of the average demand of customer in chemical environmental and safety program service (MeanKES) for each customer segment.

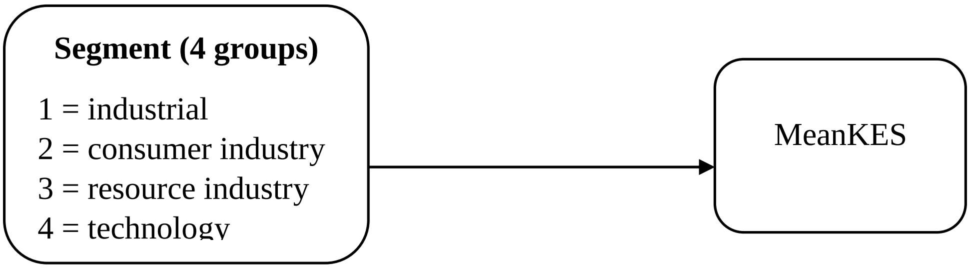


Figure 4.16: *One-Way ANOVA of Segment and MeanKES*

The objective is to test whether average MeanKES depends on segment or not. The first step is examining the average variance of MeanKES of each segment at the significant level of Sig. = .05.

$$H_0: \sigma_1^2 = \sigma_2^2 = \cdots = \sigma_k^2, k = 4$$

$$H_1: at\ least\ one\ pair\ of\ \ \sigma_i^2 \neq \sigma_j^2, i \neq j$$

The result of the test is shown below in Table 4.26. The value of Sig. = .000 can be interpreted that H_0 is rejected and H_1 is accepted. The meaning of this Sig. = .000 is that there is at least one pair of customer segments has different value of the average variance in chemical environmental and safety program service.

Table 4.26: *Homogeneity of Variances of MeanKES for each Segment*

Test of Homogeneity of Variances

MeanKES

Levene Statistic	df1	df2	Sig.
14.332	3	196	.000

Next, the researcher used Welch's statistic to test the average value of MeanKES in each segment by setting the following hypothesis:

$$H_0: \mu_1^2 = \mu_2^2 = \cdots = \mu_k^2, k = 4$$

$$H_1: at\ least\ one\ pair\ of\ \ \mu_i^2 \neq \mu_j^2, i \neq j$$

The result of Welch's statistic test is shown in Table 4.27.

Table 4.27: *Equality of Means in MeanKES for each Segment*

Robust Tests of Equality of Means

MeanKES

	Statistic[a]	df1	df2	Sig.
Welch	14.267	3	4.710	.008

a. Asymptotically F distributed.

Based on the result in Table 4.27, Welch's statistic = 14.267 and p-value or Sig. = .008 < .05, null hypothesis (H_0) is rejected and accept H_1. This can be interpreted that there is at least one pair of customer segments has different average value of MeanKES. The test concludes that the degree of purchase demand for chemical environmental and safety program service depends on the customer segments. The next step is to examine which segment has different demand of chemical environmental and safety program service. Table 4.28 expresses the result of mean value for each segment.

Table 4.28: *Multiple Comparisons of MeanKES in each Segment*

Multiple Comparisons

Dependent Variable: MeanKES

Dunnett T3

(I) Seg	(J) Seg	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Industry	Consumer Industry	2.11007*	.31068	.000	1.2636	2.9565
	Resource Industry	.06423	.60590	1.000	-14.4076	14.5361
	Technology	1.40270*	.42260	.031	.1117	2.6937
Consumer Industry	Industry	-2.11007*	.31068	.000	-2.9565	-1.2636
	Resource Industry	-2.04583	.67038	.312	-9.2439	5.1523
	Technology	-.70737	.51077	.667	-2.1545	.7397
Resource Industry	Industry	-.06423	.60590	1.000	-14.5361	14.4076
	Consumer Industry	2.04583	.67038	.312	-5.1523	9.2439
	Technology	1.33846	.72903	.526	-3.8295	6.5064
Technology	Industry	-1.40270*	.42260	.031	-2.6937	-.1117

	Consumer Industry	.70737	.51077	.667	-.7397	2.1545
	Resource Industry	-1.33846	.72903	.526	-6.5064	3.8295

*. The mean difference is significant at the 0.05 level.

From the result in Table 4.28, the data shows that there is no difference in the average demand of customers for chemical environmental and safety program service in industrial and resource segments. The average demand of customers for chemical environmental and safety program service in industrial segment is greater than the average demand of customers in consumer and technology industry segments by 2.11 and 1.40 points, respectively. Conclusion, the average demand of customers for chemical transportation service in industrial and resource industry segments is greater than the average demand of customers for chemical environmental and safety program service in technology and consumer industry segment (industrial = resource > technology > consumer).

Table 4.29: *Differences in the Average Demand of Customers in each Segment*

No.	Significant Attributes	Industry Segments			
		Industrial	**Consumer**	**Resource**	**Technology**
1	MeanPCP: Chemical Product Only	⬤	●	⬤	⬤
2	MeanPCB: Chemical Blending	⬤	●	⬤	⬤
3	MeanPCS: Chemical Storage	⬤	●	⬤	●
4	MeanPCC: Chemical Container Recycling	⬤	●	⬤	⬤
5	MeanPCT: Transportation	●	•	●	⬤
6	MeanSCD: Chemical Documentation	⬤	●	⬤	⬤
7	MeanKES: Chemical Environmental and Safety Programs	⬤	•	⬤	●

⬤ indicates the highest average demand, ● indicates medium average demand, • indicates the least average demand

Table 4.29 explains the degree of differences in the average demand of customer in each segment for seven significant attributes which are chemical product only (MeanPCP), chemical blending (MeanPCB), chemical storage (MeanPCS), chemical container recycling (MeanPCC), chemical transportation (MeanPCT), chemical documentation (MeanSCD), and chemical environmental and safety programs (MeanKES). Seven significant factors, chemical product only, chemical blending, chemical container recycling, and chemical documentation, are common in the demand levels for customers in industrial, resource and technology segment, followed by the customers in consumer segment. For chemical storage, there is no difference in the average demand of customers in industrial and resource industries, and the average demand of customers in consumer and technology does not differ as well. The average demand of the customers in chemical storage for industrial and resource industries is higher than the average demand of the customers in consumer and technology industries. Unexpectedly, customers in technology segment have highest demand in chemical transportation than any other segments. In addition, the customers in industrial and resource segments have lower demand in chemical transportation than the technology segment, but they have stronger demand than the customers in consumer industry. Finally, the customers in industrial and resource segments have the highest demand in chemical environmental and safety programs, followed by the customers in technology and consumer segments respectively. In conclusion, the customers in industrial, resource, and technology segments have strongest demand in chemical product only, chemical blending, chemical container recycling, and chemical documentation. The customers in technology segment have highest demand in chemical transportation, followed by the customers in industrial and resource segments. The most important evidence is the customers in consumer segment have the least demand in every chemical service mentioned above.

4.7 Differences in the Average Demand for each Customer Size

The next step is to analyze the differences between each customer's company size (small, medium, and large) toward seven significant service offerings obtained from the previous section. Again, those significant variables are MeanPCP, MeanPCB, MeanPCS, MeanPCC, MeanPCT, MeanSCD, and MeanKES. Customers' company sizes are classified into three group which are small (no. of employee < 50), medium (50 < no. of employee < 200), and large (no. of employee > 200). Analysis of variance (ANOVA) is the statistical method to investigate observed variables classified by three groups of data for the relationship with dependent variable. The independent variable, in this study is the company size, has 3 groups, while dependent variable is ratio scale (Vanichbuncha, 2006). The objective of this ANOVA analysis is to examine variance of the dependent variable whether it depends on group of independent variable or not. If the mean scores variance of dependent variable of each group are not the same, we can conclude that the value of dependent variable does not depend on customer segment.

1. Test the difference of the average demand of customer in chemical only service (MeanPCP) for each customer's company size.

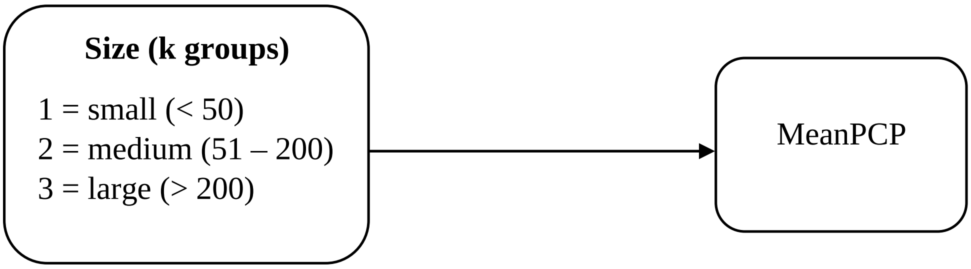


Figure 4.17: *One-Way ANOVA of Company Size and MeanPCP*

The objective is to test whether average MeanPCP depends on company size or not. The first step is examining the average variance of MeanPCP of each group at the significant level of Sig. = .05.

$$H_0: \sigma_1^2 = \sigma_2^2 = \cdots = \sigma_k^2, k = 3$$

$$H_1: at\ least\ one\ pair\ of\ \ \sigma_i^2 \neq \sigma_j^2, i \neq j$$

The result of the test is shown below in Table 4.30. The value of Sig. = .099 can be interpreted that H_0 is accepted. The meaning of this Sig. = .099 is that there is no difference the average variance in MeanPCP variable among each group.

Table 4.30: *Homogeneity of Variances of MeanPCP for each Company Size*

Test of Homogeneity of Variances

MeanPCP

Levene Statistic	df1	df2	Sig.
2.344	2	197	.099

Next, the researcher used F-Test statistic in ANOVA table to test the average value of MeanPCP in each group by setting the following hypothesis:

$$H_0: \mu_1^2 = \mu_2^2 = \cdots = \mu_k^2, k = 3$$

$$H_1: at\ least\ one\ pair\ of\ \ \mu_i^2 \neq \mu_j^2, i \neq j$$

The result of F-test statistic in ANOVA table is shown in Table 4.31

***Table 4.31:** Equality of Means in MeanPCP for each Company Size*

ANOVA

MeanPCP

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	8.190	2	4.095	1.616	.201
Within Groups	499.237	197	2.534		
Total	507.427	199			

Based on the result in Table 4.31, F-Test statistic = 1.616 and p-value or Sig. = .201 > .05, null hypothesis (H_0) is fail to rejected, thus accept H_0. This can be interpreted that the customers in different company size doesn't have different average demand value of chemical product only service (MeanPCP). The test concludes that the degree of purchase demand for chemical product only service does not depend on the customer's company size.

2. Test the difference of the average demand of customer in chemical blending service (MeanPCB) for each customer's company size.

***Figure 4.18:** One-Way ANOVA of Company Size and MeanPCB*

The objective is to test whether average MeanPCB depends on company size or not. The first step is examining the average variance of MeanPCB of each group at the significant level of Sig. = .05.

$$H_0: \sigma_1^2 = \sigma_2^2 = \cdots = \sigma_k^2, k = 3$$

$$H_1: at\ least\ one\ pair\ of\ \ \sigma_i^2 \neq \sigma_j^2, i \neq j$$

The result of the test is shown below in Table 4.32. The value of Sig. = .289 can be interpreted that H_0 is accepted. The meaning of this Sig. = .289 is that there is no difference the average variance in MeanPCB variable among each group.

Table 4.32: *Homogeneity of Variances of MeanPCB for each Company Size*

Test of Homogeneity of Variances

MeanPCB

Levene Statistic	df1	df2	Sig.
1.249	2	197	.289

Next, the researcher used F-Test statistic in ANOVA table to test the average value of MeanPCB in each group by setting the following hypothesis:

$$H_0: \mu_1^2 = \mu_2^2 = \cdots = \mu_k^2, k = 3$$

$$H_1: at\ least\ one\ pair\ of\ \ \mu_i^2 \neq \mu_j^2, i \neq j$$

The result of F-test statistic in ANOVA table is shown in Table 4.33

Table 4.33: *Equality of Means in MeanPCB for each Company Size*

ANOVA

MeanPCB

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	24.501	2	12.251	1.472	.232
Within Groups	1639.246	197	8.321		
Total	1663.747	199			

Based on the result in Table 4.33, F-Test statistic = 1.472 and p-value or Sig. = .232 > .05, null hypothesis (H_0) is fail to rejected, thus accept H_0. This can be interpreted that the customers in different company size doesn't have different average demand value of chemical blending service (MeanPCB). The test concludes that the degree of purchase demand for chemical blending service does not depend on the customer's company size.

3. Test the difference of the average demand of customer in chemical storage (MeanPCS) for each customer's company size.

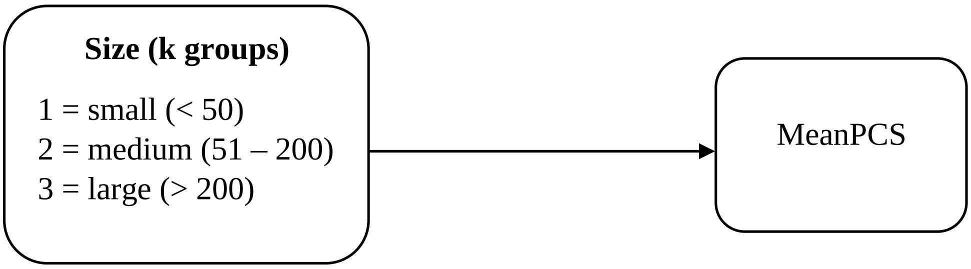


Figure 4.19: *One-Way ANOVA of Company Size and MeanPCS*

The objective is to test whether average MeanPCS depends on company size or not. The first step is examining the average variance of MeanPCS of each group at the significant level of Sig. = .05.

$$H_0: \sigma_1^2 = \sigma_2^2 = \cdots = \sigma_k^2, k = 3$$

$$H_1: at\ least\ one\ pair\ of\ \sigma_i^2 \neq \sigma_j^2, i \neq j$$

The result of the test is shown below in Table 4.34. The value of Sig. = .717 can be interpreted that H_0 is accepted. The meaning of this Sig. = .717is that there is no difference the average variance in MeanPCS variable among each group.

Table 4.34: *Homogeneity of Variances of MeanPCS for each Company Size*

Test of Homogeneity of Variances

MeanPCS

Levene Statistic	df1	df2	Sig.
.334	2	197	.717

Next, the researcher used F-Test statistic in ANOVA table to test the average value of MeanPCS in each group by setting the following hypothesis:

$$H_0: \mu_1^2 = \mu_2^2 = \cdots = \mu_k^2, k = 3$$

$$H_1: at\ least\ one\ pair\ of\ \mu_i^2 \neq \mu_j^2, i \neq j$$

The result of F-test statistic in ANOVA table is shown in Table 4.35

Table 4.35: *Equality of Means in MeanPCS for each Company Size*

ANOVA

MeanPCS

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	34.163	2	17.082	3.564	.030
Within Groups	944.305	197	4.793		
Total	978.469	199			

Based on the result in Table 4.35, F-Test statistic = 3.564 and p-value or Sig. = .030 < .05, null hypothesis (H_0) is rejected, and accept H_1. This can be interpreted that there is at least one pair of customer's company size have different average value of chemical storage (MeanPCS). The test concludes that the degree of purchase demand for chemical storage service depends on the customer's company size. The next step is to examine which group has different demand of chemical storage service. Table 4.36 expresses the result of mean value for each group.

Table 4.36: *Multiple Comparisons of MeanCPS in each Company Size*

Multiple Comparisons

Dependent Variable: MeanPCS

Dunnett T3

(I) Size	(J) Size	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Small	Medium	-.65753	.41592	.310	-1.6672	.3521
	Large	-1.06962*	.40521	.029	-2.0539	-.0853
Medium	Small	.65753	.41592	.310	-.3521	1.6672
	Large	-.41209	.35211	.566	-1.2621	.4379
Large	Small	1.06962*	.40521	.029	.0853	2.0539
	Medium	.41209	.35211	.566	-.4379	1.2621

*. The mean difference is significant at the 0.05 level.

From the result in Table 4.36, the data shows that there is no difference in the average demand of customers for chemical storage service in small and medium size of company. There is also no difference in the average demand in medium size of company comparing with small and large size. However, the average demand of customers for chemical storage service in large company size is significantly greater than the average demand of customers in small company size by 1.07 points. Conclusion, the average demand of customers for chemical storage service in large company size is greater than the average demand of customers for chemical storage service in the small company size.

4. Test the difference of the average demand of customer in chemical container recycling service (MeanPCC) for each customer's company size.

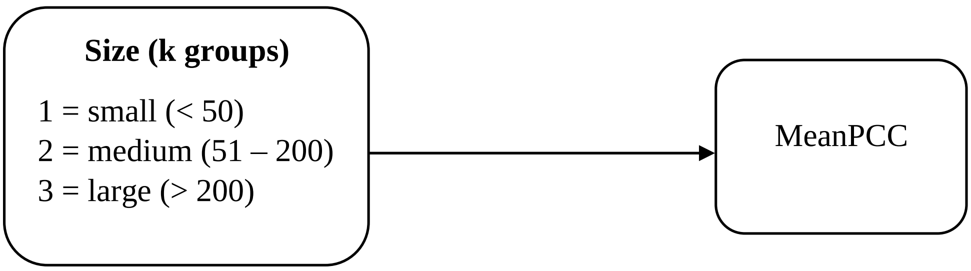


Figure 4.20: *One-Way ANOVA of Company Size and MeanPCC*

The objective is to test whether average MeanPCC depends on company size or not. The first step is examining the average variance of MeanPCC of each group at the significant level of Sig. = .05.

$$H_0: \sigma_1^2 = \sigma_2^2 = \cdots = \sigma_k^2, k = 3$$

$$H_1: at\ least\ one\ pair\ of\ \ \sigma_i^2 \neq \sigma_j^2, i \neq j$$

The result of the test is shown below in Table 4.37. The value of Sig. = .047 can be interpreted that H_0 is rejected. The meaning of this Sig. = .047 is that at least one pair of company size have different value of the average variance in chemical container recycling service.

Table 4.37: *Homogeneity of Variances of MeanPCC for each Company Size*

Test of Homogeneity of Variances

MeanPCC

Levene Statistic	df1	df2	Sig.
3.108	2	197	.047

Next, the researchers used Welch's statistic to test the average value of MeanPCC in each segment by setting the following hypothesis:

$$H_0: \mu_1^2 = \mu_2^2 = \cdots = \mu_k^2, k = 3$$

$$H_1: at\ least\ one\ pair\ of\ \ \mu_i^2 \neq \mu_j^2, i \neq j$$

The result of Welch statistic test is shown in Table 4.38

Table 4.38: *Equality of Means in MeanPCC for each Company Size*

Robust Tests of Equality of Means

MeanPCC

	Statistic[a]	df1	df2	Sig.
Welch	2.844	2	112.857	.062

a. Asymptotically F distributed.

Based on the result in Table 4.38, Welch statistic = 2.844 and p-value or Sig. = .062 > .05, null hypothesis (H_0) is fail to rejected, thus accept H_0. This can be interpreted that the customers in different company size doesn't have different average demand value of chemical container recycling service (MeanPCC). The test concludes that the degree of purchase demand for chemical container recycling service does not depend on the customer's company size.

5. Test the difference of the average demand of customer in chemical transportation (MeanPCT) for each customer's company size.

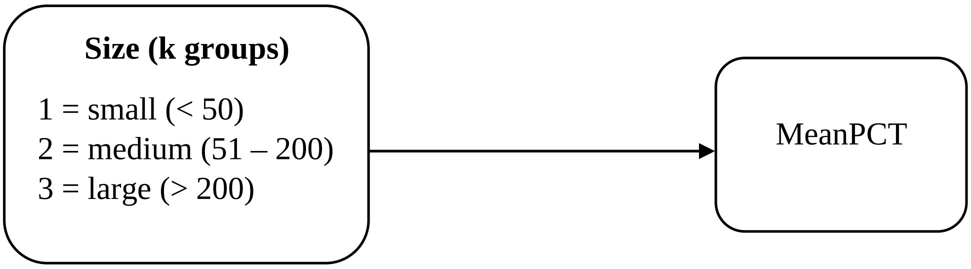


Figure 4.21: *One-Way ANOVA of Company Size and MeanPCT*

The objective is to test whether average MeanPCT depends on company size or not. The first step is examining the average variance of MeanPCT of each group at the significant level of Sig. = .05.

$$H_0: \sigma_1^2 = \sigma_2^2 = \cdots = \sigma_k^2, k = 3$$

$$H_1: at\ least\ one\ pair\ of\ \ \sigma_i^2 \neq \sigma_j^2, i \neq j$$

The result of the test is shown below in Table 4.39. The value of Sig. = .000 can be interpreted that H_0 is rejected and H_1 is accepted. The meaning of this Sig. = .000 is that there is at least one pair of customer company size have different value of the average variance in chemical transportation service.

Table 4.39: *Homogeneity of Variances of MeanPCT for each Company Size*

Test of Homogeneity of Variances

MeanPCT

Levene Statistic	df1	df2	Sig.
15.814	2	197	.000

Next, the researchers used Welch statistic to test the average value of MeanPCT in each group by setting the following hypothesis:

$$H_0: \mu_1^2 = \mu_2^2 = \cdots = \mu_k^2, k = 3$$

$$H_1: at\ least\ one\ pair\ of\ \ \mu_i^2 \neq \mu_j^2, i \neq j$$

The result of Welch statistic shown in Table 4.40

Table 4.40: *Equality of Means in MeanPCT for each Company Size*

Robust Tests of Equality of Means

MeanPCT

	Statistic[a]	df1	df2	Sig.
Welch	11.687	2	97.885	.000

a. Asymptotically F distributed.

Based on the result in Table 4.40, Welch statistic = 11.687 and p-value or Sig. = .000 < .05, null hypothesis (H_0) is rejected, and accept H_1. This can be interpreted that there is at least one pair of customer's company size have different average value of chemical transportation (MeanPCT). The test concludes that the degree of purchase demand for chemical transportation service depends on the customer's company size. The next step is to examine which group has different demand of chemical transportation service. Table 4.41 expresses the result of mean value for each group.

Table 4.411; *Multiple Comparisons of MeanPCT in each Company Size*

Multiple Comparisons

Dependent Variable: MeanPCT

Dunnett T3

(I) Size	(J) Size	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Small	Medium	-.60850	.28397	.100	-1.2991	.0821
	Large	-1.10564*	.25037	.000	-1.7199	-.4914
Medium	Small	.60850	.28397	.100	-.0821	1.2991
	Large	-.49714*	.18260	.022	-.9395	-.0548
Large	Small	1.10564*	.25037	.000	.4914	1.7199
	Medium	.49714*	.18260	.022	.0548	.9395

*. The mean difference is significant at the 0.05 level.

From the result in Table 4.41, the data shows that there is no difference in the average demand of customers for chemical transportation service in small and medium size of company. There is also no difference in the average demand in medium size of company comparing with small and large size of companies. However, the average demand of customers for chemical transportation service in large company size is significantly greater than the average demand of customers in small company size by 1.11 points. Conclusion, the average demand of customers for chemical transportation service in large company size is greater than the average demand of customers for chemical transportation service in the small company size.

6. Test the difference of the average demand of customer in chemical documentation (MeanSCD) for each customer's company size.

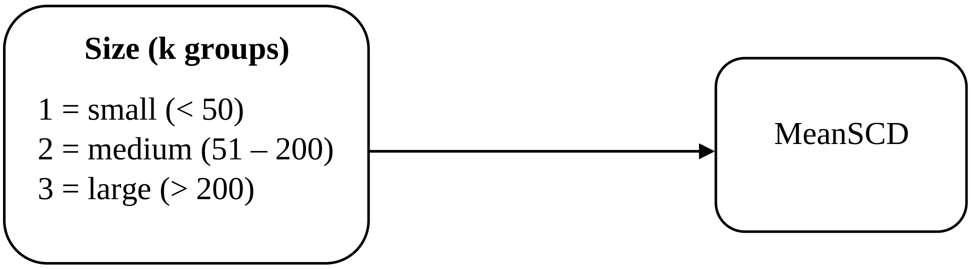


Figure 4.22: *One-Way ANOVA of Company Size and MeanSCD*

The objective is to test whether average MeanSCD depends on company size or not. The first step is examining the average variance of MeanSCD of each group at the significant level of Sig. = .05.

$H_0: \sigma_1^2 = \sigma_2^2 = \cdots = \sigma_k^2, k = 3$

$H_1: at\ least\ one\ pair\ of\ \ \sigma_i^2 \neq \sigma_j^2, i \neq j$

The result of the test is shown below in Table 4.42. The value of Sig. = .000 can be interpreted that H_0 is rejected and H_1 is accepted. The meaning of this Sig. = .000 is that there is at least one pair of customer company size have different value of the average variance in chemical documentation service.

Table 4.42: *Homogeneity of Variances of MeanSCD for each Company Size*

Test of Homogeneity of Variances

MeanSCD

Levene Statistic	df1	df2	Sig.
9.008	2	197	.000

Next, the researchers used Welch statistic to test the average value of MeanSCD in each group by setting the following hypothesis:

$H_0: \mu_1^2 = \mu_2^2 = \cdots = \mu_k^2, k = 3$

$H_1: at\ least\ one\ pair\ of\ \ \mu_i^2 \neq \mu_j^2, i \neq j$

The result of Welch statistic shown in Table 4.43

Table 4.43: *Equality of Means in MeanSCD for each Company Size*

Robust Tests of Equality of Means

MeanSCD

	Statistic[a]	df1	df2	Sig.
Welch	8.437	2	105.662	.000

a. Asymptotically F distributed.

Based on the result in Table 4.43, Welch statistic = 8.437 and p-value or Sig. = .000 < .05, null hypothesis (H_0) is rejected, and accept H_1. This can be interpreted that there is at least one pair of customer's company size have different average value of chemical documentation (MeanSCD). The test concludes that the degree of purchase demand for chemical documentation service depends on the customer's company size. The next step is to examine which group has different demand of chemical documentation service. Table 4.44 expresses the result of mean value for each group.

Table 4.44: *Multiple Comparisons of MeanSCD in each Company Size*

Multiple Comparisons

Dependent Variable: MeanSCD

Dunnett T3

(I) Size	(J) Size	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Small	Medium	-.67561	.28025	.053	-1.3570	.0058
	Large	-1.03252*	.25599	.000	-1.6583	-.4068
Medium	Small	.67561	.28025	.053	-.0058	1.3570
	Large	-.35692	.19517	.194	-.8288	.1149
Large	Small	1.03252*	.25599	.000	.4068	1.6583
	Medium	.35692	.19517	.194	-.1149	.8288

*. The mean difference is significant at the 0.05 level.

From the result in Table 4.44, the data shows that there is no difference in the average demand of customers for chemical documentation service in small and medium size of company. There is also no difference in the average demand in medium size of company comparing with small and large size of companies. However, the average demand of customers for chemical documentation service in large company size is significantly greater than the average demand of customers in small company size by 1.03 points. Conclusion, the average demand of customers for chemical documentation service in large company size is greater than the average demand of customers for chemical documentation service in the small company size.

7. Test the difference of the average demand of customer in chemical documentation (MeanKES) for each customer's company size.

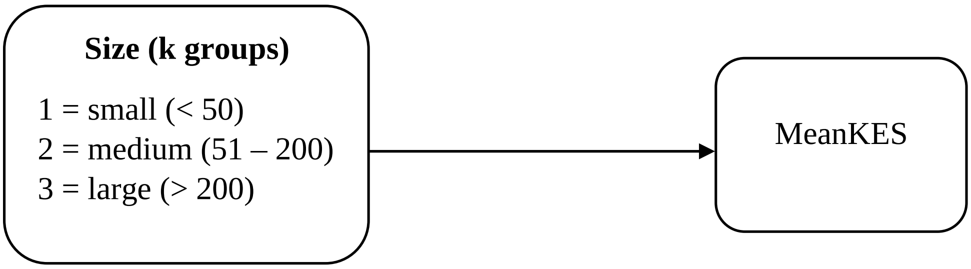


Figure 4.23: *One-Way ANOVA of Company Size and MeanKES*

The objective is to test whether average MeanKES depends on company size or not. The first step is examining the average variance of MeanKES of each group at the significant level of Sig. = .05.

$$H_0: \sigma_1^2 = \sigma_2^2 = \cdots = \sigma_k^2, k = 3$$

$$H_1: at\ least\ one\ pair\ of\ \ \sigma_i^2 \neq \sigma_j^2, i \neq j$$

The result of the test is shown below in Table 4.45. The value of Sig. = .000 can be interpreted that H_0 is rejected and H_1 is accepted. The meaning of this Sig. = .000 is that there is at least one pair of customer company size have different value of the average variance in chemical environmental and safety program service.

Table 4.45: *Homogeneity of Variances of MeanKES for each Company Size*

Test of Homogeneity of Variances

MeanKES

Levene Statistic	df1	df2	Sig.
8.189	2	197	.000

Next, the researchers used Welch statistic to test the average value of MeanKES in each group by setting the following hypothesis:

$$H_0: \mu_1^2 = \mu_2^2 = \cdots = \mu_k^2, k = 3$$

$$H_1: at\ least\ one\ pair\ of\ \ \mu_i^2 \neq \mu_j^2, i \neq j$$

The result of Welch statistic shown in Table 4.46

Table 4.46: *Equality of Means in MeanSCD for each Company Size*

Robust Tests of Equality of Means

MeanKES

	Statistic[a]	df1	df2	Sig.
Welch	11.375	2	105.297	.000

a. Asymptotically F distributed.

Based on the result in Table 4.46, Welch statistic = 11.375 and p-value or Sig. = .000 < .05, null hypothesis (H_0) is rejected, and accept H_1. This can be interpreted that there is at least one pair of customer's company size have different average value of chemical environmental and safety program (MeanKES). The test concludes that the degree of purchase demand for chemical environmental and safety program service depends on the customer's company size. The next step is to examine which group has different demand of chemical environmental and safety program service. Table 4.47 expresses the result of mean value for each group.

Table 4.47: *Multiple Comparisons of MeanKES in each Company Size*

Multiple Comparisons

Dependent Variable: MeanKES

Dunnett T3

(I) Size	(J) Size	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Small	Medium	-.77774	.33876	.070	-1.6025	.0470
	Large	-1.41044*	.31596	.000	-2.1832	-.6377
Medium	Small	.77774	.33876	.070	-.0470	1.6025
	Large	-.63270*	.22615	.018	-1.1792	-.0862
Large	Small	1.41044*	.31596	.000	.6377	2.1832
	Medium	.63270*	.22615	.018	.0862	1.1792

*. The mean difference is significant at the 0.05 level.

From the result in Table 4.47, the data shows that there is no difference in the average demand of customers for chemical environmental and safety program service in small and medium size of company. However, the average demand of customers for chemical environmental and safety program service in large company size is significantly greater than the average demand of customers in small and medium company size by 1.41 and .63 points respectively. Conclusion, the average demand of customers for chemical environmental and safety program service in large company size is greater than the average demand of customers for chemical environmental and safety program service in the small and medium company size. Thus, customers in the large company size have the highest demand of chemical environmental and safety program.

Table 4.48: *The Average Demand of Customers in each Company Size*

No.	Significant Attributes	Customers' Company Size		
		Small (< 50)	Medium (50 – 200)	Large (> 200)
1	MeanPCP: Chemical Product Only	7.96	8.30	8.49
2	MeanPCB: Chemical Blending	6.11	7.02	6.74
3	MeanPCS: Chemical Storage	7.00**	7.66	8.07**
4	MeanPCC: Chemical Container Recycling	7.15	8.13	7.84
5	MeanPCT: Transportation	8.28**	8.89	9.38**
6	MeanSCD: Chemical Documentation	8.01**	8.69	9.05**
7	MeanKES: Chemical Environmental and Safety Programs	7.23**	8.00**	8.64**

** Indicates the significant value at .05 level.

From the data in Table 4.48, the result shows that the average demand of customers in chemical product only (MeanPCP), chemical blending (MeanPCB), and chemical container recycling (MeanPCC) services does not depend on the company size. Thus, customers in different group of company size do not have different level of the average demand in those above services.

Taking a look at only services that customer demand depends on company size at .05 significant level, these services are chemical storage (MeanPCS), chemical transportation (MeanPCT), chemical documentation (MeanSCD), and chemical environmental and safety programs (MeanKES). For chemical storage (MeanPCS) service, customers in large company size have the highest demand. Based on the statistic result, the customers in the large company size have significantly higher demand in chemical storage than the customers in small size company by 1.07 points. The next significant service is chemical transportation (MeanPCT) service. The result shows that customers in large company size have the highest demand. Moreover, the customers in the large company size have significantly higher demand in chemical transportation than the customers in small size company by 1.11 points. The third significant service is chemical documentation (MeanSCD) service. The result shows that customers in large company size have the highest demand. Also, the customers in the large company size have significantly higher demand in chemical documentation than the customers in small size company by 1.04 points. The last significant service is chemical environmental and safety program (MeanKES) service. The result shows that customers in large company size have the highest demand. Likewise, the customers in the large company size have significantly higher demand in chemical environmental and safety program than the customers in small and medium size company by 1.41 and .63 points respectively.

After the researchers found that type of industry and company size have significantly impact on the demand of customer in some chemical services, the results also show that customers in industrial segment and customers in large company size have the highest demand in those significant services. However, sub-segment of the company type under the industrial segment needs to examine. There are 9 sub-segments under the industrial segment which are Adhesive, Ink, Packaging, Color, Petrochemical, Resin, Thinner, Tyre (wheel), and Others. Table 4.49 shows the result of the average demand of customers in each company type or industrial sub-segment.

Table 4.49: *The Average Demand of Customers in each Company Type (Industrial Sub-Segment)*

No.	Significant Attributes	Customers' Company Type (Industrial Sub-Segment)								
		Adhesive	Ink	Packaging	Color	Petrochemical	Resin	Thinner	Tyre	Others
1.	MeanPCP: Chemical Product Only	8.78**	8.25	9.13**	9.17**	6.88**	8.83**	8.61**	8.68**	8.75**
2.	MeanPCB: Chemical Blending	6.72	8.56**	7.93**	8.12**	4.93**	7.50	6.74	8.97**	6.17
3.	MeanPCS: Chemical Storage	8.34	8.06	9.33**	8.92**	7.31**	9.08**	8.71**	9.06	7.69
4.	MeanPCC: Chemical Container Recycling	8.53**	8.71**	9.33**	8.53**	5.76**	9.00**	8.67**	9.00**	7.31
5.	MeanPCT: Transportation	9.13	8.98	9.28	9.32	9.02	9.17	9.05	9.13	9.30
6.	MeanSCD: Chemical Documentation	9.12	8.71	9.20	8.84	9.22	8.44	8.78	9.04	9.00
7	MeanKES: Chemical Environmental and Safety Programs	8.91	8.38	9.08	8.66	8.32	9.23	8.33	9.43	8.45

** Indicates the significant value at .05 level.

The results from Table 4.49 show that the industrial sub-segment has significantly different in the average demand of customers in different company type for the service of chemical product only (MeanPCP), chemical blending (MeanPCB), chemical storage (MeanPCB), and chemical container recycling (MeanPCC). Among these services, companies in Petrochemical type have the significant lowest average demand comparing with others. Moreover, companies in Color type have the significant highest demand in chemical product only service (MeanPCP); companies in Tyre type have the significant highest demand in chemical blending service (MeanPCB); and companies in Packaging type have the significant highest demand in chemical storage (MeanPCK) and chemical container recycling services (MeanPCC).

The results at the last three items from Table 4.49 indicate that customers in the different industrial sub-segments do not have different average demand in chemical transportation (MeanPCT), chemical documentation (MeanPCD), and chemical environmental and safety programs (MeanKES) services. This means the average in demand of these services does not rely on types of company in the industrial sub-segments.

CHAPTER 5
DISCUSSION AND CONCLUSION

This chapter reviews the study that has been presented. The chapter starts from a brief review of the study including the research objectives, framework, and methodology. Then, the major findings of the study were discussed. This section explains the finding from data analysis and the significance from the previous chapter. The next section is the conclusion of this research. Lastly, the discussion on the limitations and direction for future study are carried out.

5.1 Overview of the Study

The objectives of the study are to develop servitization framework for chemical suppliers in Thailand, to apply the framework of the service level to identify the differences between each group of customers, and to provide the guidance to chemical suppliers to improve product service system. Due to many chemical suppliers in developed countries changed their business models from selling tangible product only to providing chemical solution services to customers, Thai chemical suppliers should prepare themselves to be ready for chemical product transition or servitization. The study identified chemical servitization into four groups of service levels which are chemical product only, service added to the product, service differential the product, and service is the product.

Respondents in this research are companies in chemical supply chain in Thailand which can be divided into three groups as 1) end-users or manufacturers, 2) tier-1: sub dealers or suppliers, and 3) tier-2: dealers or wholesalers. The research tools for this study is questionnaire survey distributed to respondents. The researchers distributed 30 pilot questionnaires to staff of the chemical distributor to ask their customers, and the sample size of this study is 200.

To accomplish the research objectives, few data analysis techniques are used including descriptive statistics, Multiple Linear Regression Model, Multinomial Logit Model, and Analysis of Variance (ANOVA).

5.2 Major Findings

Twelve factors were examined for the relationship between 4-category service levels and chemical customer requirements. The research findings highlight the seven significant attributes of chemical services which are chemical product only, chemical blending, chemical storage, chemical container recycling, chemical transportation, chemical document, and environmental and safety programs. The marginal effects explain better view for chemical supplier to improve their services on which determinants should be focused. There were several guidelines for chemical suppliers to propose service offerings to their customers from this research.

There are several research questions presented in the Chapter 1, this chapter will provide the answers based on the research results as follows:

<u>From Research Question 1 to Research Objective 1</u>:

1. What are the servitization framework for chemical suppliers to shift to product service integration business strategy for different types of customers in chemical industry?

   Answer:

   The servitization framework for chemical supplier has been presented in the research framework that has two parts. The first part was the 3-diemnsion of customer segments, 4-category servitization levels, and PSK system. The second part is the services recommended to the suppliers, see Figure 1.9, Conceptual Framework: Proposed Servitization Framework.

   1.1 What are the appropriate servitization levels for customers in chemical industry? (Research question 1-A)

   Answer:

Servitization levels are also mentioned in chemical industry in similar ways as in other manufacturing industries. Thoben et al. (2001) proposed the extended product concept that concists of three layers namely core product, product shell, and non-tangible product. Later, Chen and Gusmeroli (2015) proposed the migration process of Thoben et al. (2001) work to the extended product elements as a transforming concept from tangible product to intangivle service and finally service as the product. This concept starting point is the pure manufacturer traditionally provide chemical product in large volume. The next level is chemical supplier offers some product related services such as transportation. Chemical supplier may also provide other different services not directly related to the chemical product. Lastly, the chemical suppliers focus on providing intangible services with the add on tangible product (Buschak & Lay, 2014; Chen & Cusmeroli, 2015; Kortman et al., 2006).

Research Question 2 to Research Objective 2:

2. What is the servitization framework for chemical suppliers to select the appropriate servitization level to serve the customer in different groups? (Research question 2)

2.1 How many groups of customers can be divided? (Research question 2-A)

Answer:

Customers can be grouped into two ways as grouped by size and type of industry.

Customer segment by company size:

- Small size (number of employee < 50)
- Medium size (number of employee is from 50 to 200)
- Large size (number of employee > 200)

Customer segment by type of industry:

- Industrial industry
- Consumer industry
- Resource industry
- Technology industry

2.2 What are customers' needs in each segment? (Research question 2-B)

Answer:

Firstly, the researcher will describe the differences of demand for customers in each company size. Table 5.1 below is the duplicate of Table 4.48 showing the average demand of customers in each company size. The table expresses the average demand of customers in different company size towards seven significant services. The data indicates that customers in large company size have significantly higher demand in chemical storage, chemical transportation, chemical documentation, and chemical environmental and safety programs than the customers in small size of company. However, the results of the rest indicate that the customers in different size of company do not have different average demand in chemical product only, chemical blending, and chemical container recycling services. In these services, the customers in medium company size have the highest average demand followed by the customers large and small company size respectively.

***Table 5.1:** The Average Demand of Customers in each Company Size*

No.	Significant Attributes	Customers' Company Size		
		Small (< 50)	**Medium (50 – 200)**	**Large (> 200)**
1	MeanPCP: Chemical Product Only	7.96	8.30	8.49
2	MeanPCB: Chemical Blending	6.11	7.02	6.74
3	MeanPCS: Chemical Storage	7.00**	7.66	8.07**
4	MeanPCC: Chemical Container Recycling	7.15	8.13	7.84
5	MeanPCT: Transportation	8.28**	8.89	9.38**
6	MeanSCD: Chemical Documentation	8.01**	8.69	9.05**
7	MeanKES: Chemical Environmental and Safety Programs	7.23**	8.00**	8.64**

** Indicates the significant value at .05 level.

Secondly, the researchers will explain about customers' requirements for each segment. Table 5.2 is the duplicate of Table 4.29 showing the differences in the average demand of customers in industry segment. The results express that customers in industrial segment have the greatest demand in the seven significant chemical services, while the customers in consumer industry have the least demand in those services.

***Table 5.2:** Differences in the Average Demand of Customers in each Segment*

No.	Significant Attributes	Industry Segments			
		Industrial	**Consumer**	**Resource**	**Technology**
1	MeanPCP: Chemical Product Only	⬤	●	⬤	⬤
2	MeanPCB: Chemical Blending	⬤	●	⬤	⬤
3	MeanPCS: Chemical Storage	⬤	●	⬤	●
4	MeanPCC: Chemical Container Recycling	⬤	●	⬤	⬤
5	MeanPCT: Transportation	●	•	●	⬤
6	MeanSCD: Chemical Documentation	⬤	●	⬤	⬤
7	MeanKES: Chemical Environmental and Safety Programs	⬤	•	⬤	●

⬤ indicates the highest average demand, ● indicates medium average demand, • indicates the least average demand

In addition, research findings from the result of ANOVA in the Chapter 4 can identify the differences in the average demand of customers in each segment. Customers in industrial, resource, and technology segments have the common average demand in chemical product only, chemical blending, chemical container recycling, and chemical documentation services. Customers in these segments have higher average demand in those services than the consumer segment. In different types of services, the customers in technology segment has less demand in chemical environmental and safety programs than the industrial and resource segments, but greater than consumer segment. For the chemical storage service, customers in industrial and resource segments have higher average demand than the customers in consumer and technology segments. Finally, for chemical transportation service, customers in technology segment has higher average demand than the customers in industrial, resource, and consumer segments respectively.

2.3 What are the servitization levels that appropriate to the customer in each segment? (Research question 2-C)

Answer:

Based on the results of Table 5.3 which is the duplicate one of Table 4.7, 4-category servitization levels can be classified by the requirement of seven significant services. The first category, chemical product only, is the service level for customers who want chemical product only, chemical container recycling, and chemical transportation services because these services have positive marginal effect toward the service level of product only category. However, the second category, service added to the product, does not have any chemical services that have enough impact to be include in this category. The third category, service differential the product, is the service level for customers who require chemical documentation and chemical environmental and safety programs services because these services have positive marginal effect toward the service level of service differential the product category. Likewise, the last category, service is the product, is the service level for customers who want chemical blending, chemical storage, chemical documentation, and chemical environmental and safety program services.

Table 5.3: *Logit Average Marginal Effects of Significant Factors of Servitization Levels*

No.	Significant Attributes	Logit average marginal effects			
		Product Only	Service Added to the Product	Service Differential the Product	Service is the Product
1	MeanPCP: Chemical Product Only	0.054	0.0003	-0.015	-0.039
2	MeanPCB: Chemical Blending	-0.008	-0.006	-0.006	0.020
3	MeanPCS: Chemical Storage	-0.013	-0.010	-0.009	0.033
4	MeanPCC: Chemical Container Recycling	0.012	0.009	0.008	-0.029
5	MeanPCT: Transportation	0.115	-0.008	-0.069	-0.069
6	MeanSCD: Chemical Documentation	-.066	-.008	.039	.035
7	MeanKES: Chemical Environmental and Safety Programs	-.005	-.024	.015	.014

Then the researchers made a cross check of the result from Table 5.3 and Table 5.2 to find out the servitization level that appropriate to the customers in each segment, and the result is shown in Table 5.4.

Table 5.4: *Servitization Levels for Customer in Each Segment*

Servitization Level	Industrial Segment	Consumer Segment	Resource Segment	Technology Segment
Chemical Product Only	✓		✓	✓
Service Added to the Product				
Service Differential the Product	✓		✓	✓
Service is the Product	✓		✓	

Based on the result in Table 5.4, the researchers conclude that servitization levels that appropriate to the customers in industrial and resource segment are chemical product only, service differential the product, and service is the product. Whereas, servitization levels suitable to the customers in technology segment are chemical product only and service differential the product.

2.4 Based on the servitization framework with an implementation to chemical industry in Thailand, which types of services that chemical suppliers should servitize to serve demand of customers in different segment? (Research question 2-D).

Answer:

Table 5.5 presents the result that the researchers got from Chapter 4 for services that chemical suppliers should servitize to customers in each segment as follows:

- Chemical suppliers should servitize several services to serve customers in both industrial and resource segments such as chemical product only, chemical blending, chemical storage, chemical container recycling, chemical documentation, and chemical environmental and safety program.
- Chemical suppliers should also servitize several services such as, chemical product only, chemical blending, chemical container recycling, chemical transportation, and chemical documentation.

Table 5.5: *Recommended Services for Customers in each Segment*

No.	Significant Attributes	Industry Segments			
		Industrial	Consumer	Resource	Technology
1	MeanPCP: Chemical Product Only	✓		✓	✓
2	MeanPCB: Chemical Blending	✓		✓	✓
3	MeanPCS: Chemical Storage	✓		✓	
4	MeanPCC: Chemical Container Recycling	✓		✓	✓
5	MeanPCT: Transportation				✓
6	MeanSCD: Chemical Documentation	✓		✓	✓
7	MeanKES: Chemical Environmental and Safety Programs	✓		✓	

2.5 Which servitization levels should be provided by the suppliers to its customer? (Research question 2-E)

Answer:

Chemical suppliers might not sure which servitization levels they should provide for their customers. Many suppliers are already at chemical product only level and want to move forward to provide more services. However, many suppliers who provide chemical product only level are satisfy with this business model, but in fact they need to include some other services as well.

2.6 Which group of customer require the highest servitization level? (Research question 2-F)

Answer:

To answer this question, the researchers went back with Table 5.3 and looked at the last servitization level which is service as the product. There are four services that have positive marginal effect namely chemical blending (MeanPCB), chemical storage (MeanPCS), chemical documentation (MeanSCD), and chemical environmental and safety program (MeanKES). Thus, the researchers calculated the mean values of each segment for those four services as shown in Table 5.6.

Table 5.6: *The Average Demand of Customers in each Segment towards Four Services at the Service as the Product Level*

Segment	MeanPCB	MeanPCS	MeanSCD	MeanKES
Industrial	7.0146	8.4416	8.9659	8.6642
Consumer Industry	5.5000	6.0938	7.6944	6.5542
Resource Industry	6.0000	6.0000	9.6667	8.6000
Technology	7.7885	5.5000	8.9744	7.2615
Total	6.6913	7.6625	8.6683	8.0660

The result shows that customers in the industrial segment has the highest average demand in chemical storage (MeanPCS) and chemical environmental and safety program (MeanKES) services. Meanwhile, customers in technology segment has the highest average demand in chemical blending (MeanPCB) and chemical documentation (MeanSCD) services. These two segments have the highest demand in two services equally. Thus, the researchers made another table to combine total average demand of all services under service as the product level as in Table 5.7.

Table 5.7: *The Average Demand of Customers in each Segment towards the Service as the Product Level*

Segment	Mean of 4 Services under Service is the Product Level	N	Std. Deviation
Industrial	8.2716	137	1.07922
Consumer Industry	6.4606	48	1.54087
Resource Industry	7.5667	2	1.86205
Technology	7.3811	13	.89269
Total	7.7720	200	1.42102

The results of table 5.7 show that customers in industrial segment have the highest average demand in four services under service as the product level, followed by customers in resource, technology, and consumer segment respectively. The results also show that customers in industrial segment is also the majority group. Thus, the chemical supplier company should offer these services to the customers because they have the greatest demand. Therefore, to answer this question, the customers in industrial segment require the highest servitization level.

Research Question 3 to Research Objective 3

3. What are the guidance for chemical suppliers on the appropriate ways about the service levels of product service integration? (Research question 3).

Answer:

From Table 5.3 and Table 5.4, the researchers suggested that for chemical suppliers who propose chemical product only service should offer not only selling chemical products in large volume for discount prices, but also providing chemical container recycling together with their services. Suppliers who want to change their business model to service differential the product should also offer chemical documentation and environmental and safety programs services because their customers want extra services rather than just the chemical products only. Chemical providers who desire to change their business model from selling tangible product to chemical solutions should offer chemical blending, chemical storage, chemical documentation, and environmental and safety programs as bundle services along with the chemical products to their customers.

However, the study didn’t give any suggestions for the suppliers who propose service with the product business model because the research results show that all seven significant factors do not have big enough impact toward this servitization level. Even though chemical product only and chemical container recycling services have positive marginal effects towards service added to the product level, but the numbers were less than 1% which can be interpreted that these possible impacts were too low to have influences.

Now the researchers want to know the average demand of each segment for seven services because the Table 5.4 didn't show the appropriate servitization level for customer in consumer industry. Table 5.8 shows the results of the average demand of customers in each segment for all seven significant services.

Table 5.8: *The Average Demand of Customers in each Segment towards all Seven Significant Services*

Segment	**MeanPCP**	**MeanPCB**	**MeanPCS**	**MeanPCC**	**MeanPCT**	**MeanSCD**	**MeanKES**
Industrial	8.6000	7.0146	8.4416	8.1922	9.1533	8.9659	8.6642
Consumer	7.2125	5.5000	6.0938	6.6319	8.0333	7.6944	6.5542
Resource	8.1000	6.0000	6.0000	6.8333	9.6000	9.6667	8.6000
Technology	9.0615	7.7885	5.5000	7.7949	9.9077	8.9744	7.2615

Based on the table 5.8, confirmed the results of Table 5.4 such that customers in the industrial segment have very high demand in all seven significant services. This means, customers in industrial segment should be servitized in either chemical product only, service differential the product or service is the product levels according to their requests. Similarly, customers in resource segment should also get the same servitization levels as the customers in industrial segment, but noted that they have less average demand than the customers in industrial segment. While customers in technology segment have very high demand in chemical product only (MeanPCP), chemical container recycling (PCC), chemical transportation (MeanPCT), and chemical document (MeanSCD). Thus, customers in technology segment should be servitized in chemical product only and service differential the product levels.

Now the researchers need to identify which servitization level is appropriate for customers in consumer segment. Table 5.8 expresses that the top four services that have highest average demand for this segment are chemical transportation (MeanPCT), chemical documentation (MeanSCD), chemical product only (MeanPCP), and chemical container recycling (MeanPCC), respectively. This can be interpreted that customers in consumer segment should be servitized in chemical product only and service differential the product levels.

After combining all results together, the researchers provide the guidance for the appropriate ways about the servitization levels of product service integration as shown in Table 5.9.

Table 5.9: *Guidance for Servitization Levels of Product Service Integration*

Steps	Details
1. Check your current business status.	Ask yourself whether your company is suffering from providing mainly chemical product with high competition? If yes, go to step 2.
2. Select your service capabilities and customer segments	Check at yourself which services (from seven significant services) you are willing and able to offer to your customers. • Chemical product only • Chemical blending • Chemical storage • Chemical container recycling • Chemical transportation • Chemical documentation • Chemical environment and safety programs Check your customers (from four customer segments). • Industrial • Consumer • Resource • Technology
3. Select suitable servitization level	After you have listed services you can provide and group of your customers, select your servitization level option(s). **Servitization Level Option 1**: Chemical product only Suitable segments: • Industrial (adhesive, packaging, color, resin, thinner, and tyre) • Consumer • Resource • Technology Service offering: • Chemical product only • Chemical container and recycling • Chemical transportation. **Servitization Level Option 2**: Service differential the product Suitable segments: • Industrial (adhesive, ink, packaging, petrochemical, resin, and tyre) • Consumer • Technology Service offering: • Chemical documentation • Chemical environmental and safety program.

	Servitization Option 3: Service is the product Suitable segment: • Industrial (packaging, color, resin, tyre) Service offering: • Chemical blending • Chemical storage • Chemical documentation • Chemical environmental and safety program

5.3 Conclusions

The objectives of this paper were achieved. Firstly, chemical servitization framework was developed and consisted of two parts. The first part of the framework was composed of the three dimensions of customer segments, servitization levels and PSK system, and the second part was the suggestions for Thai chemical suppliers. The research explored the relationship between 4-category service levels and chemical customer requirements. The four service levels were product only, service added to the product, service differential the product and service is the product (Thoben et al., 2001), and each service level has its own attractiveness of services to be composed of. The questionnaire was distributed to gather data, and descriptive statistics, Multiple Linear Regression, Multinomial Logit Model (MNL), and ANOVA were adopted for data analysis. Secondly, seven substantial factors were identified in order to analyze the service level of customer needs. These significant attributes were chemical product only, chemical blending, chemical storage, chemical container recycling, transportation, chemical documentation, and environmental and safety programs. With different component of services, each service level proposes its own character to meet customer requirements. The marginal effects explain better view which determinant should be focus to improve supplier service offerings for customers.

The research findings highlight the significant attributes of chemical service levels. There will be several guidelines for chemical suppliers to propose service offerings to their customer from this research. For chemical suppliers who propose chemical product only should offer not only selling chemical product in large volume for discount price, but also providing chemical container recycling and transportation services in order to facilitate their customers. Suppliers who have a business model of service differential the product should offer chemical documentation and environmental and safety programs services because their customers want other special services rather than just the chemical products only. Suppliers who desire to change their business model from selling tangible products to providing chemical solutions should offer chemical blending, chemical storage, chemical documentation, and environmental and safety programs as bundle services along with chemical products to their customers. However, the study didn't have any suggestions for the suppliers who propose service with the product business model because the significant services do not have big enough impact towards this service level.

Based on the result from ANOVA, all seven attributes have different average in demand at least one pair of segments. This means, customers in each segment have different degree of demand in different services. There are some suggestions from this research to chemical suppliers. The first suggestion is for chemical suppliers who focus on selling product only business model. The suppliers should concentrate on customers in industrial, resource, and technology industries. In addition, they should provide not only chemical products, but also chemical blending, and transportation services for those industries mentioned above. Next, this suggestion is for suppliers who want to alter their business model to service differential the product. Services they should provide are chemical container recycling, chemical documentation, and chemical environmental and safety programs to customers in industrial, resource, and technology sections because these customer sections have demand in the services. Last, the suppliers who desire to change their business model to service is the product should pay attention to offer chemical blending, chemical storage, chemical documentation, and chemical environmental and safety program to the customers in industrial and resource segments. As the data shown in chapter 4, the industrial industry was the major group and counted as 68.5%, and the ANOVA results were analyzed that the customers in industrial industry have higher demand of the services than others. Thus these suggestions could be useful for the chemical suppliers to apply the servitization to their customers in order to meet the customers' demands.

5.4 Discussions

This research went very well for every process that can meet all the objectives, and there are several points to be discussed.

- Petrochemical sub-segment has the lowest average demand in four significant services.

Table 5.10 below is the duplicate of Table 4.49 showing the average demand of customers in each company type under industrial sub-segment. The results show that among four of seven services, customers in different type of company have different average in demand. These services are chemical product only, chemical blending, chemical storage, and chemical container recycling. The results obviously point out at the customers in Petrochemical sub-segment that they have the lowest average demand in all of those four services. Petrochemical sub-segment in this area refers to companies who are in midstream level of petrochemical chain, for example plastic or fiber companies. Taking a look at this sub-segment and found that customers in this group have the lowest average demand especially in chemical product only, chemical blending, chemical storage, and chemical container recycling. This because petrochemical companies have special different characters from other sub-segment companies. Chemical experts agreed with the results and also mentioned that most of petrochemical companies have expertise in some chemical activities, for example chemical blending or chemical container recycling. They have their own staff or teams to support this processes internally, and they are specialized in chemical blending because they do this process by themselves regularly at their operation routines. Moreover, petrochemical companies have their own source of raw materials for their production. Consequently, they tend not order chemical product only as much as other sub-segment companies do, and also less demand of chemical storage. Thus, the requirement degrees of these services are low compared with others.

Table 5.10: *The Average Demand of Customers in each Company Type (Industrial Sub-Segment)*

No.	Significant Attributes	Customers' Company Type (Industrial Sub-Segment)								
		Adhesive	Ink	Packaging	Color	Petrochemical	Resin	Thinner	Tyre	Others
1.	MeanPCP: Chemical Product Only	8.78**	8.25	9.13**	9.17**	6.88**	8.83**	8.61**	8.68**	8.75**
2.	MeanPCB: Chemical Blending	6.72	8.56**	7.93**	8.12**	4.93**	7.50	6.74	8.97**	6.17
3.	MeanPCS: Chemical Storage	8.34	8.06	9.33**	8.92**	7.31**	9.08**	8.71**	9.06	7.69
4.	MeanPCC: Chemical Container Recycling	8.53**	8.71**	9.33**	8.53**	5.76**	9.00**	8.67**	9.00**	7.31
5.	MeanPCT: Transportation	9.13	8.98	9.28	9.32	9.02	9.17	9.05	9.13	9.30
6.	MeanSCD: Chemical Documentation	9.12	8.71	9.20	8.84	9.22	8.44	8.78	9.04	9.00
7	MeanKES: Chemical Environmental and Safety Programs	8.91	8.38	9.08	8.66	8.32	9.23	8.33	9.43	8.45

** Indicates the significant value at .05 level.

- The reason of why Multinomal Logit Model and why not Order Logit Model.

This research adopted the Extended Product Dimention proposed by Chen and Cusmeroli (2015) as theory to categorize servitization level. Chen and Cusmeroli (2015) mentioned that there are for levels in the extended product starting from the lowest to the highest level, namely product only, service added to the product, service differential the product and service is the product. The degree of intangible service has raisen from the lowest to the highest level as well. For this concept the researchers supposed to use the Order Logit Model as the method in this research, however the researchers chose Multinomial Logit Model or Choice Model instead.

The reason why the researchers selected Multinomial Logit Model because we did not have evidence of these servitization levels used in Thailand before. This is the new theory used at the first time for chemical servitization levels adopted in Thailand. We were not sure that the degree of services will increase according with an increasing in the service levels or not. Thus, we decided to strart from the Multinomial Logit

Model at first to see if there is an increasing in the degree of service required in the service levels.

We found out from the evidence in the marginal effects of each service level in chapter 4 that the degree of service required is not increased orderly when increasing the servitization levels, see Table 5.11. Therefore, we confirmed to use Multinomial Logit Model for chemical servitization levels used in Thailand.

Table 5.11: *Ranking of the Effect toward Significant Factors of Servitization Levels*

No.	Significant Attributes	Logit average marginal effects			
		Product Only	Service Added to the Product	Service Differential the Product	Service is the Product
1	MeanPCP: Chemical Product Only	1st	2nd	3rd	4th
2	MeanPCB: Chemical Blending	3rd	2nd	2nd	1st
3	MeanPCS: Chemical Storage	4th	3rd	2nd	1st
4	MeanPCC: Chemical Container Recycling	1st	3rd	2nd	4th
5	MeanPCT: Transportation	1st	2nd	3rd	3rd
6	MeanSCD: Chemical Documentation	4th	3rd	1st	2nd
7	MeanKES: Chemical Environmental and Safety Programs	3rd	4th	1st	2nd

- Low value of R-Squre.

Results of the multiple regression models in Chapter 4 show low values of R-square in every model. The researchers worried about this issue, and were afraid that the low value of R-square would not be acceptable because the models were not well-defined. However, we found a book from Neter, Wasserman, and Kutner (1985) explaining that R-square is not a measurement of fit, but it measures the explanatory of power. R-square could be low number because the researchers did not expect the model included all the relevant predictors to explain the dependent variables. Eventhough R-square is small, ranging from .012 to .081, but it is different from zero value. This can be indicated that the multiple regression models have statistically significant explanatory power with small effect size. In the social sciences where the models are difficult to specify, low R-square values are often expected.

- Customers' requirements for each company size.

As Table 5.1 express the differences of customers' demand in each company size, the data indicates that customers in large company size have significantly higher demand in chemical storage, chemical transportation, chemical documentation, and chemical environmental and safety programs than the customers in small size of company. However, the results of the rest indicate that the customers in different size of company do not have different average demand in chemical product only, chemical blending, and chemical container recycling services.

Chemical experts agree with the results that most of customers in large company size have high demand in chemical storage, chemical transportation, chemical documentation, and chemical environmental and safety programs because these large size companies normally have large order with additional demand of those services. The chemical experts mentioned that outsourcing is a key major point for the customers in large company size to focus because the can control many activity costs. For example, the customers do not handle with transportation by themselves, but rather have chemical truck service from third party company as an alternative. Instead of owing many chemical trucks internally that they subsequently have to be responsible for other related expenses, such as truck maintenance, parking space, truck driver, fuel, or depreciation expenses. Thus, they decide to hire special equipped company to provide chemical transportation for them. This is much easier and more importantly, they can control the operation cost. Similarly, the chemical expert stated that chemical environmental and safety program is also another service that have high demand from customers in large company size. Normally companies in chemical industry have to follow chemical control pollution regulations requested by government agency. Customers in large company size have high demand for outsource experts to instruct or give some training about the knowledge in environmental and safety programs.

5.5 Future Study

Based on the research findings in Figure 4.6 and Figure 4.7, seven from twelves factors were significant, and the values of R-square were pretty low. Thus, for the future study the researchers could examine some other attributes that have impact on these service levels. Then, re-check with the R square values again. Future study may also investigate variables of these 4-category service levels in other industries that need servitization in Thailand to see if the service level is orderly increased or not. If yes, we can apply the Order Logit Model instead of using Multinomial Logit Model. This would also help companies in other industries to develop servitization framework and also provide them guidance to improve their service levels. Future study could try out to find the servitization model for chemical industry in other countries, for example in Vietnam, Indonesia, and Philippines where the chemical suppliers have operations in business and are facing the same problem of commodity traps as found in Thailand.

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APPENDIX
CR Calculation

CR1 7 7 6 7 0 0.2

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.14	0.14	0.17
Y2	7.00	1.00	0.14	5.00
Y3	7.00	7.00	1.00	5.00
Y4	6.00	0.20	0.20	1.00
Sum	21.00	8.34	1.49	11.17

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.05	0.02	0.1	0.01	0.18	0.045
0.33	0.12	0.1	0.45	1	0.25
0.33	0.84	0.67	0.45	2.29	0.5725
0.29	0.02	0.13	0.09	0.53	0.1325
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.05	0.04	0.08	0.02	0.18	4.1019
0.32	0.25	0.08	0.66	1.31	5.2371
0.32	0.25	0.57	0.66	1.8	3.1441
0.27	0.05	0.11	0.13	0.57	4.2792
0.95	0.59	0.85	1.48	λmax =	4.1906
				CI =	0.0635
				RI =	0.9
				CR1 =	0.0706 CR<0.1

CR2 8 6 9 8 0 0.2

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.13	0.17	0.11
Y2	8.00	1.00	0.13	3.00
Y3	6.00	8.00	1.00	3.00
Y4	9.00	0.33	0.33	1.00
Sum	24.00	9.46	1.63	7.11

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.05	0.01	0.11	0.01	0.18	0.0417
0.38	0.12	0.08	0.27	0.85	0.3333
0.29	0.96	0.67	0.27	2.19	0.25
0.43	0.04	0.22	0.09	0.78	0.375
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.04	0.04	0.04	0.04	0.17	4
0.33	0.33	0.03	0.05	0.74	2.2344
0.25	0.33	0.25	1.13	1.96	7.8333
0.38	0.11	0.08	0.38	0.94	2.5185
1	0.82	0.41	1.59	λmax =	4.1466
				CI =	0.0489
				RI =	0.9
				CR1 =	0.0543 CR<0.1

CR3 8 5 0.14 0.2 6 6

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.13	0.20	7.00
Y2	8.00	1.00	5.00	0.17
Y3	5.00	0.20	1.00	0.17
Y4	0.14	6.00	6.00	1.00
Sum	14.14	7.33	12.20	8.33

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.07	0.02	0.02	0.84	0.95	0.2375
0.57	0.14	0.41	0.02	1.14	0.285
0.35	0.03	0.08	0.02	0.48	0.12
0.01	0.82	0.49	0.12	1.44	0.36
					1.0025

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.24	0.04	0.02	0.36	0.66	2.7668
0.24	0.29	0.6	0.06	1.18	4.1491
0.24	0.29	0.12	0.06	0.7	5.8542
0.03	0.04	0.72	0.36	1.15	3.2073
0.75	0.65	1.46	0.84	λmax =	3.9944
				CI =	-0.002
				RI =	0.9
				CR1 =	-0.002 CR<0.1

CR4 8 8 8 8 0 0.14

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.13	0.13	0.13
Y2	8.00	1.00	0.13	6.00
Y3	8.00	8.00	1.00	7.00
Y4	8.00	0.17	0.14	1.00
Sum	25.00	9.29	1.39	14.13

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.04	0.01	0.09	0.01	0.15	0.0375
0.32	0.11	0.09	0.42	0.94	0.235
0.32	0.86	0.72	0.5	2.4	0.6
0.32	0.02	0.1	0.07	0.51	0.1275
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.04	0.03	0.08	0.02	0.16	4.2083
0.3	0.24	0.08	0.77	1.38	5.8511
0.3	0.24	0.6	0.13	1.26	2.1042
0.3	0.04	0.09	0.13	0.55	4.3324
0.94	0.54	0.84	1.04	λmax =	4.124

CI = 0.0413
RI = 0.9
CR1 = 0.0459 CR<0.1

CR5 6 5 5 3 2 1

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.17	0.20	0.20
Y2	6.00	1.00	0.33	0.50
Y3	5.00	3.00	1.00	1.00
Y4	5.00	2.00	1.00	1.00
Sum	17.00	6.17	2.53	2.70

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.06	0.03	0.08	0.07	0.24	0.06
0.35	0.16	0.13	0.19	0.83	0.2075
0.29	0.49	0.39	0.37	1.54	0.385
0.29	0.32	0.39	0.37	1.37	0.3425
					0.995

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.06	0.03	0.08	0.07	0.24	4.0014
0.36	0.21	0.13	0.17	0.87	4.1787
0.3	0.62	0.39	0.34	1.65	4.2857
0.3	0.42	0.39	0.34	1.44	4.2117
1.02	1.28	0.98	0.92	λmax =	4.1694

CI = 0.0565
RI = 0.9
CR1 = 0.0627 CR<0.1

CR6 0.2 0.2 0.2 0.2 0 0.33

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	5.00	5.00	5.00
Y2	0.20	1.00	5.00	3.00
Y3	0.20	0.20	1.00	3.00
Y4	0.20	0.33	0.33	1.00
Sum	1.60	6.53	11.33	12.00

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.63	0.77	0.44	0.42	2.26	0.565
0.13	0.15	0.44	0.25	0.97	0.2425
0.13	0.03	0.09	0.25	0.5	0.125
0.13	0.05	0.03	0.08	0.29	0.0725
					1.005

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.57	0.24	0.63	0.36	1.8	3.177
0.11	0.24	0.63	0.22	1.2	4.9402
0.11	0.05	0.13	0.22	0.5	4.032
0.11	0.08	0.04	0.07	0.31	4.2483
0.9	0.61	1.42	0.87	λmax =	4.0994

CI = 0.0331
RI = 0.9
CR1 = 0.0368 CR<0.1

CR7 8 7 1 6 0 0.13

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.13	0.14	1.00
Y2	8.00	1.00	0.17	5.00
Y3	7.00	6.00	1.00	6.00
Y4	1.00	0.20	0.17	1.00
Sum	17.00	7.33	1.48	13.00

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.06	0.02	0.1	0.08	0.26	0.065
0.47	0.14	0.11	0.38	1.1	0.275
0.41	0.82	0.68	0.46	2.37	0.5925
0.06	0.03	0.11	0.08	0.28	0.07
					1.0025

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.07	0.03	0.08	0.07	0.25	3.908
0.52	0.28	0.1	0.35	1.24	4.5227
0.46	0.28	0.59	0.42	1.74	2.9409
0.07	0.06	0.1	0.07	0.29	4.125
1.11	0.64	0.87	0.91	λmax =	3.8742

CI = -0.042
RI = 0.9
CR1 = -0.047 CR<0.1

CR8 7 5 8 8 7 6

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.13	0.14	1.00
Y2	8.00	1.00	0.17	5.00
Y3	7.00	6.00	1.00	8.00
Y4	1.00	0.20	0.13	1.00
Sum	17.00	7.33	1.43	15.00

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.06	0.02	0.1	0.07	0.25	0.0625
0.47	0.14	0.12	0.33	1.06	0.265
0.41	0.82	0.7	0.53	2.46	0.615
0.06	0.03	0.09	0.07	0.25	0.0625
					1.005

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.06	0.03	0.09	0.06	0.25	3.9357
0.5	0.27	0.1	0.31	1.18	4.4528
0.44	0.27	0.62	0.5	1.82	2.9553
0.06	0.05	0.08	0.06	0.25	4.078
1.06	0.62	0.88	0.94	λmax =	3.8555

CI = -0.048

RI = 0.9

CR1 = -0.054 CR<0.1

CR9 8 8 6 0.17 0 0.17

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.13	0.13	0.17
Y2	8.00	1.00	6.00	6.00
Y3	8.00	0.17	1.00	6.00
Y4	6.00	0.17	0.17	1.00
Sum	23.00	1.46	7.29	13.17

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.04	0.09	0.02	0.01	0.16	0.04
0.35	0.69	0.82	0.46	2.32	0.58
0.35	0.11	0.14	0.46	1.06	0.265
0.26	0.11	0.02	0.08	0.47	0.1175
					1.0025

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.04	0.07	0.03	0.02	0.17	4.1302
0.32	0.58	0.27	0.71	1.87	3.2241
0.32	0.1	0.27	0.71	1.39	5.2327
0.24	0.1	0.04	0.12	0.5	4.2411
0.92	0.85	0.61	1.55	λmax =	4.207

CI = 0.069

RI = 0.9

CR1 = 0.0767 CR<0.1

CR10 5 4 9 5 0 0.11

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.20	0.25	0.11
Y2	5.00	1.00	0.20	9.00
Y3	4.00	5.00	1.00	9.00
Y4	9.00	0.11	0.11	1.00
Sum	19.00	6.31	1.56	19.11

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.05	0.03	0.16	0.01	0.25	0.0625
0.26	0.16	0.13	0.47	1.02	0.255
0.21	0.79	0.64	0.47	2.11	0.5275
0.47	0.02	0.07	0.05	0.61	0.1525
					0.9975

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.06	0.05	0.13	0.02	0.26	4.1971
0.31	0.26	0.11	0.66	1.34	5.2373
0.25	0.26	0.53	0.13	1.17	2.2085
0.56	0.03	0.06	0.13	0.78	5.1275
1.19	0.59	0.82	0.94	λmax =	4.1926

CI = 0.0642

RI = 0.9

CR1 = 0.0713 CR<0.1

CR11 9 8 6 7 0 0.14

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.11	0.13	0.17
Y2	9.00	1.00	0.14	7.00
Y3	8.00	7.00	1.00	7.00
Y4	6.00	0.14	0.14	1.00
Sum	24.00	8.25	1.41	15.17

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.04	0.01	0.09	0.01	0.15	0.0375
0.38	0.12	0.1	0.46	1.06	0.265
0.33	0.85	0.71	0.46	2.35	0.5875
0.25	0.02	0.1	0.07	0.44	0.11
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.04	0.03	0.07	0.02	0.16	4.2324
0.34	0.27	0.08	0.11	0.8	3.0054
0.3	0.27	0.59	0.77	1.92	3.2723
0.23	0.04	0.08	0.11	0.46	4.1526
0.9	0.6	0.83	1.01	λmax =	3.6657

CI = -0.111

RI = 0.9

CR1 = -0.124 CR<0.1

CR12 9 9 9 9 0 0.13

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.11	0.11	0.11
Y2	9.00	1.00	0.11	5.00
Y3	9.00	9.00	1.00	6.00
Y4	9.00	0.20	0.17	1.00
Sum	28.00	10.31	1.39	12.11

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.04	0.01	0.08	0.01	0.14	0.035
0.32	0.1	0.08	0.41	0.91	0.2275
0.32	0.87	0.72	0.5	2.41	0.6025
0.32	0.02	0.12	0.08	0.54	0.135
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.04	0.03	0.07	0.02	0.14	4.0635
0.32	0.23	0.07	0.68	1.28	5.6459
0.32	0.23	0.6	0.14	1.28	2.1245
0.32	0.05	0.1	0.14	0.6	4.4142
0.98	0.53	0.84	0.96	λmax =	4.062

CI = 0.0207

RI = 0.9

CR1 = 0.023 CR<0.1

CR13 9 5 7 8 0 0.17

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.11	0.20	0.14
Y2	9.00	1.00	0.13	6.00
Y3	5.00	8.00	1.00	6.00
Y4	7.00	0.17	0.17	1.00
Sum	22.00	9.28	1.49	13.14

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.05	0.01	0.13	0.01	0.2	0.05
0.41	0.11	0.08	0.46	1.06	0.265
0.23	0.86	0.67	0.46	2.22	0.555
0.32	0.02	0.11	0.08	0.53	0.1325
					1.0025

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.05	0.03	0.11	0.02	0.21	4.1875
0.45	0.27	0.07	0.13	0.92	3.4599
0.25	1.33	0.56	0.13	2.26	4.0766
0.35	0.04	0.09	0.13	0.62	4.673
1.1	1.66	0.83	0.42	λmax =	4.0992

CI = 0.0331

RI = 0.9

CR1 = 0.0367 CR<0.1

CR14 7 4 5 5 0 0.17

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.14	0.25	0.20
Y2	7.00	1.00	0.20	4.00
Y3	4.00	5.00	1.00	6.00
Y4	5.00	0.25	0.17	1.00
Sum	17.00	6.39	1.62	11.20

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.06	0.02	0.15	0.02	0.25	0.0625
0.41	0.16	0.12	0.36	1.05	0.2625
0.24	0.78	0.62	0.54	2.18	0.545
0.29	0.04	0.1	0.09	0.52	0.13
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.06	0.04	0.14	0.03	0.26	4.196
0.44	0.26	0.11	0.52	1.33	5.0629
0.25	0.26	0.55	0.65	1.71	3.133
0.31	0.07	0.09	0.13	0.6	4.6074
1.06	0.63	0.88	1.33	λmax =	4.2498

CI = 0.0833

RI = 0.9

CR1 = 0.0925 CR<0.1

CR15 7 8 0.33 0.33 5 5

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.14	0.13	3.00
Y2	7.00	1.00	3.00	0.20
Y3	8.00	0.33	1.00	0.20
Y4	0.33	5.00	5.00	1.00
Sum	16.33	6.48	9.13	4.40

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.06	0.02	0.01	0.68	0.77	0.1925
0.43	0.15	0.33	0.05	0.96	0.24
0.49	0.05	0.11	0.05	0.7	0.175
0.02	0.77	0.55	0.23	1.57	0.3925
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.19	0.03	0.02	0.39	0.64	3.3307
0.04	0.24	0.53	0.08	0.88	3.675
0.06	0.08	0.18	0.08	0.4	2.2724
0.06	0.24	0.88	0.39	1.57	4.0042
0.36	0.59	1.6	0.94	λmax =	3.3206

CI = -0.226

RI = 0.9

CR1 = -0.252 CR<0.1

CR16 8 5 5 6 6 6

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.13	0.25	0.20
Y2	8.00	1.00	0.17	0.17
Y3	4.00	6.00	1.00	0.17
Y4	5.00	6.00	6.00	1.00
Sum	18.00	13.13	7.42	1.53

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.06	0.01	0.03	0.13	0.23	0.0575
0.44	0.08	0.02	0.11	0.65	0.1625
0.22	0.46	0.13	0.11	0.92	0.23
0.28	0.46	0.81	0.65	2.2	0.55
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.06	0.02	0.06	0.11	0.25	4.2663
0.46	0.03	0.04	0.09	0.62	3.7974
0.23	0.65	0.23	0.09	1.2	5.2246
0.29	0.81	0.23	0.55	1.88	3.4182
1.04	1.51	0.56	0.84	λmax =	4.1766

CI = 0.0589
RI = 0.9
CR1 = 0.0654 CR<0.1

CR17 7 7 7 7 0 0.14

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.14	0.14	0.14
Y2	7.00	1.00	0.14	7.00
Y3	7.00	7.00	1.00	7.00
Y4	7.00	0.14	0.14	1.00
Sum	22.00	8.29	1.43	15.14

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.05	0.02	0.1	0.01	0.18	0.045
0.32	0.12	0.1	0.46	1	0.25
0.32	0.84	0.7	0.46	2.32	0.58
0.32	0.02	0.1	0.07	0.51	0.1275
					1.0025

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.05	0.04	0.08	0.02	0.18	4.0397
0.32	0.25	0.08	0.89	1.54	6.1614
0.32	0.25	0.58	0.13	1.27	2.194
0.32	0.04	0.08	0.13	0.56	4.4006
0.99	0.57	0.83	1.17	λmax =	4.1989

CI = 0.0663
RI = 0.9
CR1 = 0.0737 CR<0.1

CR18 7 7 7 0.14 0 0.14

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.14	0.14	0.14
Y2	7.00	1.00	7.00	7.00
Y3	7.00	0.14	1.00	7.00
Y4	7.00	0.14	0.14	1.00
Sum	22.00	1.43	8.29	15.14

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.05	0.1	0.02	0.01	0.18	0.045
0.32	0.7	0.84	0.46	2.32	0.58
0.32	0.1	0.12	0.46	1	0.25
0.32	0.1	0.02	0.07	0.51	0.1275
					1.0025

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.05	0.08	0.04	0.02	0.18	4.0397
0.32	0.58	0.25	0.89	2.04	3.5129
0.32	0.08	0.25	0.13	0.78	3.1014
0.32	0.08	0.04	0.13	0.56	4.4006
0.99	0.83	0.57	1.17	λmax =	3.7637

CI = -0.079
RI = 0.9
CR1 = -0.088 CR<0.1

CR19 9 9 9 8 0 0.13

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.11	0.11	0.11
Y2	9.00	1.00	0.13	8.00
Y3	9.00	8.00	1.00	8.00
Y4	9.00	0.13	0.13	1.00
Sum	28.00	9.24	1.36	17.11

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.04	0.01	0.08	0.01	0.14	0.035
0.32	0.11	0.09	0.47	0.99	0.2475
0.32	0.87	0.73	0.47	2.39	0.5975
0.32	0.01	0.09	0.06	0.48	0.12
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.04	0.03	0.07	0.01	0.14	4.0635
0.32	0.25	0.07	0.12	0.76	3.0593
0.32	0.25	0.6	0.96	2.12	3.5481
0.32	0.03	0.07	0.12	0.54	4.5052
0.98	0.55	0.81	1.21	λmax =	3.794

CI = -0.069
RI = 0.9
CR1 = -0.076 CR<0.1

CR20 8 8 6 0.14 0 0.17

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.13	0.13	0.11
Y2	8.00	1.00	7.00	7.00
Y3	8.00	0.14	1.00	6.00
Y4	9.00	0.14	0.17	1.00
Sum	26.00	1.41	8.29	14.11

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.04	0.09	0.02	0.01	0.16	0.04
0.31	0.71	0.84	0.5	2.36	0.59
0.31	0.1	0.12	0.43	0.96	0.24
0.35	0.1	0.02	0.07	0.54	0.135
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.04	0.07	0.03	0.02	0.16	3.9688
0.32	0.59	0.24	0.14	1.29	2.178
0.32	0.08	0.24	0.81	1.45	6.0595
0.36	0.08	0.04	0.14	0.62	4.5873
1.04	0.83	0.55	1.1	λmax =	4.1984

CI = 0.0661
RI = 0.9
CR1 = 0.0735CR<0.1

CR21 7 6 5 0.2 0 5

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.14	0.17	0.20
Y2	7.00	1.00	5.00	5.00
Y3	6.00	0.20	1.00	0.20
Y4	5.00	0.20	5.00	1.00
Sum	19.00	1.54	11.17	6.40

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.05	0.09	0.01	0.03	0.18	0.045
0.37	0.65	0.45	0.78	2.25	0.5625
0.32	0.13	0.09	0.03	0.57	0.1425
0.26	0.13	0.45	0.16	1	0.25
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.05	0.08	0.02	0.05	0.2	4.4246
0.32	0.56	0.71	0.25	1.84	3.2711
0.27	0.11	0.14	0.05	0.58	4.0351
0.23	0.11	0.71	0.25	1.3	5.2
0.86	0.87	1.59	0.6	λmax =	4.2327

CI = 0.0776
RI = 0.9
CR1 = 0.0862CR<0.1

CR22 4 5 7 0.14 0 6

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.25	0.20	0.14
Y2	4.00	1.00	7.00	7.00
Y3	5.00	0.14	1.00	0.17
Y4	7.00	0.14	6.00	1.00
Sum	17.00	1.54	14.20	8.31

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.06	0.16	0.01	0.02	0.25	0.0625
0.24	0.65	0.49	0.84	2.22	0.555
0.29	0.09	0.07	0.02	0.47	0.1175
0.41	0.09	0.42	0.12	1.04	0.26
					0.995

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.06	0.14	0.02	0.04	0.26	4.1903
0.25	0.56	0.12	0.26	1.18	2.1306
0.31	0.08	0.12	0.04	0.55	4.7031
0.44	0.08	0.71	0.26	1.48	5.6992
1.06	0.85	0.96	0.6	λmax =	4.1808

CI = 0.0603
RI = 0.9
CR1 = 0.067CR<0.1

CR23 7 6 5 6 7 7

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.14	0.17	0.20
Y2	7.00	1.00	0.20	0.14
Y3	6.00	5.00	1.00	0.14
Y4	5.00	7.00	7.00	1.00
Sum	19.00	13.14	8.37	1.49

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.05	0.01	0.02	0.13	0.22	0.0545
0.37	0.08	0.02	0.1	0.56	0.1411
0.32	0.38	0.12	0.1	0.92	0.2291
0.26	0.53	0.84	0.67	2.31	0.5764
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.05	0.02	0.04	0.12	0.23	4.1852
0.38	0.14	0.05	0.08	0.65	4.6118
0.33	0.71	0.23	0.08	1.34	5.868
0.27	0.14	0.23	0.58	1.22	2.115
1.04	1.01	0.54	0.86	λmax =	4.195

CI = 0.065
RI = 0.9
CR1 = 0.0722CR<0.1

CR24 5 4 5 4 2 2

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.20	0.25	0.20
Y2	5.00	1.00	0.25	0.50
Y3	4.00	4.00	1.00	0.50
Y4	5.00	2.00	2.00	1.00
Sum	15.00	7.20	3.50	2.20

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.07	0.03	0.07	0.09	0.26	0.0642
0.33	0.14	0.07	0.23	0.77	0.1927
0.27	0.56	0.29	0.23	1.34	0.3338
0.33	0.28	0.57	0.45	1.64	0.4093
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.06	0.04	0.08	0.08	0.27	4.1755
0.32	0.19	0.08	0.2	0.8	4.1602
0.26	0.77	0.33	0.2	1.57	4.6918
0.32	0.39	0.33	0.41	1.45	3.5417
0.96	1.39	0.83	0.9	λmax =	4.1423

CI = 0.0474

RI = 0.9

CR1 = 0.0527 CR<0.1

CR25 5 6 5 3 3 3

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.20	0.17	0.20
Y2	5.00	1.00	0.33	0.33
Y3	6.00	3.00	1.00	0.33
Y4	5.00	3.00	3.00	1.00
Sum	17.00	7.20	4.50	1.87

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.06	0.03	0.04	0.11	0.23	0.0577
0.29	0.14	0.07	0.18	0.69	0.1714
0.35	0.42	0.22	0.18	1.17	0.2926
0.29	0.42	0.67	0.54	1.91	0.4783
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.06	0.03	0.05	0.1	0.24	4.0974
0.29	0.17	0.1	0.16	0.72	4.182
0.35	0.51	0.29	0.16	1.31	4.4854
0.29	0.51	0.29	0.48	1.57	3.2901
0.98	1.23	0.73	0.89	λmax =	4.0137

CI = 0.0046

RI = 0.9

CR1 = 0.0051 CR<0.1

CR26 5 7 6 3 3 3

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.20	0.14	0.17
Y2	5.00	1.00	0.33	0.33
Y3	7.00	3.00	1.00	0.50
Y4	6.00	3.00	2.00	1.00
Sum	19.00	7.20	3.48	2.00

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.05	0.03	0.04	0.08	0.2	0.0512
0.26	0.14	0.1	0.17	0.66	0.1662
0.37	0.42	0.29	0.25	1.32	0.3307
0.32	0.42	0.58	0.5	1.81	0.4519
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.05	0.03	0.05	0.08	0.21	4.0423
0.26	0.17	0.11	0.15	0.68	4.1112
0.36	0.5	0.33	0.23	1.41	4.2747
0.31	0.5	0.66	0.45	1.92	4.2461
0.97	1.2	1.15	0.9	λmax =	4.1686

CI = 0.0562

RI = 0.9

CR1 = 0.0624 CR<0.1

CR27 4 6 6 2 3 3

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.25	0.17	0.17
Y2	4.00	1.00	0.50	0.33
Y3	6.00	2.00	1.00	0.33
Y4	6.00	3.00	3.00	1.00
Sum	17.00	6.25	4.67	1.83

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.06	0.04	0.04	0.09	0.23	0.0564
0.24	0.16	0.11	0.18	0.68	0.1711
0.35	0.32	0.21	0.18	1.07	0.2673
0.35	0.48	0.64	0.55	2.02	0.5053
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.06	0.04	0.04	0.08	0.23	4.0433
0.23	0.17	0.13	0.17	0.7	4.0837
0.34	0.34	0.27	0.17	1.12	4.1757
0.34	0.51	0.8	0.51	2.16	4.2715
0.96	1.07	1.25	0.93	λmax =	4.1436

CI = 0.0479

RI = 0.9

CR1 = 0.0532 CR<0.1

CR28 9 0.11 8 0.11 9 9

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.11	9.00	0.13
Y2	9.00	1.00	9.00	0.11
Y3	0.11	0.11	1.00	0.11
Y4	8.00	9.00	9.00	1.00
Sum	18.11	10.22	28.00	1.35

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.06	0.01	0.32	0.09	0.48	0.1201
0.5	0.1	0.32	0.08	1	0.2497
0.01	0.01	0.04	0.08	0.14	0.0338
0.44	0.88	0.32	0.74	2.39	0.5965
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.12	0.03	0.3	0.07	0.53	4.3853
0.12	0.25	0.3	0.07	0.74	2.9648
0.01	0.03	0.03	0.07	0.14	4.1764
0.12	2.25	0.3	0.6	3.27	5.4785
0.37	2.55	0.95	0.8	λmax =	4.2512

CI = 0.0837

RI = 0.9

CR1 = 0.093 CR<0.1

CR29 7 5 0.2 1 0 1

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.14	0.20	5.00
Y2	7.00	1.00	1.00	5.00
Y3	5.00	1.00	1.00	1.00
Y4	0.20	0.20	1.00	1.00
Sum	13.20	2.34	3.20	12.00

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.08	0.06	0.06	0.42	0.62	0.154
0.53	0.43	0.31	0.42	1.69	0.4216
0.38	0.43	0.31	0.08	1.2	0.3004
0.02	0.09	0.31	0.08	0.5	0.1241
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.15	0.06	0.06	0.02	0.3	1.9425
0.15	0.42	0.3	0.62	1.5	3.5494
0.77	0.42	0.3	0.12	1.62	5.3798
0.03	0.08	0.3	0.12	0.54	4.3482
1.11	0.99	0.96	0.89	λmax =	3.805

CI = -0.065

RI = 0.9

CR1 = -0.072 CR<0.1

CR30 8 7 4 6 3 1

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.13	0.14	0.25
Y2	8.00	1.00	0.17	0.33
Y3	7.00	6.00	1.00	1.00
Y4	4.00	3.00	1.00	1.00
Sum	20.00	10.13	2.31	2.58

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.05	0.01	0.06	0.1	0.22	0.0552
0.4	0.1	0.07	0.13	0.7	0.175
0.35	0.59	0.43	0.39	1.76	0.4407
0.2	0.3	0.43	0.39	1.32	0.3291
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.06	0.02	0.06	0.08	0.22	4.0248
0.44	0.17	0.07	0.11	0.8	4.5722
0.39	0.17	0.44	0.33	1.33	3.0215
0.22	0.52	0.44	0.33	1.52	4.6057
1.1	0.9	1.02	0.85	λmax =	4.056

CI = 0.0187

RI = 0.9

CR1 = 0.0207 CR<0.1

CR31 5 5 1 1 0 1

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.20	0.20	1.00
Y2	5.00	1.00	1.00	5.00
Y3	5.00	1.00	1.00	1.00
Y4	1.00	0.20	1.00	1.00
Sum	12.00	2.40	3.20	8.00

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.08	0.08	0.06	0.13	0.35	0.0885
0.42	0.42	0.31	0.63	1.77	0.4427
0.42	0.42	0.31	0.13	1.27	0.3177
0.08	0.08	0.31	0.13	0.6	0.151
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.06	0.03	0.09	0.33	0.51	5.7314
0.28	0.17	0.44	0.33	1.22	2.758
0.28	0.17	0.44	0.33	1.22	3.8431
0.06	0.03	0.09	0.33	0.51	3.3598
0.66	0.42	1.06	1.32	λmax =	3.9231

CI = -0.026

RI = 0.9

CR1 = -0.028 CR<0.1

CR32 0.33 3 1 1 1 0.5

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.13	0.14	0.25
Y2	8.00	1.00	0.17	0.33
Y3	7.00	6.00	1.00	1.00
Y4	4.00	3.00	1.00	1.00
Sum	20.00	10.13	2.31	2.58

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.05	0.01	0.06	0.1	0.22	0.0552
0.4	0.1	0.07	0.13	0.7	0.175
0.35	0.59	0.43	0.39	1.76	0.4407
0.2	0.3	0.43	0.39	1.32	0.3291
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.06	0.02	0.06	0.08	0.22	4.0248
0.44	0.17	0.07	0.11	0.8	4.5722
0.39	0.17	0.44	0.33	1.33	3.0215
0.22	0.52	0.44	0.33	1.52	4.6057
1.1	0.9	1.02	0.85	λmax =	4.056

CI = 0.0187
RI = 0.9
CR1 = 0.0207 CR<0.1

CR33 2 1 0.5 3 1 1

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.50	1.00	2.00
Y2	2.00	1.00	0.33	2.00
Y3	1.00	3.00	1.00	1.00
Y4	0.50	0.50	1.00	1.00
Sum	4.50	5.00	3.33	6.00

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.22	0.1	0.3	0.33	0.96	0.2389
0.44	0.2	0.1	0.33	1.08	0.2694
0.22	0.6	0.3	0.17	1.29	0.3222
0.11	0.1	0.3	0.17	0.68	0.1694
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.24	0.13	0.32	0.34	1.03	4.3314
0.48	0.27	0.11	0.34	1.19	4.4296
0.24	0.27	0.32	0.17	1	3.1034
0.12	0.13	0.32	0.17	0.75	4.4016
1.08	0.81	1.07	1.02	λmax =	4.0665

CI = 0.0222
RI = 0.9
CR1 = 0.0246 CR<0.1

CR34 6 5 6 6 6 6

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.17	0.20	0.17
Y2	6.00	1.00	0.17	0.17
Y3	5.00	6.00	1.00	0.17
Y4	6.00	6.00	6.00	1.00
Sum	18.00	13.17	7.37	1.50

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.06	0.01	0.03	0.11	0.21	0.0516
0.33	0.08	0.02	0.11	0.54	0.1358
0.28	0.46	0.14	0.11	0.98	0.2451
0.33	0.46	0.81	0.67	2.27	0.5675
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.05	0.02	0.05	0.09	0.22	4.2204
0.31	0.14	0.04	0.09	0.58	4.2791
0.26	0.81	0.25	0.09	1.41	5.7625
0.31	0.14	0.25	0.57	1.26	2.2167
0.93	1.11	0.58	0.85	λmax =	4.1197

CI = 0.0399
RI = 0.9
CR1 = 0.0443 CR<0.1

CR35 1 0.5 2 3 1 1

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	1.00	2.00	0.50
Y2	1.00	1.00	0.33	1.00
Y3	0.50	3.00	1.00	1.00
Y4	2.00	1.00	1.00	1.00
Sum	4.50	6.00	4.33	3.50

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.22	0.17	0.46	0.14	0.99	0.2483
0.22	0.17	0.08	0.29	0.75	0.1879
0.11	0.5	0.23	0.29	1.13	0.2819
0.44	0.17	0.23	0.29	1.13	0.2819
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.25	0.19	0.56	0.14	1.14	4.5947
0.25	0.19	0.09	0.28	0.81	4.3222
0.12	0.19	0.28	0.28	0.88	3.1069
0.5	0.19	0.28	0.28	1.25	4.4283
1.12	0.75	1.22	0.99	λmax =	4.113

CI = 0.0377
RI = 0.9
CR1 = 0.0419 CR<0.1

CR36 6 7 7 7 6 5

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.17	0.14	0.14
Y2	6.00	1.00	0.14	0.17
Y3	7.00	7.00	1.00	0.20
Y4	7.00	6.00	5.00	1.00
Sum	21.00	14.17	6.29	1.51

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.05	0.01	0.02	0.09	0.18	0.0442
0.29	0.07	0.02	0.11	0.49	0.1224
0.33	0.49	0.16	0.13	1.12	0.2798
0.33	0.42	0.8	0.66	2.21	0.5537
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.04	0.02	0.04	0.08	0.18	4.1561
0.27	0.12	0.04	0.09	0.52	4.2476
0.31	0.02	0.28	0.11	0.72	2.5889
0.31	0.73	1.4	0.55	3	5.4108
0.93	0.9	1.76	0.84	λmax =	4.1009

CI = 0.0336
RI = 0.9
CR1 = 0.0374 CR<0.1

CR37 7 7 7 7 7 7

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.14	0.14	0.14
Y2	7.00	1.00	0.14	0.14
Y3	7.00	7.00	1.00	0.14
Y4	7.00	7.00	7.00	1.00
Sum	22.00	15.14	8.29	1.43

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.05	0.01	0.02	0.1	0.17	0.043
0.32	0.07	0.02	0.1	0.5	0.1254
0.32	0.46	0.12	0.1	1	0.2503
0.32	0.46	0.84	0.7	2.33	0.5813
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.04	0.02	0.04	0.08	0.18	4.1769
0.3	0.13	0.04	0.08	0.55	4.3504
0.3	0.13	0.25	0.08	0.76	3.0362
0.3	0.88	0.25	0.58	2.01	3.4583
0.95	1.15	0.57	0.83	λmax =	3.7555

CI = -0.082
RI = 0.9
CR1 = -0.091 CR<0.1

CR38 6 7 6 8 8 6

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.17	0.14	0.17
Y2	6.00	1.00	0.13	0.13
Y3	7.00	8.00	1.00	0.17
Y4	6.00	8.00	6.00	1.00
Sum	20.00	17.17	7.27	1.46

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.05	0.01	0.02	0.11	0.19	0.0484
0.3	0.06	0.02	0.09	0.46	0.1153
0.35	0.47	0.14	0.11	1.07	0.267
0.3	0.47	0.83	0.69	2.28	0.5693
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.05	0.02	0.04	0.09	0.2	4.1447
0.29	0.12	0.03	0.07	0.51	4.4262
0.34	0.12	0.27	0.09	0.82	3.0566
0.29	0.69	0.27	0.57	1.82	3.1942
0.97	0.94	0.61	0.83	λmax =	3.7054

CI = -0.098
RI = 0.9
CR1 = -0.109 CR<0.1

CR39 0.5 0.5 2 1 1 1

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	2.00	2.00	0.50
Y2	0.50	1.00	1.00	1.00
Y3	0.50	1.00	1.00	1.00
Y4	2.00	1.00	1.00	1.00
Sum	4.00	5.00	5.00	3.50

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.25	0.4	0.4	0.14	1.19	0.2982
0.13	0.2	0.2	0.29	0.81	0.2027
0.13	0.2	0.2	0.29	0.81	0.2027
0.5	0.2	0.2	0.29	1.19	0.2964
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.3	0.41	0.41	0.15	1.26	4.2156
0.15	0.2	0.2	0.3	0.85	4.1982
0.15	0.2	0.2	0.3	0.85	4.1982
0.6	0.2	0.2	0.3	1.3	4.3795
1.19	1.01	1.01	1.04	λmax =	4.2479

CI = 0.0826
RI = 0.9
CR1 = 0.0918 CR<0.1

CR40 2 1 1 2 1 0.5

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.50	1.00	1.00
Y2	2.00	1.00	0.50	2.00
Y3	1.00	2.00	1.00	2.00
Y4	1.00	0.50	0.50	1.00
Sum	5.00	4.00	3.00	6.00

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.2	0.13	0.33	0.17	0.83	0.2063
0.4	0.25	0.17	0.33	1.15	0.2875
0.2	0.5	0.33	0.33	1.37	0.3417
0.2	0.13	0.17	0.17	0.66	0.1646
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.21	0.14	0.34	0.16	0.86	4.1515
0.41	0.29	0.17	0.33	1.2	4.1739
0.21	0.58	0.34	0.33	1.45	4.25
0.21	0.14	0.17	0.16	0.69	4.1646
1.03	1.15	1.03	0.99	λmax =	4.185

CI = 0.0617

RI = 0.9

CR1 = 0.0685 CR<0.1

CR41 1 2 1 1 1 1

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	1.00	0.50	1.00
Y2	1.00	1.00	1.00	1.00
Y3	2.00	1.00	1.00	1.00
Y4	1.00	1.00	1.00	1.00
Sum	5.00	4.00	3.50	4.00

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.2	0.25	0.14	0.25	0.84	0.2107
0.2	0.25	0.29	0.25	0.99	0.2464
0.4	0.25	0.29	0.25	1.19	0.2964
0.2	0.25	0.29	0.25	0.99	0.2464
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.21	0.25	0.15	0.25	0.85	4.0424
0.21	0.25	0.3	0.25	1	4.058
0.42	0.25	0.3	0.25	1.21	4.0843
0.21	0.25	0.3	0.25	1	4.058
1.05	0.99	1.04	0.99	λmax =	4.0607

CI = 0.0202

RI = 0.9

CR1 = 0.0225 CR<0.1

CR42 7 7 8 7 6 7

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.14	0.14	0.13
Y2	7.00	1.00	0.14	0.17
Y3	7.00	7.00	1.00	0.14
Y4	8.00	6.00	7.00	1.00
Sum	23.00	14.14	8.29	1.43

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.04	0.01	0.02	0.09	0.16	0.0395
0.3	0.07	0.02	0.12	0.51	0.1271
0.3	0.49	0.12	0.1	1.02	0.2549
0.35	0.42	0.84	0.7	2.31	0.5785
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.04	0.02	0.04	0.07	0.17	4.2132
0.28	0.13	0.04	0.1	0.54	4.2194
0.28	0.89	0.25	0.08	1.5	5.8997
0.32	0.13	0.25	0.58	1.28	2.2064
0.91	1.16	0.58	0.83	λmax =	4.1347

CI = 0.0449

RI = 0.9

CR1 = 0.0499 CR<0.1

CR43 8 7 7 6 7 7

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.13	0.14	0.14
Y2	8.00	1.00	0.17	0.14
Y3	7.00	6.00	1.00	0.14
Y4	7.00	7.00	7.00	1.00
Sum	23.00	14.13	8.31	1.43

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.04	0.01	0.02	0.1	0.17	0.0424
0.35	0.07	0.02	0.1	0.54	0.1347
0.3	0.42	0.12	0.1	0.95	0.2374
0.3	0.5	0.84	0.7	2.34	0.5856
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.04	0.02	0.03	0.08	0.18	4.1713
0.34	0.13	0.04	0.08	0.6	4.4325
0.3	0.81	0.24	0.08	1.43	6.0063
0.3	0.13	0.24	0.59	1.25	2.1419
0.97	1.09	0.55	0.84	λmax =	4.188

CI = 0.0627

RI = 0.9

CR1 = 0.0696 CR<0.1

CR44 6 7 7 7 6 5

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.17	0.14	0.14
Y2	6.00	1.00	0.14	0.17
Y3	7.00	7.00	1.00	0.20
Y4	7.00	6.00	5.00	1.00
Sum	21.00	14.17	6.29	1.51

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.05	0.01	0.02	0.09	0.18	0.0442
0.29	0.07	0.02	0.11	0.49	0.1224
0.33	0.49	0.16	0.13	1.12	0.2798
0.33	0.42	0.8	0.66	2.21	0.5537
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.04	0.02	0.04	0.08	0.18	4.1561
0.27	0.12	0.04	0.09	0.52	4.2476
0.31	0.12	0.28	0.11	0.82	2.9388
0.31	0.73	0.28	0.55	1.88	3.3898
0.93	1	0.64	0.84	λmax =	3.6831

CI = -0.106
RI = 0.9
CR1 = -0.117 CR<0.1

CR45 6 7 7 8 6 7

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.17	0.14	0.14
Y2	6.00	1.00	0.13	0.17
Y3	7.00	8.00	1.00	0.14
Y4	7.00	6.00	7.00	1.00
Sum	21.00	15.17	8.27	1.45

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.05	0.01	0.02	0.1	0.17	0.0436
0.29	0.07	0.02	0.11	0.48	0.1204
0.33	0.53	0.12	0.1	1.08	0.27
0.33	0.4	0.85	0.69	2.26	0.566
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.04	0.02	0.04	0.08	0.18	4.2023
0.26	0.12	0.03	0.09	0.51	4.2353
0.3	0.12	0.27	0.08	0.78	2.8745
0.3	0.72	0.27	0.57	1.86	3.2918
0.91	0.98	0.61	0.82	λmax =	3.651

CI = -0.116
RI = 0.9
CR1 = -0.129 CR<0.1

CR46 1 0.5 3 1 1 3

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	1.00	2.00	0.33
Y2	1.00	1.00	1.00	2.00
Y3	0.50	1.00	1.00	0.33
Y4	3.00	0.50	3.00	1.00
Sum	5.50	3.50	7.00	3.67

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.18	0.29	0.29	0.09	0.84	0.211
0.18	0.29	0.14	0.55	1.16	0.289
0.09	0.29	0.14	0.09	0.61	0.1526
0.55	0.14	0.43	0.27	1.39	0.3474
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.21	0.29	0.31	0.12	0.92	4.3641
0.21	0.29	0.15	0.35	1	3.4607
0.11	0.29	0.15	0.12	0.66	4.344
0.63	0.14	0.46	0.35	1.58	4.5561
1.16	1.01	1.07	0.93	λmax =	4.1812

CI = 0.0604
RI = 0.9
CR1 = 0.0671 CR<0.1

CR47 8 8 9 8 8 8

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.13	0.13	0.11
Y2	8.00	1.00	0.13	0.13
Y3	8.00	8.00	1.00	0.13
Y4	9.00	8.00	8.00	1.00
Sum	26.00	17.13	9.25	1.36

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.04	0.01	0.01	0.08	0.14	0.0352
0.31	0.06	0.01	0.09	0.47	0.1179
0.31	0.47	0.11	0.09	0.97	0.2437
0.35	0.47	0.86	0.73	2.41	0.6032
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.04	0.01	0.03	0.07	0.15	4.1856
0.28	0.12	0.03	0.08	0.51	4.2893
0.28	0.94	0.24	0.08	1.54	6.3348
0.32	0.12	0.24	0.6	1.28	2.125
0.92	1.19	0.55	0.82	λmax =	4.2337

CI = 0.0779
RI = 0.9
CR1 = 0.0866 CR<0.1

CR48 7 7 7 6 6 6

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.14	0.14	0.14
Y2	7.00	1.00	0.17	0.17
Y3	7.00	6.00	1.00	0.17
Y4	7.00	6.00	6.00	1.00
Sum	22.00	13.14	7.31	1.48

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.05	0.01	0.02	0.1	0.17	0.0432
0.32	0.08	0.02	0.11	0.53	0.1325
0.32	0.46	0.14	0.11	1.02	0.2561
0.32	0.46	0.82	0.68	2.27	0.5682
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.04	0.02	0.04	0.08	0.18	4.167
0.3	0.13	0.04	0.09	0.57	4.3173
0.3	0.13	0.26	0.09	0.79	3.0668
0.3	0.79	0.26	0.57	1.92	3.3814
0.95	1.08	0.59	0.84	λmax =	3.7331

CI = -0.089

RI = 0.9

CR1 = -0.099 CR<0.1

CR49 7 8 8 8 6 6

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.14	0.13	0.13
Y2	7.00	1.00	0.13	0.17
Y3	8.00	8.00	1.00	0.17
Y4	8.00	6.00	6.00	1.00
Sum	24.00	15.14	7.25	1.46

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.04	0.01	0.02	0.09	0.15	0.0385
0.29	0.07	0.02	0.11	0.49	0.1223
0.33	0.53	0.14	0.11	1.11	0.2785
0.33	0.4	0.83	0.69	2.24	0.5607
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.04	0.02	0.03	0.07	0.16	4.1773
0.27	0.12	0.03	0.09	0.52	4.2529
0.31	0.73	0.28	0.09	1.41	5.0774
0.31	0.73	0.28	0.56	1.88	3.3549
0.92	1.61	0.63	0.82	λmax =	4.2156

CI = 0.0719

RI = 0.9

CR1 = 0.0799 CR<0.1

CR50 8 8 8 9 8 7

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.13	0.13	0.13
Y2	8.00	1.00	0.11	0.13
Y3	8.00	9.00	1.00	0.14
Y4	8.00	8.00	7.00	1.00
Sum	25.00	18.13	8.24	1.39

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.04	0.01	0.02	0.09	0.15	0.038
0.32	0.06	0.01	0.09	0.48	0.1196
0.32	0.5	0.12	0.1	1.04	0.2601
0.32	0.44	0.85	0.72	2.33	0.5823
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.04	0.01	0.03	0.07	0.16	4.1684
0.3	0.12	0.03	0.07	0.52	4.389
0.3	0.12	0.26	0.08	0.77	2.9468
0.3	0.96	0.26	0.58	2.1	3.6113
0.95	1.21	0.58	0.81	λmax =	3.7789

CI = -0.074

RI = 0.9

CR1 = -0.082 CR<0.1

CR51 7 6 7 5 8 6

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.14	0.17	0.14
Y2	7.00	1.00	0.20	0.13
Y3	6.00	5.00	1.00	0.17
Y4	7.00	8.00	6.00	1.00
Sum	21.00	14.14	7.37	1.43

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.05	0.01	0.02	0.1	0.18	0.045
0.33	0.07	0.03	0.09	0.52	0.1296
0.29	0.35	0.14	0.12	0.89	0.2228
0.33	0.57	0.81	0.7	2.41	0.6026
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.04	0.02	0.04	0.14	0.24	5.4129
0.31	0.13	0.04	0.13	0.61	4.7385
0.27	0.13	0.22	0.17	0.79	3.5411
0.31	0.13	0.22	1	1.67	2.7666
0.94	0.41	0.53	1.43	λmax =	4.1147

CI = 0.0382

RI = 0.9

CR1 = 0.0425 CR<0.1

CR52 3 1 1 1 1 2

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.33	1.00	1.00
Y2	3.00	1.00	1.00	2.00
Y3	1.00	1.00	1.00	0.50
Y4	1.00	0.50	2.00	1.00
Sum	6.00	2.83	5.00	4.50

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.17	0.12	0.2	0.22	0.71	0.1766
0.5	0.35	0.2	0.44	1.5	0.3743
0.17	0.35	0.2	0.11	0.83	0.2077
0.17	0.18	0.4	0.22	0.97	0.2413
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.18	0.12	0.21	0.24	0.75	4.2485
0.53	0.37	0.21	0.48	1.59	4.2597
0.18	0.37	0.21	0.12	0.88	4.2341
0.18	0.19	0.42	0.24	1.02	4.2285
1.06	1.06	1.04	1.09	λmax =	4.2427

CI = 0.0809
RI = 0.9
CR1 = 0.0899 CR<0.1

CR53 8 7 8 7 8 7

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.13	0.14	0.13
Y2	8.00	1.00	0.14	0.13
Y3	7.00	7.00	1.00	0.14
Y4	8.00	8.00	7.00	1.00
Sum	24.00	16.13	8.29	1.39

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.04	0.01	0.02	0.09	0.16	0.0391
0.33	0.06	0.02	0.09	0.5	0.1256
0.29	0.43	0.12	0.1	0.95	0.2373
0.33	0.5	0.84	0.72	2.39	0.5981
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.04	0.02	0.03	0.07	0.16	4.1802
0.31	0.13	0.03	0.07	0.55	4.356
0.27	0.88	0.24	0.09	1.48	6.2189
0.31	0.13	0.24	0.6	1.27	2.1297
0.94	1.15	0.54	0.83	λmax =	4.2212

CI = 0.0737
RI = 0.9
CR1 = 0.0819 CR<0.1

CR54 3 1 1 1 1 0.5

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.33	1.00	1.00
Y2	3.00	1.00	1.00	1.00
Y3	1.00	1.00	1.00	2.00
Y4	1.00	1.00	0.50	1.00
Sum	6.00	3.33	3.50	5.00

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.17	0.1	0.29	0.2	0.75	0.1881
0.5	0.3	0.29	0.2	1.29	0.3214
0.17	0.3	0.29	0.4	1.15	0.2881
0.17	0.3	0.14	0.2	0.81	0.2024
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.19	0.11	0.29	0.2	0.79	4.1772
0.56	0.32	0.29	0.2	1.38	4.2815
0.19	0.32	0.29	0.4	1.2	4.1736
0.19	0.32	0.14	0.2	0.86	4.2294
1.13	1.07	1.01	1.01	λmax =	4.2154

CI = 0.0718
RI = 0.9
CR1 = 0.0798 CR<0.1

CR55 0.5 0.5 1 1 1 0.33

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	2.00	2.00	1.00
Y2	0.50	1.00	1.00	2.00
Y3	0.50	1.00	1.00	3.00
Y4	1.00	0.50	0.33	1.00
Sum	3.00	4.50	4.33	7.00

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.33	0.44	0.46	0.14	1.38	0.3455
0.17	0.22	0.23	0.29	0.91	0.2263
0.17	0.22	0.23	0.43	1.05	0.2621
0.33	0.11	0.08	0.14	0.66	0.1661
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.35	0.45	0.52	0.17	1.49	4.3074
0.17	0.23	0.26	0.17	0.83	3.6548
0.17	0.23	0.26	0.5	1.16	4.424
0.35	0.11	0.09	0.17	0.71	4.2884
1.04	1.02	1.14	1	λmax =	4.1687

CI = 0.0562
RI = 0.9
CR1 = 0.0625 CR<0.1

CR56 0.5 0.5 1 1 1 1

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	2.00	2.00	1.00
Y2	0.50	1.00	1.00	1.00
Y3	0.50	1.00	1.00	1.00
Y4	1.00	1.00	1.00	1.00

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.33	0.4	0.4	0.25	1.38	0.3458
0.17	0.2	0.2	0.25	0.82	0.2042
0.17	0.2	0.2	0.25	0.82	0.2042
0.33	0.2	0.2	0.25	0.98	0.2458

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.35	0.41	0.41	0.25	1.41	4.0723
0.17	0.2	0.2	0.25	0.83	4.051
0.17	0.2	0.2	0.25	0.83	4.051
0.35	0.2	0.2	0.25	1	4.0678

Sum	3.00	5.00	5.00	4.00						1	1.04	1.02	1.02	0.98	λmax =	4.0605
															CI =	0.0202
															RI =	0.9
															CR1 =	0.0224	CR<0.1

CR57 1 1 2 0.25 0 0.5

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	1.00	1.00	0.50
Y2	1.00	1.00	4.00	3.00
Y3	1.00	0.25	1.00	2.00
Y4	2.00	0.33	0.50	1.00
Sum	5.00	2.58	6.50	6.50

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.2	0.39	0.15	0.08	0.82	0.2045
0.2	0.39	0.62	0.46	1.66	0.416
0.2	0.1	0.15	0.31	0.76	0.1896
0.4	0.13	0.08	0.15	0.76	0.19
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.2	0.42	0.19	0.09	0.91	4.4263
0.2	0.42	0.76	0.57	1.95	4.6842
0.2	0.1	0.19	0.38	0.88	4.6311
0.41	0.14	0.09	0.19	0.83	4.3819
1.02	1.07	1.23	1.23	λmax =	4.5308
				CI =	0.1769
				RI =	0.9
				CR1 =	0.1966 CR>0.1

CR58 0.2 0.25 0.33 0.33 1 1

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	5.00	4.00	3.00
Y2	0.20	1.00	3.00	1.00
Y3	0.25	0.33	1.00	1.00
Y4	0.33	1.00	1.00	1.00
Sum	1.78	7.33	9.00	6.00

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.56	0.68	0.44	0.5	2.19	0.5468
0.11	0.14	0.33	0.17	0.75	0.1871
0.14	0.05	0.11	0.17	0.46	0.1159
0.19	0.14	0.11	0.17	0.6	0.1503
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.55	0.94	0.46	0.45	2.4	4.3833
0.11	0.19	0.35	0.15	0.79	4.2447
0.14	0.06	0.12	0.15	0.47	4.0152
0.18	0.19	0.12	0.15	0.64	4.2292
0.98	1.37	1.04	0.9	λmax =	4.2181
				CI =	0.0727
				RI =	0.9
				CR1 =	0.0808 CR<0.1

CR59 0.25 0.33 0.2 0.2 0 0.33

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	4.00	3.00	5.00
Y2	0.25	1.00	5.00	4.00
Y3	0.33	0.20	1.00	3.00
Y4	0.20	0.25	0.33	1.00
Sum	1.78	5.45	9.33	13.00

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.56	0.73	0.32	0.38	2	0.5002
0.14	0.18	0.54	0.31	1.17	0.2918
0.19	0.04	0.11	0.23	0.56	0.1404
0.11	0.05	0.04	0.08	0.27	0.0677
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.5	1.17	0.42	0.34	2.43	4.8517
0.13	0.29	0.7	0.27	1.39	4.7619
0.17	0.06	0.14	0.2	0.57	4.0494
0.1	0.07	0.05	0.07	0.29	4.248
0.89	1.59	1.31	0.88	λmax =	4.4777
				CI =	0.1592
				RI =	0.9
				CR1 =	0.1769 CR>0.1

CR60 1 1 1 1 1 1

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	1.00	1.00	1.00

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.25	0.25	0.25	0.25	1	0.25

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.25	0.25	0.25	0.25	1	4

Y2	1.00	1.00	1.00	1.00
Y3	1.00	1.00	1.00	1.00
Y4	1.00	1.00	1.00	1.00
Sum	4.00	4.00	4.00	4.00

0.25	0.25	0.25	0.25	1	0.25
0.25	0.25	0.25	0.25	1	0.25
0.25	0.25	0.25	0.25	1	0.25
					1

0.25	0.25	0.25	0.25	1	4
0.25	0.25	0.25	0.25	1	4
0.25	0.25	0.25	0.25	1	4
1	1	1	1	λmax =	4
				CI =	0
				RI =	0.9
				CR1 =	0CR<0.1

CR61 1 1 0.5 1 0 1

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	1.00	1.00	2.00
Y2	1.00	1.00	1.00	3.00
Y3	1.00	1.00	1.00	1.00
Y4	0.50	0.33	1.00	1.00
Sum	3.50	3.33	4.00	7.00

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.29	0.3	0.25	0.29	1.12	0.2804
0.29	0.3	0.25	0.43	1.26	0.3161
0.29	0.3	0.25	0.14	0.98	0.2446
0.14	0.1	0.25	0.14	0.64	0.1589
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.28	0.32	0.24	0.32	1.16	4.1338
0.28	0.32	0.24	0.48	1.32	4.1695
0.28	0.32	0.24	0.16	1	4.0876
0.14	0.11	0.24	0.16	0.65	4.0843
0.98	1.05	0.98	1.11	λmax =	4.1188
				CI =	0.0396
				RI =	0.9
				CR1 =	0.044CR<0.1

CR62 0.17 0.2 0.2 0.17 0 0.33

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	6.00	5.00	5.00
Y2	0.17	1.00	6.00	3.00
Y3	0.20	0.17	1.00	3.00
Y4	0.20	0.33	0.33	1.00
Sum	1.57	7.50	12.33	12.00

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.64	0.8	0.41	0.42	2.26	0.5651
0.11	0.13	0.49	0.25	0.98	0.2441
0.13	0.02	0.08	0.25	0.48	0.1202
0.13	0.04	0.03	0.08	0.28	0.0706
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.57	0.24	0.6	0.35	1.76	3.1206
0.09	0.24	0.72	0.21	1.27	5.2101
0.11	0.04	0.12	0.21	0.49	4.0401
0.11	0.08	0.04	0.07	0.31	4.3201
0.89	0.61	1.48	0.85	λmax =	4.1727
				CI =	0.0576
				RI =	0.9
				CR1 =	0.064CR<0.1

CR63 0.25 0.25 0.33 0.33 1 0.5

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	4.00	4.00	3.00
Y2	0.25	1.00	3.00	2.00
Y3	0.25	0.33	1.00	2.00
Y4	0.33	0.50	0.50	1.00
Sum	1.83	5.83	8.50	8.00

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.55	0.69	0.47	0.38	2.08	0.5192
0.14	0.17	0.35	0.25	0.91	0.2277
0.14	0.06	0.12	0.25	0.56	0.1403
0.18	0.09	0.06	0.13	0.45	0.1128
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.52	0.68	0.56	0.34	2.1	4.0484
0.13	0.23	0.42	0.23	1	4.4097
0.13	0.08	0.14	0.23	0.57	4.0749
0.17	0.11	0.07	0.11	0.47	4.1642
0.95	1.1	1.19	0.9	λmax =	4.1743
				CI =	0.0581
				RI =	0.9
				CR1 =	0.0646CR<0.1

CR64 1 1 0.5 0.5 2 2

	Pairwise Comparison Y1	Y2	Y3	Y4	Standardized Matrix Y1	Y2	Y3	Y4	Sum	Weight	Consistency Matrix Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	1.00	1.00	2.00	0.29	0.22	0.17	0.5	1.17	0.2937	0.29	0.24	0.17	0.29	1	3.4054
Y2	1.00	1.00	2.00	0.50	0.29	0.22	0.33	0.13	0.97	0.2416	0.29	0.24	0.34	0.15	1.03	4.2464
Y3	1.00	0.50	1.00	0.50	0.29	0.11	0.17	0.13	0.69	0.1721	0.29	0.12	0.17	0.15	0.73	4.2579
Y4	0.50	2.00	2.00	1.00	0.14	0.44	0.33	0.25	1.17	0.2927	0.15	0.48	0.34	0.29	1.27	4.3288
Sum	3.50	4.50	6.00	4.00						1	1.03	1.09	1.03	1.17	λmax =	4.0596
															CI =	0.0199
															RI =	0.9
															CR1 =	0.0221 CR<0.1

CR65 4 5 3 0.33 1 1

	Pairwise Comparison Y1	Y2	Y3	Y4	Standardized Matrix Y1	Y2	Y3	Y4	Sum	Weight	Consistency Matrix Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.25	0.20	0.33	0.08	0.12	0.04	0.08	0.31	0.0781	0.08	0.11	0.05	0.07	0.32	4.0356
Y2	4.00	1.00	3.00	2.00	0.31	0.48	0.58	0.46	1.83	0.4565	0.31	0.46	0.73	0.45	1.94	4.2527
Y3	5.00	0.33	1.00	1.00	0.38	0.16	0.19	0.23	0.97	0.2419	0.39	0.15	0.24	0.22	1.01	4.1664
Y4	3.00	0.50	1.00	1.00	0.23	0.24	0.19	0.23	0.89	0.2235	0.23	0.23	0.24	0.22	0.93	4.1523
Sum	13.00	2.08	5.20	4.33						1	1.02	0.95	1.26	0.97	λmax =	4.1518
															CI =	0.0506
															RI =	0.9
															CR1 =	0.0562 CR<0.1

CR66 0.5 1 0.5 0.33 1 1

	Pairwise Comparison Y1	Y2	Y3	Y4	Standardized Matrix Y1	Y2	Y3	Y4	Sum	Weight	Consistency Matrix Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	2.00	1.00	2.00	0.33	0.46	0.17	0.4	1.36	0.3404	0.34	0.27	0.19	0.38	1.19	3.4991
Y2	0.50	1.00	3.00	1.00	0.17	0.23	0.5	0.2	1.1	0.2744	0.17	0.27	0.58	0.19	1.22	4.4404
Y3	1.00	0.33	1.00	1.00	0.33	0.08	0.17	0.2	0.78	0.1942	0.34	0.09	0.19	0.19	0.82	4.2068
Y4	0.50	1.00	1.00	1.00	0.17	0.23	0.17	0.2	0.76	0.191	0.17	0.27	0.19	0.19	0.83	4.344
Sum	3.00	4.33	6.00	5.00						1	1.02	0.91	1.17	0.96	λmax =	4.1226
															CI =	0.0409
															RI =	0.9
															CR1 =	0.0454 CR<0.1

CR67 4 3 0.25 0.5 1 0.33

	Pairwise Comparison Y1	Y2	Y3	Y4	Standardized Matrix Y1	Y2	Y3	Y4	Sum	Weight	Consistency Matrix Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.25	0.33	4.00	0.12	0.09	0.09	0.44	0.75	0.1869	0.19	0.05	0.06	0.75	1.04	5.5833
Y2	4.00	1.00	2.00	1.00	0.48	0.36	0.55	0.11	1.51	0.3763	0.37	0.19	0.37	0.19	1.12	2.9799
Y3	3.00	0.50	1.00	3.00	0.36	0.18	0.27	0.33	1.15	0.2879	0.56	0.09	0.19	0.56	1.4	4.8684
Y4	0.25	1.00	0.33	1.00	0.03	0.36	0.09	0.11	0.6	0.149	0.05	0.19	0.06	0.19	0.48	3.2401
Sum	8.25	2.75	3.67	9.00						1	1.17	0.51	0.69	1.68	λmax =	4.1679
															CI =	0.056
															RI =	0.9

CR1 = 0.0622 CR<0.1

CR68 1 1 0.33 4 3 6

	Pairwise Comparison				**Standardized Matrix**						**Consistency Matrix**					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	1.00	1.00	3.00	0.3	0.11	0.12	0.67	1.2	0.2997	0.3	0.13	0.23	0.35	1	3.3361
Y2	1.00	1.00	0.25	0.33	0.3	0.11	0.03	0.07	0.52	0.1289	0.3	0.13	0.06	0.12	0.6	4.6579
Y3	1.00	4.00	1.00	0.17	0.3	0.44	0.12	0.04	0.9	0.2257	0.3	0.52	0.23	0.06	1.1	4.8678
Y4	0.33	3.00	6.00	1.00	0.1	0.33	0.73	0.22	1.38	0.3457	0.1	0.39	0.23	0.35	1.06	3.0601
Sum	3.33	9.00	8.25	4.50						1	0.83	1.16	0.73	0.86	λmax =	3.9805
															CI =	-0.007
															RI =	0.9
															CR1 =	-0.007 CR<0.1

CR69 0.17 0.25 0.33 1 1 1

	Pairwise Comparison				**Standardized Matrix**						**Consistency Matrix**					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	6.00	4.00	3.00	0.57	0.67	0.57	0.5	2.31	0.5774	0.58	0.77	0.56	0.46	2.37	4.11
Y2	0.17	1.00	1.00	1.00	0.1	0.11	0.14	0.17	0.52	0.129	0.1	0.13	0.14	0.15	0.52	4.0231
Y3	0.25	1.00	1.00	1.00	0.14	0.11	0.14	0.17	0.56	0.1409	0.14	0.13	0.14	0.15	0.57	4.0246
Y4	0.33	1.00	1.00	1.00	0.19	0.11	0.14	0.17	0.61	0.1528	0.19	0.13	0.14	0.15	0.62	4.026
Sum	1.75	9.00	7.00	6.00						1	1.01	1.16	0.99	0.92	λmax =	4.0459
															CI =	0.0153
															RI =	0.9
															CR1 =	0.017 CR<0.1

CR70 0.13 0.14 0.13 0.17 1 1

	Pairwise Comparison				**Standardized Matrix**						**Consistency Matrix**					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	8.00	7.00	8.00	0.72	0.79	0.47	0.73	2.7	0.6747	0.67	0.17	0.48	0.69	2.02	2.9936
Y2	0.13	1.00	6.00	1.00	0.09	0.1	0.4	0.09	0.68	0.1698	0.08	0.17	0.41	0.09	0.76	4.4495
Y3	0.14	0.17	1.00	1.00	0.1	0.02	0.07	0.09	0.28	0.0691	0.1	0.03	0.07	0.09	0.28	4.0535
Y4	0.13	1.00	1.00	1.00	0.09	0.1	0.07	0.09	0.35	0.0864	0.08	0.17	0.07	0.09	0.41	4.7401
Sum	1.39	10.17	15.00	11.00						1	0.94	0.54	1.04	0.95	λmax =	4.0592
															CI =	0.0197
															RI =	0.9
															CR1 =	0.0219 CR<0.1

CR71 0.13 0.13 0.14 0.13 0 0.33

	Pairwise Comparison				**Standardized Matrix**						**Consistency Matrix**					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	8.00	8.00	7.00	0.72	0.86	0.46	0.37	2.41	0.6032	0.6	0.27	0.64	0.33	1.84	3.0502
Y2	0.13	1.00	8.00	8.00	0.09	0.11	0.46	0.42	1.08	0.2701	0.08	0.27	0.64	0.38	1.36	5.0316
Y3	0.13	0.13	1.00	3.00	0.09	0.01	0.06	0.16	0.32	0.0797	0.08	0.03	0.08	0.14	0.33	4.1378
Y4	0.14	0.13	0.33	1.00	0.1	0.01	0.02	0.05	0.19	0.047	0.09	0.03	0.03	0.05	0.19	4.1181

	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Sum	1.39	9.25	17.33	19.00						1	0.84	0.61	1.38	0.89	λmax =	4.0844
															CI =	0.0281
															RI =	0.9
															CR1 =	0.0313 CR<0.1

CR72 0.17 0.14 0.2 1 1 1

Pairwise Comparison					Standardized Matrix						Consistency Matrix					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	6.00	7.00	5.00	0.66	0.67	0.7	0.63	2.65	0.6635	0.66	0.67	0.75	0.59	2.67	4.0283
Y2	0.17	1.00	1.00	1.00	0.11	0.11	0.1	0.13	0.45	0.1116	0.11	0.11	0.11	0.12	0.45	4.0048
Y3	0.14	1.00	1.00	1.00	0.09	0.11	0.1	0.13	0.43	0.1077	0.09	0.11	0.11	0.12	0.43	4.0047
Y4	0.20	1.00	1.00	1.00	0.13	0.11	0.1	0.13	0.47	0.1172	0.13	0.11	0.11	0.12	0.47	4.0049
Sum	1.51	9.00	10.00	8.00						1	1	1	1.08	0.94	λmax =	4.0107
															CI =	0.0036
															RI =	0.9
															CR1 =	0.004 CR<0.1

CR73 1 1 0.5 0.33 0 1

Pairwise Comparison					Standardized Matrix						Consistency Matrix					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	1.00	1.00	2.00	0.29	0.38	0.17	0.29	1.11	0.2783	0.28	0.4	0.18	0.29	1.14	4.1123
Y2	1.00	1.00	3.00	3.00	0.29	0.38	0.5	0.43	1.59	0.3973	0.28	0.4	0.54	0.43	1.65	4.1498
Y3	1.00	0.33	1.00	1.00	0.29	0.13	0.17	0.14	0.72	0.1801	0.28	0.13	0.18	0.14	0.74	4.0826
Y4	0.50	0.33	1.00	1.00	0.14	0.13	0.17	0.14	0.58	0.1443	0.14	0.13	0.18	0.14	0.6	4.1289
Sum	3.50	2.67	6.00	7.00						1	0.97	1.06	1.08	1.01	λmax =	4.1184
															CI =	0.0395
															RI =	0.9
															CR1 =	0.0439 CR<0.1

CR74 0.17 0.14 0.17 0.25 0 0.33

Pairwise Comparison					Standardized Matrix						Consistency Matrix					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	8.00	7.00	8.00	0.72	0.85	0.57	0.47	2.6	0.6507	0.65	0.2	0.68	0.39	1.92	2.9572
Y2	0.13	1.00	4.00	5.00	0.09	0.11	0.32	0.29	0.81	0.2035	0.08	0.2	0.39	0.25	0.92	4.5078
Y3	0.14	0.25	1.00	3.00	0.1	0.03	0.08	0.18	0.39	0.0966	0.09	0.05	0.1	0.15	0.39	4.0152
Y4	0.13	0.20	0.33	1.00	0.09	0.02	0.03	0.06	0.2	0.0492	0.08	0.04	0.03	0.05	0.2	4.1358
Sum	1.39	9.45	12.33	17.00						1	0.91	0.5	1.19	0.84	λmax =	3.904
															CI =	-0.032
															RI =	0.9
															CR1 =	-0.036 CR<0.1

CR75 0.25 0.14 0.14 0.17 0 0.17

Pairwise Comparison					Standardized Matrix						Consistency Matrix					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	4.00	7.00	7.00	0.65	0.75	0.49	0.37	2.26	0.5648	0.56	1.04	0.89	0.34	2.83	5.0191

Y2	0.25	1.00	6.00	5.00	0.16	0.19	0.42	0.26	1.04	0.259	0.14	0.26	0.13	0.24	0.77	2.9778
Y3	0.14	0.17	1.00	6.00	0.09	0.03	0.07	0.32	0.51	0.1276	0.08	0.04	0.13	0.29	0.54	4.2588
Y4	0.14	0.20	0.17	1.00	0.09	0.04	0.01	0.05	0.19	0.0487	0.08	0.05	0.02	0.05	0.2	4.1587
Sum	1.54	5.37	14.17	19.00						1	0.87	1.39	1.17	0.92	λmax =	4.1036
															CI =	0.0345
															RI =	0.9
															CR1 =	0.0384 CR<0.1

CR76 1 1 3 2 2 2

	Pairwise Comparison				**Standardized Matrix**						**Consistency Matrix**					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	1.00	1.00	0.33	0.17	0.17	0.22	0.14	0.7	0.1746	0.17	0.16	0.23	0.14	0.72	4.0985
Y2	1.00	1.00	0.50	0.50	0.17	0.17	0.11	0.21	0.66	0.1647	0.17	0.16	0.12	0.21	0.67	4.0663
Y3	1.00	2.00	1.00	0.50	0.17	0.33	0.22	0.21	0.94	0.2341	0.17	0.33	0.23	0.21	0.95	4.0636
Y4	3.00	2.00	2.00	1.00	0.5	0.33	0.44	0.43	1.71	0.4266	0.52	0.33	0.47	0.43	1.75	4.0977
Sum	6.00	6.00	4.50	2.33						1	1.05	0.99	1.05	1	λmax =	4.0815
															CI =	0.0272
															RI =	0.9
															CR1 =	0.0302 CR<0.1

CR77 4 4 5 4 5 4

	Pairwise Comparison				**Standardized Matrix**						**Consistency Matrix**					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.25	0.25	0.20	0.07	0.02	0.05	0.12	0.26	0.0656	0.07	0.03	0.06	0.11	0.27	4.1448
Y2	4.00	1.00	0.25	0.20	0.29	0.1	0.05	0.12	0.55	0.1375	0.26	0.14	0.06	0.11	0.57	4.1602
Y3	4.00	4.00	1.00	0.25	0.29	0.39	0.18	0.15	1.01	0.2523	0.26	0.55	0.25	0.14	1.2	4.7593
Y4	5.00	5.00	4.00	1.00	0.36	0.49	0.73	0.61	2.18	0.5446	0.33	0.69	0.25	0.54	1.81	3.3282
Sum	14.00	10.25	5.50	1.65						1	0.92	1.41	0.63	0.9	λmax =	4.0981
															CI =	0.0327
															RI =	0.9
															CR1 =	0.0363 CR<0.1

CR78 5 5 4 6 5 4

	Pairwise Comparison				**Standardized Matrix**						**Consistency Matrix**					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.20	0.20	0.25	0.07	0.02	0.04	0.15	0.27	0.0668	0.07	0.03	0.06	0.13	0.28	4.1678
Y2	5.00	1.00	0.17	0.20	0.33	0.08	0.03	0.12	0.56	0.141	0.33	0.14	0.05	0.1	0.62	4.4256
Y3	5.00	6.00	1.00	0.25	0.33	0.49	0.19	0.15	1.16	0.2896	0.33	0.71	0.29	0.13	1.45	5.0219
Y4	4.00	5.00	4.00	1.00	0.27	0.41	0.75	0.59	2.01	0.5025	0.27	0.56	0.29	0.5	1.62	3.2308
Sum	15.00	12.20	5.37	1.70						1	1	1.44	0.69	0.85	λmax =	4.2115
															CI =	0.0705
															RI =	0.9
															CR1 =	0.0783 CR<0.1

CR79 2 2 1 1 1 1

	Pairwise Comparison				Standardized Matrix						Consistency Matrix					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.50	0.50	1.00	0.17	0.14	0.14	0.25	0.7	0.1756	0.18	0.14	0.14	0.25	0.71	4.0508
Y2	2.00	1.00	1.00	1.00	0.33	0.29	0.29	0.25	1.15	0.2887	0.35	0.29	0.29	0.25	1.18	4.0722
Y3	2.00	1.00	1.00	1.00	0.33	0.29	0.29	0.25	1.15	0.2887	0.35	0.29	0.29	0.25	1.18	4.0722
Y4	1.00	1.00	1.00	1.00	0.17	0.29	0.29	0.25	0.99	0.247	0.18	0.29	0.29	0.25	1	4.0482
Sum	6.00	3.50	3.50	4.00						1	1.05	1.01	1.01	0.99	λmax =	4.0608
															CI =	0.0203
															RI =	0.9
															CR1 =	0.0225 CR<0.1

CR80 7 7 6 8 7 7

	Pairwise Comparison				Standardized Matrix						Consistency Matrix					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.14	0.14	0.17	0.05	0.01	0.02	0.11	0.19	0.0471	0.05	0.02	0.04	0.09	0.2	4.1733
Y2	7.00	1.00	0.13	0.14	0.33	0.06	0.02	0.1	0.51	0.1272	0.33	0.13	0.03	0.08	0.57	4.4842
Y3	7.00	8.00	1.00	0.14	0.33	0.5	0.12	0.1	1.05	0.2621	0.33	0.13	0.26	0.08	0.8	3.0514
Y4	6.00	7.00	7.00	1.00	0.29	0.43	0.85	0.69	2.25	0.5636	0.28	0.89	0.26	0.56	2	3.5462
Sum	21.00	16.14	8.27	1.45						1	0.99	1.16	0.59	0.82	λmax =	3.8138
															CI =	-0.062
															RI =	0.9
															CR1 =	-0.069 CR<0.1

CR81 6 6 8 6 6 7

	Pairwise Comparison				Standardized Matrix						Consistency Matrix					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.17	0.17	0.13	0.05	0.01	0.02	0.09	0.17	0.0422	0.04	0.02	0.04	0.07	0.18	4.2067
Y2	6.00	1.00	0.17	0.17	0.29	0.08	0.02	0.11	0.5	0.1247	0.25	0.12	0.04	0.1	0.52	4.1438
Y3	6.00	6.00	1.00	0.17	0.29	0.46	0.14	0.11	0.99	0.248	0.25	0.75	0.25	0.1	1.35	5.4296
Y4	8.00	6.00	6.00	1.00	0.38	0.46	0.82	0.69	2.34	0.5851	0.34	0.75	0.25	0.59	1.92	3.2789
Sum	21.00	13.17	7.33	1.46						1	0.89	1.64	0.58	0.85	λmax =	4.2648
															CI =	0.0883
															RI =	0.9
															CR1 =	0.0981 CR<0.1

CR82 5 5 7 4 7 7

	Pairwise Comparison				Standardized Matrix						Consistency Matrix					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.20	0.20	0.14	0.06	0.02	0.02	0.1	0.2	0.0489	0.05	0.02	0.04	0.09	0.2	4.1619
Y2	5.00	1.00	0.25	0.14	0.28	0.08	0.03	0.1	0.49	0.1223	0.24	0.12	0.05	0.09	0.51	4.1471
Y3	5.00	4.00	1.00	0.14	0.28	0.33	0.12	0.1	0.82	0.206	0.24	0.49	0.21	0.09	1.03	4.9943
Y4	7.00	7.00	7.00	1.00	0.39	0.57	0.83	0.7	2.49	0.6228	0.34	0.86	0.21	0.62	2.03	3.2555
Sum	18.00	12.20	8.45	1.43						1	0.88	1.49	0.5	0.89	λmax =	4.1397
															CI =	0.0466
															RI =	0.9

CR1 = 0.0517CR<0.1

CR83 5 5 2 1 2 1

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.20	0.20	0.50
Y2	5.00	1.00	1.00	0.50
Y3	5.00	1.00	1.00	1.00
Y4	2.00	2.00	1.00	1.00
Sum	13.00	4.20	3.20	3.00

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.08	0.05	0.06	0.17	0.35	0.0884
0.38	0.24	0.31	0.17	1.1	0.2755
0.38	0.24	0.31	0.33	1.27	0.3171
0.15	0.48	0.31	0.33	1.28	0.319
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.09	0.06	0.06	0.16	0.37	4.148
0.44	0.28	0.32	0.16	1.2	4.3419
0.44	0.28	0.32	0.32	1.36	4.2743
0.18	0.55	0.32	0.32	1.37	4.2817
1.15	1.16	1.02	0.96	λmax =	4.2615

CI = 0.0872

RI = 0.9

CR1 = 0.0968CR<0.1

CR84 0.25 0.5 0.5 1 1 1

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	4.00	2.00	2.00
Y2	0.25	1.00	1.00	1.00
Y3	0.50	1.00	1.00	1.00
Y4	0.50	1.00	1.00	1.00
Sum	2.25	7.00	5.00	5.00

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.44	0.57	0.4	0.4	1.82	0.454
0.11	0.14	0.2	0.2	0.65	0.1635
0.22	0.14	0.2	0.2	0.77	0.1913
0.22	0.14	0.2	0.2	0.77	0.1913
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.45	0.65	0.38	0.38	1.87	4.1259
0.11	0.16	0.19	0.19	0.66	4.034
0.23	0.16	0.19	0.19	0.77	4.0415
0.23	0.16	0.19	0.19	0.77	4.0415
1.02	1.14	0.96	0.96	λmax =	4.0607

CI = 0.0202

RI = 0.9

CR1 = 0.0225CR<0.1

CR85 0.17 0.14 0.2 0.25 0 0.2

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	6.00	7.00	5.00
Y2	0.17	1.00	4.00	6.00
Y3	0.14	0.25	1.00	5.00
Y4	0.20	0.17	0.20	1.00
Sum	1.51	7.42	12.20	17.00

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.66	0.81	0.57	0.29	2.34	0.5848
0.11	0.13	0.33	0.35	0.93	0.2315
0.09	0.03	0.08	0.29	0.5	0.1261
0.13	0.02	0.02	0.06	0.23	0.0575
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.58	0.23	0.88	0.29	1.99	3.3972
0.1	0.23	0.5	0.35	1.18	5.0912
0.08	0.06	0.13	0.29	0.56	4.4031
0.12	0.04	0.03	0.06	0.24	4.1414
0.88	0.56	1.54	0.98	λmax =	4.2582

CI = 0.0861

RI = 0.9

CR1 = 0.0956CR<0.1

CR86 4 3 3 2 4 3

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.25	0.33	0.33
Y2	4.00	1.00	0.50	0.25
Y3	3.00	2.00	1.00	0.33
Y4	3.00	4.00	3.00	1.00

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.09	0.03	0.07	0.17	0.37	0.0921
0.36	0.14	0.1	0.13	0.74	0.1839
0.27	0.28	0.21	0.17	0.93	0.2323
0.27	0.55	0.62	0.52	1.97	0.4917

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.09	0.02	0.03	0.03	0.18	1.9167
0.37	0.09	0.05	0.02	0.53	2.8793
0.28	0.18	0.09	0.03	0.58	2.5096
0.28	0.37	0.28	0.09	1.01	2.0596

Sum	11.00	7.25	4.83	1.92						1	1.01	0.67	0.44	0.18	λmax =	2.3413
															CI =	-0.553
															RI =	0.9
															CR1 =	-0.614 CR<0.1

CR87 3 4 3 4 2 3

Pairwise Comparison					**Standardized Matrix**						**Consistency Matrix**					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.33	0.25	0.33	0.09	0.05	0.06	0.15	0.35	0.0864	0.09	0.06	0.08	0.14	0.36	4.2131
Y2	3.00	1.00	0.25	0.50	0.27	0.14	0.06	0.23	0.7	0.1739	0.26	0.17	0.08	0.21	0.72	4.157
Y3	4.00	4.00	1.00	0.33	0.36	0.55	0.22	0.15	1.29	0.3213	0.35	0.7	0.32	0.14	1.5	4.6747
Y4	3.00	2.00	3.00	1.00	0.27	0.27	0.67	0.46	1.67	0.4184	0.26	0.35	0.32	0.42	1.35	3.2187
Sum	11.00	7.33	4.50	2.17						1	0.95	1.27	0.8	0.91	λmax =	4.0659
															CI =	0.022
															RI =	0.9
															CR1 =	0.0244 CR<0.1

CR88 0.2 0.17 0.2 0.17 0 0.17

Pairwise Comparison					**Standardized Matrix**						**Consistency Matrix**					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	5.00	6.00	5.00	0.64	0.79	0.46	0.26	2.15	0.5374	0.54	0.28	0.79	0.27	1.87	3.4821
Y2	0.20	1.00	6.00	7.00	0.13	0.16	0.46	0.37	1.11	0.2776	0.11	0.28	0.13	0.38	0.89	3.2189
Y3	0.17	0.17	1.00	6.00	0.11	0.03	0.08	0.32	0.52	0.1311	0.09	0.05	0.13	0.32	0.59	4.5019
Y4	0.20	0.14	0.17	1.00	0.13	0.02	0.01	0.05	0.22	0.0539	0.11	0.04	0.02	0.05	0.22	4.1354
Sum	1.57	6.31	13.17	19.00						1	0.84	0.64	1.07	1.02	λmax =	3.8345
															CI =	-0.055
															RI =	0.9
															CR1 =	-0.061 CR<0.1

CR89 4 4 3 2 4 3

Pairwise Comparison					**Standardized Matrix**						**Consistency Matrix**					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.25	0.25	0.33	0.08	0.03	0.05	0.17	0.34	0.0861	0.09	0.04	0.06	0.16	0.36	4.127
Y2	4.00	1.00	0.50	0.25	0.33	0.14	0.11	0.13	0.71	0.1767	0.34	0.18	0.12	0.12	0.77	4.3425
Y3	4.00	2.00	1.00	0.33	0.33	0.28	0.21	0.17	0.99	0.2484	0.34	0.35	0.25	0.16	1.11	4.4651
Y4	3.00	4.00	3.00	1.00	0.25	0.55	0.63	0.52	1.96	0.4888	0.26	0.71	0.25	0.49	1.7	3.4831
Sum	12.00	7.25	4.75	1.92						1	1.03	1.28	0.68	0.94	λmax =	4.1044
															CI =	0.0348
															RI =	0.9
															CR1 =	0.0387 CR<0.1

CR90 4 4 3 4 4 4

Pairwise Comparison					**Standardized Matrix**						**Consistency Matrix**					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.25	0.25	0.33	0.08	0.03	0.05	0.18	0.34	0.0844	0.08	0.04	0.07	0.16	0.35	4.1944

Y2	4.00	1.00	0.25	0.25	0.33	0.11	0.05	0.14	0.62	0.1558	0.34	0.16	0.07	0.12	0.68	4.3859
Y3	4.00	4.00	1.00	0.25	0.33	0.43	0.18	0.14	1.08	0.271	0.34	0.62	0.27	0.12	1.35	4.9968
Y4	3.00	4.00	4.00	1.00	0.25	0.43	0.73	0.55	1.96	0.4888	0.25	0.62	0.27	0.49	1.64	3.3476
Sum	12.00	9.25	5.50	1.83						1	1.01	1.44	0.68	0.9	λmax =	4.2312
															CI =	0.0771
															RI =	0.9
															CR1 =	0.0856 CR<0.1

CR91 2 4 4 2 3 5

Pairwise Comparison **Standardized Matrix** **Consistency Matrix**

	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.50	0.25	0.25	0.09	0.08	0.04	0.14	0.35	0.0863	0.09	0.07	0.06	0.13	0.35	4.0804
Y2	2.00	1.00	0.50	0.33	0.18	0.15	0.07	0.19	0.6	0.1492	0.17	0.15	0.12	0.18	0.62	4.1254
Y3	4.00	2.00	1.00	0.20	0.36	0.31	0.15	0.11	0.93	0.2329	0.35	0.3	0.23	0.11	0.98	4.219
Y4	4.00	3.00	5.00	1.00	0.36	0.46	0.74	0.56	2.13	0.5317	0.35	0.45	0.7	0.53	2.02	3.8049
Sum	11.00	6.50	6.75	1.78						1	0.95	0.97	1.11	0.95	λmax =	4.0574
															CI =	0.0191
															RI =	0.9
															CR1 =	0.0213 CR<0.1

CR92 3 3 3 1 1 1

Pairwise Comparison **Standardized Matrix** **Consistency Matrix**

	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.33	0.33	0.33	0.1	0.1	0.1	0.1	0.4	0.1	0.1	0.1	0.1	0.1	0.4	4
Y2	3.00	1.00	1.00	1.00	0.3	0.3	0.3	0.3	1.2	0.3	0.3	0.3	0.3	0.3	1.2	4
Y3	3.00	1.00	1.00	1.00	0.3	0.3	0.3	0.3	1.2	0.3	0.3	0.3	0.3	0.3	1.2	4
Y4	3.00	1.00	1.00	1.00	0.3	0.3	0.3	0.3	1.2	0.3	0.3	0.3	0.3	0.3	1.2	4
Sum	10.00	3.33	3.33	3.33						1	1	1	1	1	λmax =	4
															CI =	0
															RI =	0.9
															CR1 =	0 CR<0.1

CR93 3 3 4 3 4 3

Pairwise Comparison **Standardized Matrix** **Consistency Matrix**

	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.33	0.33	0.25	0.09	0.04	0.07	0.14	0.34	0.0847	0.08	0.05	0.09	0.13	0.35	4.1033
Y2	3.00	1.00	0.33	0.25	0.27	0.12	0.07	0.14	0.6	0.1501	0.25	0.15	0.09	0.13	0.62	4.109
Y3	3.00	3.00	1.00	0.33	0.27	0.36	0.21	0.18	1.03	0.2572	0.25	0.45	0.26	0.17	1.13	4.397
Y4	4.00	4.00	3.00	1.00	0.36	0.48	0.64	0.55	2.03	0.508	0.34	0.6	0.77	0.51	2.22	4.3679
Sum	11.00	8.33	4.67	1.83						1	0.93	1.25	1.2	0.93	λmax =	4.2443
															CI =	0.0814
															RI =	0.9
															CR1 =	0.0905 CR<0.1

CR94 4 4 3 4 3 2

	Pairwise Comparison				Standardized Matrix						Consistency Matrix					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.25	0.25	0.33	0.08	0.03	0.07	0.15	0.34	0.0847	0.08	0.04	0.08	0.14	0.35	4.1055
Y2	4.00	1.00	0.25	0.33	0.33	0.12	0.07	0.15	0.68	0.17	0.34	0.17	0.08	0.14	0.73	4.2923
Y3	4.00	4.00	1.00	0.50	0.33	0.48	0.29	0.23	1.33	0.3337	0.34	0.17	0.33	0.21	1.05	3.1419
Y4	3.00	3.00	2.00	1.00	0.25	0.36	0.57	0.46	1.65	0.4117	0.25	0.51	0.67	0.41	1.84	4.4772
Sum	12.00	8.25	3.50	2.17						1	1.02	0.89	1.17	0.89	λmax =	4.0042
															CI =	0.0014
															RI =	0.9
															CR1 =	0.0016 CR<0.1

CR95 0.11 0.11 0.11 0.11 9 9

	Pairwise Comparison				Standardized Matrix						Consistency Matrix					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	9.00	9.00	9.00	0.75	0.47	0.32	0.88	2.42	0.6057	0.61	0.12	0.31	2.19	3.22	5.3137
Y2	0.11	1.00	9.00	0.11	0.08	0.05	0.32	0.01	0.47	0.117	0.07	0.12	0.31	0.03	0.52	4.4169
Y3	0.11	0.11	1.00	0.11	0.08	0.01	0.04	0.01	0.14	0.0339	0.07	0.01	0.03	0.03	0.14	4.1633
Y4	0.11	9.00	9.00	1.00	0.08	0.47	0.32	0.1	0.97	0.2434	0.07	0.12	0.31	0.24	0.73	3.012
Sum	1.33	19.11	28.00	10.22						1	0.81	0.36	0.95	2.49	λmax =	4.2265
															CI =	0.0755
															RI =	0.9
															CR1 =	0.0839 CR<0.1

CR96 0.17 0.13 0.13 9 9 9

	Pairwise Comparison				Standardized Matrix						Consistency Matrix					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	6.00	8.00	8.00	0.71	0.24	0.44	0.87	2.26	0.5638	0.56	0.26	1.03	0.26	2.12	3.7638
Y2	0.17	1.00	0.11	0.11	0.12	0.04	0.01	0.01	0.18	0.044	0.09	0.04	0.01	0.03	0.18	4.1291
Y3	0.13	9.00	1.00	0.11	0.09	0.36	0.06	0.01	0.52	0.1289	0.07	0.4	0.13	0.03	0.62	4.8437
Y4	0.13	9.00	9.00	1.00	0.09	0.36	0.5	0.11	1.05	0.2634	0.07	0.4	0.13	0.26	0.86	3.2588
Sum	1.42	25.00	18.11	9.22						1	0.8	1.1	1.3	0.59	λmax =	3.9988
															CI =	-4E-04
															RI =	0.9
															CR1 =	-4E-04 CR<0.1

CR97 9 9 9 9 9 9

	Pairwise Comparison				Standardized Matrix						Consistency Matrix					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.11	0.11	0.11	0.04	0.01	0.01	0.08	0.14	0.0339	0.03	0.01	0.03	0.07	0.14	4.1633
Y2	9.00	1.00	0.11	0.11	0.32	0.05	0.01	0.08	0.47	0.117	0.31	0.12	0.03	0.07	0.52	4.4169
Y3	9.00	9.00	1.00	0.11	0.32	0.47	0.1	0.08	0.97	0.2434	0.31	0.12	0.24	0.07	0.73	3.012
Y4	9.00	9.00	9.00	1.00	0.32	0.47	0.88	0.75	2.42	0.6057	0.31	0.12	0.24	0.61	1.27	2.0992
Sum	28.00	19.11	10.22	1.33						1	0.95	0.36	0.54	0.81	λmax =	3.4228
															CI =	-0.192
															RI =	0.9

CR1 = -0.214CR<0.1

CR98 7 0.13 0.13 0.13 8 8

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.14	8.00	8.00
Y2	7.00	1.00	8.00	0.13
Y3	0.13	0.13	1.00	0.13
Y4	0.13	8.00	8.00	1.00
Sum	8.25	9.27	25.00	9.25

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.12	0.02	0.32	0.86	1.32	0.3304
0.85	0.11	0.32	0.01	1.29	0.3225
0.02	0.01	0.04	0.01	0.08	0.0205
0.02	0.86	0.32	0.11	1.31	0.3266
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.33	0.05	0.16	0.33	0.87	2.6254
0.33	0.32	0.16	0.04	0.86	2.6606
0.04	0.04	0.02	0.04	0.14	6.9612
0.04	0.04	0.16	0.33	0.57	1.7529
0.74	0.45	0.51	0.73	λmax =	3.5
				CI =	-0.167
				RI =	0.9
				CR1 =	-0.185CR<0.1

CR99 7 7 8 0.14 8 8

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.14	0.14	0.13
Y2	7.00	1.00	7.00	0.13
Y3	7.00	0.14	1.00	0.13
Y4	8.00	8.00	8.00	1.00
Sum	23.00	9.29	16.14	1.38

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.04	0.02	0.01	0.09	0.16	0.0397
0.3	0.11	0.43	0.09	0.94	0.2341
0.3	0.02	0.06	0.09	0.47	0.1181
0.35	0.86	0.5	0.73	2.43	0.6081
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.04	0.03	0.02	0.08	0.17	4.1858
0.28	0.23	0.83	0.08	1.41	6.0423
0.28	0.03	0.12	0.08	0.51	4.2759
0.32	0.23	0.12	0.61	1.28	2.1011
0.91	0.54	1.08	0.84	λmax =	4.1513
				CI =	0.0504
				RI =	0.9
				CR1 =	0.056CR<0.1

CR100 0.2 0.13 0.13 0.13 0 0.13

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	5.00	8.00	8.00
Y2	0.20	1.00	8.00	8.00
Y3	0.13	0.13	1.00	8.00
Y4	0.13	0.13	0.13	1.00
Sum	1.45	6.25	17.13	25.00

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.69	0.8	0.47	0.32	2.28	0.5692
0.14	0.16	0.47	0.32	1.09	0.2713
0.09	0.02	0.06	0.32	0.48	0.1212
0.09	0.02	0.01	0.04	0.15	0.0384
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.57	0.27	0.12	0.31	1.27	2.2288
0.11	0.27	0.97	0.31	1.66	6.1242
0.07	0.03	0.12	0.31	0.53	4.4013
0.07	0.03	0.02	0.04	0.16	4.1322
0.83	0.61	1.23	0.96	λmax =	4.2216
				CI =	0.0739
				RI =	0.9
				CR1 =	0.0821CR<0.1

CR101 0.2 0.2 0.13 0.13 0 0.11

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	5.00	5.00	8.00
Y2	0.20	1.00	8.00	8.00
Y3	0.20	0.13	1.00	8.00
Y4	0.13	0.13	0.13	1.00

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.66	0.8	0.35	0.32	2.13	0.5324
0.13	0.16	0.57	0.32	1.18	0.2944
0.13	0.02	0.07	0.32	0.54	0.1355
0.08	0.02	0.01	0.04	0.15	0.0377

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.53	0.29	0.68	0.3	1.81	3.3918
0.11	0.29	0.68	0.3	1.38	4.6876
0.11	0.04	0.14	0.3	0.58	4.2839
0.07	0.04	0.02	0.04	0.16	4.1903

	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Sum	1.53	6.25	14.13	25.00						1	0.81	0.66	1.51	0.94	λmax =	4.1384
															CI =	0.0461
															RI =	0.9
															CR1 =	0.0512 CR<0.1

CR102 0.2 0.17 0.17 0.17 0 0.2

Pairwise Comparison / **Standardized Matrix** / **Consistency Matrix**

	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	5.00	6.00	6.00	0.65	0.79	0.45	0.33	2.23	0.5574	0.56	0.27	0.73	0.31	1.87	3.3511
Y2	0.20	1.00	6.00	6.00	0.13	0.16	0.45	0.33	1.08	0.2691	0.11	0.27	0.73	0.31	1.42	5.2849
Y3	0.17	0.17	1.00	5.00	0.11	0.03	0.08	0.28	0.49	0.1221	0.09	0.04	0.12	0.26	0.52	4.2332
Y4	0.17	0.17	0.20	1.00	0.11	0.03	0.02	0.06	0.21	0.0514	0.09	0.04	0.02	0.05	0.21	4.1532
Sum	1.53	6.33	13.20	18.00						1	0.85	0.63	1.61	0.93	λmax =	4.2556
															CI =	0.0852
															RI =	0.9
															CR1 =	0.0947 CR<0.1

CR103 0.17 0.14 0.14 5 0 6

Pairwise Comparison / **Standardized Matrix** / **Consistency Matrix**

	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	6.00	7.00	7.00	0.69	0.49	0.49	0.46	2.14	0.5343	0.53	0.17	0.15	0.15	1	1.8717
Y2	0.17	1.00	0.20	7.00	0.11	0.08	0.01	0.46	0.67	0.1682	0.09	0.17	0.03	0.03	0.32	1.8833
Y3	0.14	5.00	1.00	0.17	0.1	0.41	0.07	0.01	0.59	0.1479	0.08	0.84	0.15	0.02	1.09	7.3711
Y4	0.14	0.14	6.00	1.00	0.1	0.01	0.42	0.07	0.6	0.1496	0.08	0.02	0.15	0.15	0.4	2.6588
Sum	1.45	12.14	14.20	15.17						1	0.78	1.2	0.47	0.35	λmax =	3.4462
															CI =	-0.185
															RI =	0.9
															CR1 =	-0.205 CR<0.1

CR104 0.17 0.14 0.14 0.14 0 0.13

Pairwise Comparison / **Standardized Matrix** / **Consistency Matrix**

	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	6.00	7.00	7.00	0.69	0.83	0.46	0.29	2.27	0.5671	0.57	0.26	0.91	0.29	2.02	3.5696
Y2	0.17	1.00	7.00	8.00	0.11	0.14	0.46	0.33	1.05	0.2621	0.09	0.26	0.13	0.33	0.82	3.1168
Y3	0.14	0.14	1.00	8.00	0.1	0.02	0.07	0.33	0.52	0.1294	0.08	0.04	0.13	0.33	0.58	4.4742
Y4	0.14	0.13	0.13	1.00	0.1	0.02	0.01	0.04	0.17	0.0414	0.08	0.03	0.02	0.04	0.17	4.1411
Sum	1.45	7.27	15.13	24.00						1	0.82	0.59	1.18	0.99	λmax =	3.8254
															CI =	-0.058
															RI =	0.9
															CR1 =	-0.065 CR<0.1

CR105 0.13 0.13 8 9 9 9

Pairwise Comparison / **Standardized Matrix** / **Consistency Matrix**

	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	8.00	7.00	0.13	0.11	0.3	0.41	0.09	0.91	0.2265	0.23	0.28	0.86	0.08	1.44	6.3546

	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y2	0.13	1.00	0.11	0.11	0.01	0.04	0.01	0.08	0.14	0.0349	0.03	0.03	0.01	0.07	0.15	4.1653
Y3	0.14	9.00	1.00	0.11	0.02	0.33	0.06	0.08	0.49	0.1224	0.03	0.31	0.12	0.07	0.54	4.3875
Y4	8.00	9.00	9.00	1.00	0.86	0.33	0.53	0.74	2.46	0.6162	0.23	0.31	0.12	0.62	1.28	2.0756
Sum	9.27	27.00	17.11	1.35						1	0.51	0.94	1.12	0.83	λmax =	4.2458
															CI =	0.0819
															RI =	0.9
															CR1 =	0.091 CR<0.1

CR106 0.11 0.11 8 0.13 0 8

Pairwise Comparison / **Standardized Matrix** / **Consistency Matrix**

	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	9.00	9.00	0.13	0.11	0.88	0.35	0.01	1.35	0.3365	0.34	0.32	0.17	0.04	0.87	2.5823
Y2	0.11	1.00	8.00	8.00	0.01	0.1	0.31	0.86	1.28	0.3205	0.04	0.32	0.15	0.32	0.83	2.6026
Y3	0.11	0.13	1.00	0.13	0.01	0.01	0.04	0.01	0.08	0.0191	0.04	0.04	0.02	0.04	0.14	7.1898
Y4	8.00	0.13	8.00	1.00	0.87	0.01	0.31	0.11	1.3	0.3239	0.04	0.04	0.15	0.32	0.56	1.7243
Sum	9.22	10.25	26.00	9.25						1	0.45	0.72	0.5	0.73	λmax =	3.5248
															CI =	-0.158
															RI =	0.9
															CR1 =	-0.176 CR<0.1

CR107 9 9 9 9 9 9

Pairwise Comparison / **Standardized Matrix** / **Consistency Matrix**

	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.11	0.11	0.11	0.04	0.01	0.01	0.08	0.14	0.0339	0.03	0.01	0.03	0.07	0.14	4.1633
Y2	9.00	1.00	0.11	0.11	0.32	0.05	0.01	0.08	0.47	0.117	0.31	0.12	0.03	0.07	0.52	4.4169
Y3	9.00	9.00	1.00	0.11	0.32	0.47	0.1	0.08	0.97	0.2434	0.31	0.12	0.24	0.07	0.73	3.012
Y4	9.00	9.00	9.00	1.00	0.32	0.47	0.88	0.75	2.42	0.6057	0.31	1.05	0.24	0.61	2.21	3.6443
Sum	28.00	19.11	10.22	1.33						1	0.95	1.3	0.54	0.81	λmax =	3.8091
															CI =	-0.064
															RI =	0.9
															CR1 =	-0.071 CR<0.1

CR108 0.11 0.11 0.11 0.11 0 9

Pairwise Comparison / **Standardized Matrix** / **Consistency Matrix**

	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	9.00	9.00	9.00	0.75	0.88	0.32	0.47	2.42	0.6057	0.61	0.24	0.31	1.05	2.21	3.6443
Y2	0.11	1.00	9.00	9.00	0.08	0.1	0.32	0.47	0.97	0.2434	0.07	0.24	0.31	0.12	0.73	3.012
Y3	0.11	0.11	1.00	0.11	0.08	0.01	0.04	0.01	0.14	0.0339	0.07	0.03	0.03	0.01	0.14	4.1633
Y4	0.11	0.11	9.00	1.00	0.08	0.01	0.32	0.05	0.47	0.117	0.07	0.03	0.31	0.12	0.52	4.4169
Sum	1.33	10.22	28.00	19.11						1	0.81	0.54	0.95	1.3	λmax =	3.8091
															CI =	-0.064
															RI =	0.9
															CR1 =	-0.071 CR<0.1

CR109 1 1 1 9 0 0.11

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	1.00	1.00	1.00
Y2	1.00	1.00	0.11	9.00
Y3	1.00	9.00	1.00	9.00
Y4	1.00	0.11	0.11	1.00
Sum	4.00	11.11	2.22	20.00

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.25	0.09	0.45	0.05	0.84	0.21
0.25	0.09	0.05	0.45	0.84	0.21
0.25	0.81	0.45	0.45	1.96	0.49
0.25	0.01	0.05	0.05	0.36	0.09
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.21	0.21	0.49	0.09	1	4.7619
0.21	0.21	0.05	0.35	0.82	3.904
0.21	0.21	0.49	0.35	1.26	2.562
0.21	0.02	0.05	0.04	0.33	3.6239
0.84	0.65	1.09	0.82	λmax =	3.713
				CI =	-0.096
				RI =	0.9
				CR1 =	-0.106 CR<0.1

CR110 6 7 7 7 0 0.17

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.17	0.14	0.14
Y2	6.00	1.00	0.14	6.00
Y3	7.00	7.00	1.00	6.00
Y4	7.00	0.17	0.17	1.00
Sum	21.00	8.33	1.45	13.14

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.05	0.02	0.1	0.01	0.18	0.0442
0.29	0.12	0.1	0.46	0.96	0.2401
0.33	0.84	0.69	0.46	2.32	0.5796
0.33	0.02	0.11	0.08	0.54	0.136
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.04	0.04	0.08	0.02	0.19	4.2176
0.27	0.24	0.08	0.14	0.72	3.0159
0.31	1.44	0.58	0.82	3.15	5.4283
0.31	0.04	0.1	0.14	0.58	4.2792
0.93	1.76	0.84	1.11	λmax =	4.2353
				CI =	0.0784
				RI =	0.9
				CR1 =	0.0871 CR<0.1

CR111 7 4 4 4 4 0.2

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.14	0.25	0.25
Y2	7.00	1.00	0.25	0.25
Y3	4.00	4.00	1.00	5.00
Y4	4.00	4.00	0.20	1.00
Sum	16.00	9.14	1.70	6.50

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.06	0.02	0.15	0.04	0.26	0.0659
0.44	0.11	0.15	0.04	0.73	0.1831
0.25	0.44	0.59	0.77	2.04	0.5112
0.25	0.44	0.12	0.15	0.96	0.2397
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.07	0.03	0.13	0.06	0.28	4.2453
0.46	0.18	0.13	0.06	0.83	4.5452
0.26	0.73	0.51	0.24	1.75	3.4172
0.26	0.18	0.1	0.24	0.79	3.2899
1.05	1.12	0.87	0.6	λmax =	3.8744
				CI =	-0.042
				RI =	0.9
				CR1 =	-0.047 CR<0.1

CR112 0.14 0.14 1 1 1 1

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	7.00	7.00	1.00
Y2	0.14	1.00	1.00	1.00
Y3	0.14	1.00	1.00	1.00
Y4	1.00	1.00	1.00	1.00
Sum	2.29	10.00	10.00	4.00

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.44	0.7	0.7	0.25	2.09	0.5219
0.06	0.1	0.1	0.25	0.51	0.1281
0.06	0.1	0.1	0.25	0.51	0.1281
0.44	0.1	0.1	0.25	0.89	0.2219
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.52	0.13	0.9	0.22	1.77	3.3892
0.07	0.13	0.13	0.22	0.55	4.3136
0.07	0.13	0.13	0.22	0.55	4.3136
0.52	0.13	0.13	0.22	1	4.507
1.19	0.51	1.28	0.89	λmax =	4.1309
				CI =	0.0436
				RI =	0.9

CR1 = 0.0485CR<0.1

CR113 7 7 1 1 1 1

	Pairwise Comparison				**Standardized Matrix**						**Consistency Matrix**					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.14	0.14	1.00	0.06	0.05	0.05	0.25	0.4	0.1009	0.1	0.05	0.05	0.24	0.43	4.2897
Y2	7.00	1.00	1.00	1.00	0.44	0.32	0.32	0.25	1.32	0.331	0.1	0.33	0.33	0.24	1	3.0215
Y3	7.00	1.00	1.00	1.00	0.44	0.32	0.32	0.25	1.32	0.331	0.71	0.33	0.33	0.24	1.61	4.8498
Y4	1.00	1.00	1.00	1.00	0.06	0.32	0.32	0.25	0.95	0.2372	0.1	0.33	0.33	0.24	1	4.2156
Sum	16.00	3.14	3.14	4.00						1	1.01	1.04	1.04	0.95	λmax =	4.0941
															CI =	0.0314
															RI =	0.9
															CR1 =	0.0349CR<0.1

CR114 7 1 1 0.14 1 1

	Pairwise Comparison				**Standardized Matrix**						**Consistency Matrix**					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.14	1.00	1.00	0.1	0.06	0.1	0.25	0.51	0.1281	0.13	0.07	0.13	0.22	0.55	4.3136
Y2	7.00	1.00	7.00	1.00	0.7	0.44	0.7	0.25	2.09	0.5219	0.13	0.52	0.9	0.22	1.77	3.3892
Y3	1.00	0.14	1.00	1.00	0.1	0.06	0.1	0.25	0.51	0.1281	0.13	0.07	0.13	0.22	0.55	4.3136
Y4	1.00	1.00	1.00	1.00	0.1	0.44	0.1	0.25	0.89	0.2219	0.13	0.52	0.13	0.22	1	4.507
Sum	10.00	2.29	10.00	4.00						1	0.51	1.19	1.28	0.89	λmax =	4.1309
															CI =	0.0436
															RI =	0.9
															CR1 =	0.0485CR<0.1

CR115 0.17 0.17 0.17 6 6 6

	Pairwise Comparison				**Standardized Matrix**						**Consistency Matrix**					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	6.00	6.00	6.00	0.67	0.32	0.46	0.82	2.26	0.5641	0.56	0.3	0.79	0.25	1.91	3.3787
Y2	0.17	1.00	0.17	0.17	0.11	0.05	0.01	0.02	0.2	0.0498	0.09	0.05	0.02	0.04	0.21	4.1813
Y3	0.17	6.00	1.00	0.17	0.11	0.32	0.08	0.02	0.53	0.1314	0.09	0.3	0.13	0.04	0.57	4.3119
Y4	0.17	6.00	6.00	1.00	0.11	0.32	0.46	0.14	1.02	0.2547	0.09	0.3	0.13	0.25	0.78	3.0574
Sum	1.50	19.00	13.17	7.33						1	0.85	0.95	1.07	0.59	λmax =	3.7323
															CI =	-0.089
															RI =	0.9
															CR1 =	-0.099CR<0.1

CR116 0.14 0.14 0.14 0.33 1 7

	Pairwise Comparison				**Standardized Matrix**						**Consistency Matrix**					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	7.00	7.00	7.00	0.7	0.75	0.39	0.77	2.6	0.6511	0.65	0.85	0.36	0.18	2.04	3.1255
Y2	0.14	1.00	3.00	1.00	0.1	0.11	0.17	0.11	0.48	0.1208	0.09	0.12	0.16	0.18	0.55	4.5145
Y3	0.14	0.33	1.00	0.14	0.1	0.04	0.06	0.02	0.21	0.0517	0.09	0.04	0.05	0.03	0.21	4.0639
Y4	0.14	1.00	7.00	1.00	0.1	0.11	0.39	0.11	0.71	0.1764	0.09	0.12	0.36	0.18	0.75	4.2655

Sum	1.43	9.33	18.00	9.14						1	0.93	1.13	0.93	0.55	λmax =	3.9924
															CI =	-0.003
															RI =	0.9
															CR1 =	-0.003CR<0.1

CR117 7 8 8 8 0 0.13

	Pairwise Comparison				Standardized Matrix						Consistency Matrix					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.14	0.13	0.13	0.04	0.02	0.09	0.01	0.16	0.0388	0.04	0.03	0.07	0.02	0.16	4.2049
Y2	7.00	1.00	0.13	8.00	0.29	0.11	0.09	0.47	0.96	0.2394	0.27	0.24	0.07	0.12	0.71	2.9653
Y3	8.00	8.00	1.00	8.00	0.33	0.86	0.73	0.47	2.39	0.5977	0.31	0.24	0.6	0.12	1.27	2.1276
Y4	8.00	0.13	0.13	1.00	0.33	0.01	0.09	0.06	0.5	0.124	0.31	0.03	0.07	0.12	0.54	4.3477
Sum	24.00	9.27	1.38	17.13						1	0.93	0.54	0.82	0.39	λmax =	3.4114
															CI =	-0.196
															RI =	0.9
															CR1 =	-0.218CR<0.1

CR118 1 1 1 1 1 1

	Pairwise Comparison				Standardized Matrix						Consistency Matrix					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	1.00	1.00	1.00	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	1	4
Y2	1.00	1.00	1.00	1.00	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	1	4
Y3	1.00	1.00	1.00	1.00	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	1	4
Y4	1.00	1.00	1.00	1.00	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	1	4
Sum	4.00	4.00	4.00	4.00						1	1	1	1	1	λmax =	4
															CI =	0
															RI =	0.9
															CR1 =	0CR<0.1

CR119 8 9 8 1 0 1

	Pairwise Comparison				Standardized Matrix						Consistency Matrix					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.13	0.11	0.13	0.04	0.05	0.04	0.02	0.14	0.036	0.04	0.06	0.03	0.03	0.15	4.2264
Y2	8.00	1.00	1.00	6.00	0.31	0.44	0.32	0.74	1.8	0.451	0.29	0.45	0.31	0.21	1.25	2.7765
Y3	9.00	1.00	1.00	1.00	0.35	0.44	0.32	0.12	1.23	0.3068	0.32	0.45	0.31	0.21	1.29	4.1995
Y4	8.00	0.17	1.00	1.00	0.31	0.07	0.32	0.12	0.82	0.2062	0.29	0.08	0.31	0.21	0.88	4.2494
Sum	26.00	2.29	3.11	8.13						1	0.94	1.03	0.95	0.64	λmax =	3.863
															CI =	-0.046
															RI =	0.9
															CR1 =	-0.051CR<0.1

CR120 8 8 1 8 0 0.17

	Pairwise Comparison				Standardized Matrix						Consistency Matrix					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.13	0.13	1.00	0.06	0.01	0.09	0.07	0.23	0.0572	0.06	0.03	0.08	0.07	0.23	4.0662

	Y1	Y2	Y3	Y4		Y1	Y2	Y3	Y4	Sum	Weight		Y1	Y2	Y3	Y4	Sum	Average
Y2	8.00	1.00	0.13	6.00		0.44	0.11	0.09	0.43	1.07	0.2672		0.46	0.27	0.08	0.39	1.19	4.4707
Y3	8.00	8.00	1.00	6.00		0.44	0.86	0.71	0.43	2.44	0.61		0.46	0.27	0.61	0.39	1.73	2.8336
Y4	1.00	0.17	0.17	1.00		0.06	0.02	0.12	0.07	0.26	0.0656		0.06	0.04	0.1	0.07	0.27	4.0981
Sum	18.00	9.29	1.42	14.00							1		1.03	0.61	0.86	0.92	λmax =	3.8672

CI = -0.044
RI = 0.9
CR1 = -0.049 CR<0.1

CR121 7 8 1 1 1 1

Pairwise Comparison / **Standardized Matrix** / **Consistency Matrix**

	Y1	Y2	Y3	Y4		Y1	Y2	Y3	Y4	Sum	Weight		Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.14	0.13	1.00		0.06	0.05	0.04	0.25	0.39	0.0986		0.1	0.05	0.04	0.24	0.42	4.3037
Y2	7.00	1.00	1.00	1.00		0.41	0.32	0.32	0.25	1.3	0.325		0.69	0.32	0.34	0.24	1.59	4.8969
Y3	8.00	1.00	1.00	1.00		0.47	0.32	0.32	0.25	1.36	0.3397		0.1	0.32	0.34	0.24	1	2.9438
Y4	1.00	1.00	1.00	1.00		0.06	0.32	0.32	0.25	0.95	0.2368		0.1	0.32	0.34	0.24	1	4.2238
Sum	17.00	3.14	3.13	4.00							1		0.99	1.02	1.06	0.95	λmax =	4.0921

CI = 0.0307
RI = 0.9
CR1 = 0.0341 CR<0.1

CR122 0.2 0.2 0.2 5 5 5

Pairwise Comparison / **Standardized Matrix** / **Consistency Matrix**

	Y1	Y2	Y3	Y4		Y1	Y2	Y3	Y4	Sum	Weight		Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	5.00	5.00	5.00		0.63	0.31	0.45	0.78	2.17	0.5413		0.54	0.3	0.7	0.26	1.79	3.3155
Y2	0.20	1.00	0.20	0.20		0.13	0.06	0.02	0.03	0.24	0.0592		0.11	0.06	0.03	0.05	0.25	4.1811
Y3	0.20	5.00	1.00	0.20		0.13	0.31	0.09	0.03	0.56	0.1395		0.11	0.3	0.14	0.05	0.6	4.2688
Y4	0.20	5.00	5.00	1.00		0.13	0.31	0.45	0.16	1.04	0.26		0.11	0.3	0.7	0.26	1.36	5.2361
Sum	1.60	16.00	11.20	6.40							1		0.87	0.95	1.56	0.62	λmax =	4.2504

CI = 0.0835
RI = 0.9
CR1 = 0.0927 CR<0.1

CR123 7 7 7 1 1 5

Pairwise Comparison / **Standardized Matrix** / **Consistency Matrix**

	Y1	Y2	Y3	Y4		Y1	Y2	Y3	Y4	Sum	Weight		Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.14	0.14	0.14		0.05	0.05	0.02	0.06	0.17	0.043		0.04	0.04	0.03	0.06	0.18	4.1816
Y2	7.00	1.00	1.00	1.00		0.32	0.32	0.14	0.43	1.2	0.3008		0.3	0.3	0.22	0.44	1.26	4.1816
Y3	7.00	1.00	1.00	0.20		0.32	0.32	0.14	0.09	0.86	0.2154		0.3	0.3	0.22	0.09	0.91	4.2017
Y4	7.00	1.00	5.00	1.00		0.32	0.32	0.7	0.43	1.76	0.4408		0.3	0.3	0.22	0.44	1.26	2.8535
Sum	22.00	3.14	7.14	2.34							1		0.95	0.95	0.68	1.03	λmax =	3.8546

CI = -0.048
RI = 0.9
CR1 = -0.054 CR<0.1

CR124 1 5 1 1 1 1

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	1.00	0.20	1.00
Y2	1.00	1.00	1.00	1.00
Y3	5.00	1.00	1.00	1.00
Y4	1.00	1.00	1.00	1.00
Sum	8.00	4.00	3.20	4.00

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.13	0.25	0.06	0.25	0.69	0.1719
0.13	0.25	0.31	0.25	0.94	0.2344
0.63	0.25	0.31	0.25	1.44	0.3594
0.13	0.25	0.31	0.25	0.94	0.2344
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.17	0.23	0.07	0.23	0.71	4.1455
0.17	0.23	0.36	0.23	1	4.2667
0.17	0.23	0.36	0.23	1	2.7826
0.17	0.23	0.36	0.23	1	4.2667
0.69	0.94	1.15	0.94	λmax =	3.8653
				CI =	-0.045
				RI =	0.9
				CR1 =	-0.05 CR<0.1

CR125 9 9 1 1 1 1

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.11	0.11	1.00
Y2	9.00	1.00	1.00	1.00
Y3	9.00	1.00	1.00	1.00
Y4	1.00	1.00	1.00	1.00
Sum	20.00	3.11	3.11	4.00

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.05	0.04	0.04	0.25	0.37	0.0929
0.45	0.32	0.32	0.25	1.34	0.3357
0.45	0.32	0.32	0.25	1.34	0.3357
0.05	0.32	0.32	0.25	0.94	0.2357
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.09	0.04	0.04	0.24	0.4	4.3419
0.09	0.34	0.34	0.24	1	2.9787
0.84	0.34	0.34	0.24	1.74	5.1915
0.09	0.34	0.34	0.24	1	4.2424
1.86	1.04	1.04	0.94	λmax =	4.1886
				CI =	0.0629
				RI =	0.9
				CR1 =	0.0699 CR<0.1

CR126 7 7 7 9 8 8

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.14	0.14	0.14
Y2	7.00	1.00	0.11	0.13
Y3	7.00	9.00	1.00	0.13
Y4	7.00	8.00	8.00	1.00
Sum	22.00	18.14	9.25	1.39

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.05	0.01	0.02	0.1	0.17	0.0428
0.32	0.06	0.01	0.09	0.48	0.1188
0.32	0.5	0.11	0.09	1.01	0.253
0.32	0.44	0.86	0.72	2.34	0.5854
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.04	0.02	0.04	0.08	0.18	4.1924
0.3	0.12	0.03	0.07	0.52	4.3774
0.3	0.12	0.25	0.07	0.74	2.9436
0.3	0.95	0.25	0.59	2.09	3.5674
0.94	1.2	0.57	0.82	λmax =	3.7702
				CI =	-0.077
				RI =	0.9
				CR1 =	-0.085 CR<0.1

CR127 7 7 7 7 8 0.17

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.14	0.14	0.14
Y2	7.00	1.00	0.14	0.13
Y3	7.00	7.00	1.00	6.00
Y4	7.00	8.00	0.17	1.00
Sum	22.00	16.14	1.45	7.27

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.05	0.01	0.1	0.02	0.17	0.0431
0.32	0.06	0.1	0.02	0.5	0.1239
0.32	0.43	0.69	0.83	2.27	0.5665
0.32	0.5	0.11	0.14	1.07	0.2665
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.04	0.02	0.08	0.04	0.18	4.1732
0.3	0.12	0.08	0.03	0.54	4.3553
0.3	0.87	0.57	0.27	2	3.5342
0.3	0.12	0.09	0.27	0.79	2.9506
0.95	1.13	0.82	0.6	λmax =	3.7533
				CI =	-0.082
				RI =	0.9

CR1 = -0.091 CR<0.1

CR128 0.11 0.11 1 0.2 1 1

	Pairwise Comparison Y1	Y2	Y3	Y4	Standardized Matrix Y1	Y2	Y3	Y4	Sum	Weight	Consistency Matrix Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	9.00	9.00	1.00	0.45	0.8	0.56	0.25	2.07	0.5165	0.52	0.18	0.1	0.21	1	1.936
Y2	0.11	1.00	5.00	1.00	0.05	0.09	0.31	0.25	0.7	0.1754	0.06	0.18	0.48	0.21	0.92	5.2508
Y3	0.11	0.20	1.00	1.00	0.05	0.02	0.06	0.25	0.38	0.0951	0.06	0.04	0.1	0.21	0.4	4.212
Y4	1.00	1.00	1.00	1.00	0.45	0.09	0.06	0.25	0.85	0.2129	0.52	0.18	0.1	0.21	1	4.696
Sum	2.22	11.20	16.00	4.00						1	1.15	0.56	0.76	0.85	λmax =	4.0237

CI = 0.0079

RI = 0.9

CR1 = 0.0088 CR<0.1

CR129 0.2 0.2 0.2 0.2 0 0.2

	Pairwise Comparison Y1	Y2	Y3	Y4	Standardized Matrix Y1	Y2	Y3	Y4	Sum	Weight	Consistency Matrix Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	5.00	5.00	5.00	0.63	0.78	0.45	0.31	2.17	0.5413	0.54	0.26	0.7	0.3	1.79	3.3155
Y2	0.20	1.00	5.00	5.00	0.13	0.16	0.45	0.31	1.04	0.26	0.11	0.26	0.7	0.3	1.36	5.2361
Y3	0.20	0.20	1.00	5.00	0.13	0.03	0.09	0.31	0.56	0.1395	0.11	0.05	0.14	0.3	0.6	4.2688
Y4	0.20	0.20	0.20	1.00	0.13	0.03	0.02	0.06	0.24	0.0592	0.11	0.05	0.03	0.06	0.25	4.1811
Sum	1.60	6.40	11.20	16.00						1	0.87	0.62	1.56	0.95	λmax =	4.2504

CI = 0.0835

RI = 0.9

CR1 = 0.0927 CR<0.1

CR130 3 0.2 1 5 0 1

	Pairwise Comparison Y1	Y2	Y3	Y4	Standardized Matrix Y1	Y2	Y3	Y4	Sum	Weight	Consistency Matrix Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.33	5.00	1.00	0.19	0.05	0.69	0.14	1.08	0.2701	0.27	0.11	0.27	0.13	0.78	2.8833
Y2	3.00	1.00	0.20	4.00	0.58	0.15	0.03	0.57	1.33	0.332	0.81	0.33	0.05	0.51	1.71	5.1451
Y3	0.20	5.00	1.00	1.00	0.04	0.76	0.14	0.14	1.08	0.2699	0.05	0.33	0.27	0.13	0.78	2.9043
Y4	1.00	0.25	1.00	1.00	0.19	0.04	0.14	0.14	0.51	0.128	0.27	0.08	0.27	0.13	0.75	5.8668
Sum	5.20	6.58	7.20	7.00						1	1.4	0.86	0.86	0.9	λmax =	4.1999

CI = 0.0666

RI = 0.9

CR1 = 0.074 CR<0.1

CR131 1 1 1 1 1 1

	Pairwise Comparison Y1	Y2	Y3	Y4	Standardized Matrix Y1	Y2	Y3	Y4	Sum	Weight	Consistency Matrix Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	1.00	1.00	1.00	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	1	4
Y2	1.00	1.00	1.00	1.00	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	1	4
Y3	1.00	1.00	1.00	1.00	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	1	4
Y4	1.00	1.00	1.00	1.00	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	1	4

	Y1	Y2	Y3	Y4
Sum	4.00	4.00	4.00	4.00

	Y1	Y2	Y3	Y4	Sum	Weight
						1

	Y1	Y2	Y3	Y4	Sum	Average
	1	1	1	1	λmax =	4
					CI =	0
					RI =	0.9
					CR1 =	0 CR<0.1

CR132 1 1 1 1 1 1

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	1.00	1.00	1.00
Y2	1.00	1.00	1.00	1.00
Y3	1.00	1.00	1.00	1.00
Y4	1.00	1.00	1.00	1.00
Sum	4.00	4.00	4.00	4.00

Standardized Matrix

	Y1	Y2	Y3	Y4	Sum	Weight
Y1	0.25	0.25	0.25	0.25	1	0.25
Y2	0.25	0.25	0.25	0.25	1	0.25
Y3	0.25	0.25	0.25	0.25	1	0.25
Y4	0.25	0.25	0.25	0.25	1	0.25
						1

Consistency Matrix

	Y1	Y2	Y3	Y4	Sum	Average
Y1	0.25	0.25	0.25	0.25	1	4
Y2	0.25	0.25	0.25	0.25	1	4
Y3	0.25	0.25	0.25	0.25	1	4
Y4	0.25	0.25	0.25	0.25	1	4
	1	1	1	1	λmax =	4
					CI =	0
					RI =	0.9
					CR1 =	0 CR<0.1

CR133 5 3 1 1 1 1

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.33	5.00	1.00
Y2	3.00	1.00	0.20	4.00
Y3	0.20	5.00	1.00	1.00
Y4	1.00	0.25	1.00	1.00
Sum	5.20	6.58	7.20	7.00

Standardized Matrix

	Y1	Y2	Y3	Y4	Sum	Weight
Y1	0.19	0.05	0.69	0.14	1.08	0.2701
Y2	0.58	0.15	0.03	0.57	1.33	0.332
Y3	0.04	0.76	0.14	0.14	1.08	0.2699
Y4	0.19	0.04	0.14	0.14	0.51	0.128
						1

Consistency Matrix

	Y1	Y2	Y3	Y4	Sum	Average
Y1	0.27	0.11	0.27	0.13	0.78	2.8833
Y2	0.81	0.33	0.05	0.51	1.71	5.1451
Y3	0.05	0.33	0.27	0.13	0.78	2.9043
Y4	0.27	0.08	0.27	0.13	0.75	5.8668
	1.4	0.86	0.86	0.9	λmax =	4.1999
					CI =	0.0666
					RI =	0.9
					CR1 =	0.074 CR<0.1

CR134 3 0.33 3 1 1 1

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.33	3.00	0.33
Y2	3.00	1.00	1.00	1.00
Y3	0.33	1.00	1.00	1.00
Y4	3.00	1.00	1.00	1.00
Sum	7.33	3.33	6.00	3.33

Standardized Matrix

	Y1	Y2	Y3	Y4	Sum	Weight
Y1	0.14	0.1	0.5	0.1	0.84	0.2091
Y2	0.41	0.3	0.17	0.3	1.18	0.2939
Y3	0.05	0.3	0.17	0.3	0.81	0.203
Y4	0.41	0.3	0.17	0.3	1.18	0.2939
						1

Consistency Matrix

	Y1	Y2	Y3	Y4	Sum	Average
Y1	0.21	0.1	0.2	0.1	0.61	2.9082
Y2	0.63	0.29	0.2	0.29	1.42	4.8247
Y3	0.07	0.29	0.2	0.29	0.86	4.2388
Y4	0.21	0.29	0.2	0.29	1	3.4021
	1.12	0.98	0.81	0.98	λmax =	3.8435
					CI =	-0.052
					RI =	0.9
					CR1 =	-0.058 CR<0.1

CR135 0.33 5 5 1 1 5

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	3.00	0.20	0.20

Standardized Matrix

	Y1	Y2	Y3	Y4	Sum	Weight
Y1	0.09	0.5	0.03	0.08	0.7	0.1748

Consistency Matrix

	Y1	Y2	Y3	Y4	Sum	Average
Y1	0.17	0.56	0.04	0.09	0.87	4.9533

	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average	
Y2	0.33	1.00	1.00	1.00	0.03	0.17	0.14	0.42	0.75	0.1879	0.06	0.19	0.21	0.43	0.88	4.7014	
Y3	5.00	1.00	1.00	0.20	0.44	0.17	0.14	0.08	0.83	0.2075	0.17	0.19	0.21	0.09	0.66	3.1622	
Y4	5.00	1.00	5.00	1.00	0.44	0.17	0.69	0.42	1.72	0.4297	0.87	0.19	0.21	0.43	1.7	3.9544	
Sum	11.33	6.00	7.20	2.40						1	1.28	1.13	0.66	1.03	λmax =	4.1928	
															CI =	0.0643	
															RI =	0.9	
															CR1 =	0.0714	CR<0.1

CR136 4 6 5 0.14 0 0.17

Pairwise Comparison / **Standardized Matrix** / **Consistency Matrix**

	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average	
Y1	1.00	0.25	0.17	0.20	0.06	0.16	0.02	0.02	0.26	0.0645	0.06	0.14	0.04	0.03	0.27	4.1904	
Y2	4.00	1.00	7.00	6.00	0.25	0.64	0.84	0.45	2.19	0.5464	0.26	0.55	0.26	0.13	1.19	2.1841	
Y3	6.00	0.14	1.00	6.00	0.38	0.09	0.12	0.45	1.04	0.2603	0.39	0.08	0.26	0.77	1.5	5.7551	
Y4	5.00	0.17	0.17	1.00	0.31	0.11	0.02	0.08	0.52	0.1288	0.32	0.09	0.04	0.13	0.59	4.5479	
Sum	16.00	1.56	8.33	13.20						1	1.03	0.85	0.61	1.06	λmax =	4.1694	
															CI =	0.0565	
															RI =	0.9	
															CR1 =	0.0627	CR<0.1

CR137 1 3 1 3 0 1

Pairwise Comparison / **Standardized Matrix** / **Consistency Matrix**

	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average	
Y1	1.00	1.00	0.33	1.00	0.17	0.19	0.13	0.17	0.65	0.1615	0.16	0.24	0.13	0.19	0.73	4.5376	
Y2	1.00	1.00	0.33	3.00	0.17	0.19	0.13	0.5	0.98	0.2448	0.16	0.24	0.13	0.58	1.12	4.5674	
Y3	3.00	3.00	1.00	1.00	0.5	0.56	0.38	0.17	1.6	0.401	0.48	0.24	0.4	0.19	1.32	3.2987	
Y4	1.00	0.33	1.00	1.00	0.17	0.06	0.38	0.17	0.77	0.1927	0.16	0.08	0.4	0.19	0.84	4.3423	
Sum	6.00	5.33	2.67	6.00						1	0.97	0.82	1.07	1.16	λmax =	4.1865	
															CI =	0.0622	
															RI =	0.9	
															CR1 =	0.0691	CR<0.1

CR138 1 0.2 2 3 1 5

Pairwise Comparison / **Standardized Matrix** / **Consistency Matrix**

	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average	
Y1	1.00	1.00	5.00	0.50	0.19	0.15	0.69	0.07	1.11	0.2775	0.28	0.13	0.17	0.17	0.75	2.6953	
Y2	1.00	1.00	0.33	1.00	0.19	0.15	0.05	0.14	0.53	0.1333	0.28	0.13	0.06	0.34	0.81	6.0706	
Y3	0.20	3.00	1.00	0.20	0.04	0.46	0.14	0.03	0.66	0.1654	0.06	0.4	0.17	0.07	0.69	4.1693	
Y4	2.00	1.00	5.00	1.00	0.38	0.15	0.69	0.14	1.37	0.3435	0.56	0.13	0.17	0.34	1.2	3.4859	
Sum	4.20	6.00	11.33	2.70						0.92	1.17	0.8	0.55	0.93	λmax =	4.1052	
															CI =	0.0351	
															RI =	0.9	
															CR1 =	0.039	CR<0.1

CR139 1 1 1 1 1 1

	Pairwise Comparison				**Standardized Matrix**						**Consistency Matrix**					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	1.00	1.00	1.00	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	1	4
Y2	1.00	1.00	1.00	1.00	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	1	4
Y3	1.00	1.00	1.00	1.00	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	1	4
Y4	1.00	1.00	1.00	1.00	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	1	4
Sum	4.00	4.00	4.00	4.00						1	1	1	1	1	λmax =	4
															CI =	0
															RI =	0.9
															CR1 =	0CR<0.1

CR140 1 0.33 0.2 1 5 1

	Pairwise Comparison				**Standardized Matrix**						**Consistency Matrix**					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	1.00	3.00	5.00	0.39	0.13	0.5	0.69	1.71	0.4285	0.43	0.18	0.42	0.76	1.79	4.1672
Y2	1.00	1.00	1.00	0.20	0.39	0.13	0.17	0.03	0.71	0.1785	0.43	0.18	0.14	0.05	0.8	4.47
Y3	0.33	1.00	1.00	1.00	0.13	0.13	0.17	0.14	0.56	0.1405	0.14	0.18	0.14	0.25	0.71	5.0828
Y4	0.20	5.00	1.00	1.00	0.08	0.63	0.17	0.14	1.01	0.2524	0.09	0.18	0.14	0.25	0.66	2.6039
Sum	2.53	8.00	6.00	7.20						1	1.09	0.71	0.84	1.31	λmax =	4.081
															CI =	0.027
															RI =	0.9
															CR1 =	0.03CR<0.1

CR141 1 1 1 0.33 5 1

	Pairwise Comparison				**Standardized Matrix**						**Consistency Matrix**					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	1.00	1.00	1.00	0.25	0.14	0.17	0.31	0.87	0.2164	0.22	0.24	0.19	0.35	1	4.6214
Y2	1.00	1.00	3.00	0.20	0.25	0.14	0.5	0.06	0.95	0.2372	0.22	0.24	0.58	0.07	1.11	4.6587
Y3	1.00	0.33	1.00	1.00	0.25	0.05	0.17	0.31	0.77	0.1937	0.22	0.08	0.19	0.35	0.84	4.3472
Y4	1.00	5.00	1.00	1.00	0.25	0.68	0.17	0.31	1.41	0.3527	0.22	0.24	0.19	0.35	1	2.8349
Sum	4.00	7.33	6.00	3.20						1	0.87	0.79	1.16	1.13	λmax =	4.1156
															CI =	0.0385
															RI =	0.9
															CR1 =	0.0428CR<0.1

CR142 5 3 1 1 1 1

	Pairwise Comparison				**Standardized Matrix**						**Consistency Matrix**					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.25	0.33	1.00	0.11	0.08	0.1	0.25	0.54	0.1345	0.13	0.08	0.1	0.24	0.56	4.1436
Y2	4.00	1.00	1.00	1.00	0.44	0.31	0.3	0.25	1.3	0.3255	0.54	0.33	0.3	0.24	1.4	4.3115
Y3	3.00	1.00	1.00	1.00	0.33	0.31	0.3	0.25	1.19	0.2978	0.4	0.33	0.3	0.24	1.27	4.2619
Y4	1.00	1.00	1.00	1.00	0.11	0.31	0.3	0.25	0.97	0.2422	0.13	0.33	0.3	0.24	1	4.1288
Sum	9.00	3.25	3.33	4.00						1	1.21	1.06	0.99	0.97	λmax =	4.2114
															CI =	0.0705
															RI =	0.9

CR1 = 0.0783CR<0.1

CR143 0.13 1 0.13 7 0 0.2

	Pairwise Comparison				**Standardized Matrix**						**Consistency Matrix**					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	8.00	1.00	8.00	0.44	0.49	0.43	0.4	1.77	0.4415	0.44	0.12	0.39	0.4	1.35	3.0624
Y2	0.13	1.00	0.14	6.00	0.06	0.06	0.06	0.3	0.48	0.1196	0.06	0.12	0.06	0.3	0.53	4.4495
Y3	1.00	7.00	1.00	5.00	0.44	0.43	0.43	0.25	1.55	0.3886	0.44	0.84	0.39	0.25	1.92	4.9382
Y4	0.13	0.17	0.20	1.00	0.06	0.01	0.09	0.05	0.2	0.0503	0.06	0.02	0.08	0.05	0.2	4.038
Sum	2.25	16.17	2.34	20.00						1	0.99	1.1	0.91	1.01	λmax =	4.122
															CI =	0.0407
															RI =	0.9
															CR1 =	0.0452CR<0.1

CR144 1 3 1 0.2 1 1

	Pairwise Comparison				**Standardized Matrix**						**Consistency Matrix**					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	1.00	0.33	1.00	0.17	0.31	0.05	0.25	0.77	0.1937	0.19	0.35	0.08	0.22	0.84	4.3472
Y2	1.00	1.00	5.00	1.00	0.17	0.31	0.68	0.25	1.41	0.3527	0.19	0.35	0.24	0.22	1	2.8349
Y3	3.00	0.20	1.00	1.00	0.5	0.06	0.14	0.25	0.95	0.2372	0.58	0.07	0.24	0.22	1.11	4.6587
Y4	1.00	1.00	1.00	1.00	0.17	0.31	0.14	0.25	0.87	0.2164	0.19	0.35	0.24	0.22	1	4.6214
Sum	6.00	3.20	7.33	4.00						1	1.16	1.13	0.79	0.87	λmax =	4.1156
															CI =	0.0385
															RI =	0.9
															CR1 =	0.0428CR<0.1

CR145 1 1 1 1 1 1

	Pairwise Comparison				**Standardized Matrix**						**Consistency Matrix**					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	1.00	1.00	1.00	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	1	4
Y2	1.00	1.00	1.00	1.00	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	1	4
Y3	1.00	1.00	1.00	1.00	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	1	4
Y4	1.00	1.00	1.00	1.00	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	1	4
Sum	4.00	4.00	4.00	4.00						1	1	1	1	1	λmax =	4
															CI =	0
															RI =	0.9
															CR1 =	0CR<0.1

CR146 5 5 5 1 1 1

	Pairwise Comparison				**Standardized Matrix**						**Consistency Matrix**					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.20	0.20	0.20	0.06	0.06	0.06	0.06	0.25	0.0625	0.06	0.06	0.06	0.06	0.25	4
Y2	5.00	1.00	1.00	1.00	0.31	0.31	0.31	0.31	1.25	0.3125	0.31	0.31	0.31	0.31	1.25	4
Y3	5.00	1.00	1.00	1.00	0.31	0.31	0.31	0.31	1.25	0.3125	0.31	0.31	0.31	0.31	1.25	4
Y4	5.00	1.00	1.00	1.00	0.31	0.31	0.31	0.31	1.25	0.3125	0.31	0.31	0.31	0.31	1.25	4

	Y1	Y2	Y3	Y4		Y1	Y2	Y3	Y4	Sum	Weight		Y1	Y2	Y3	Y4	Sum	Average
Sum	16.00	3.20	3.20	3.20							1		1	1	1	1	λmax =	4
																	CI =	0
																	RI =	0.9
																	CR1 =	0 CR<0.1

CR147 0.2 0.2 0.2 1 1 1

Pairwise Comparison	Y1	Y2	Y3	Y4	Standardized Matrix	Y1	Y2	Y3	Y4	Sum	Weight	Consistency Matrix	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	5.00	5.00	5.00		0.63	0.63	0.63	0.63	2.5	0.625		0.63	0.63	0.63	0.63	2.5	4
Y2	0.20	1.00	1.00	1.00		0.13	0.13	0.13	0.13	0.5	0.125		0.13	0.13	0.13	0.13	0.5	4
Y3	0.20	1.00	1.00	1.00		0.13	0.13	0.13	0.13	0.5	0.125		0.13	0.13	0.13	0.13	0.5	4
Y4	0.20	1.00	1.00	1.00		0.13	0.13	0.13	0.13	0.5	0.125		0.13	0.13	0.13	0.13	0.5	4
Sum	1.60	8.00	8.00	8.00							1		1	1	1	1	λmax =	4
																	CI =	0
																	RI =	0.9
																	CR1 =	0 CR<0.1

CR148 5 5 5 5 5 5

Pairwise Comparison	Y1	Y2	Y3	Y4	Standardized Matrix	Y1	Y2	Y3	Y4	Sum	Weight	Consistency Matrix	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.20	0.20	0.20		0.06	0.02	0.03	0.13	0.24	0.0592		0.06	0.03	0.05	0.11	0.25	4.1811
Y2	5.00	1.00	0.20	0.20		0.31	0.09	0.03	0.13	0.56	0.1395		0.3	0.14	0.05	0.11	0.6	4.2688
Y3	5.00	5.00	1.00	0.20		0.31	0.45	0.16	0.13	1.04	0.26		0.3	0.7	0.26	0.11	1.36	5.2361
Y4	5.00	5.00	5.00	1.00		0.31	0.45	0.78	0.63	2.17	0.5413		0.3	0.7	0.26	0.54	1.79	3.3155
Sum	16.00	11.20	6.40	1.60							1		0.95	1.56	0.62	0.87	λmax =	4.2504
																	CI =	0.0835
																	RI =	0.9
																	CR1 =	0.0927 CR<0.1

CR149 3 7 6 0.2 0 0.14

Pairwise Comparison	Y1	Y2	Y3	Y4	Standardized Matrix	Y1	Y2	Y3	Y4	Sum	Weight	Consistency Matrix	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.33	0.14	0.17		0.06	0.2	0.02	0.01	0.29	0.0723		0.07	0.17	0.04	0.02	0.3	4.1821
Y2	3.00	1.00	5.00	6.00		0.18	0.59	0.8	0.42	1.98	0.4959		0.22	0.5	0.3	0.82	1.83	3.6801
Y3	7.00	0.20	1.00	7.00		0.41	0.12	0.16	0.49	1.18	0.2957		0.51	0.1	0.3	0.14	1.04	3.5087
Y4	6.00	0.17	0.14	1.00		0.35	0.1	0.02	0.07	0.54	0.1361		0.43	0.08	0.04	0.14	0.7	5.1079
Sum	17.00	1.70	6.29	14.17							1		1.23	0.84	0.68	1.11	λmax =	4.1197
																	CI =	0.0399
																	RI =	0.9
																	CR1 =	0.0443 CR<0.1

CR150 4 6 6 0.17 0 0.14

Pairwise Comparison	Y1	Y2	Y3	Y4	Standardized Matrix	Y1	Y2	Y3	Y4	Sum	Weight	Consistency Matrix	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.25	0.17	0.17		0.06	0.16	0.02	0.01	0.25	0.0628		0.06	0.13	0.05	0.02	0.26	4.1865

	Y1	Y2	Y3	Y4
Y2	4.00	1.00	6.00	6.00
Y3	6.00	0.17	1.00	7.00
Y4	6.00	0.17	0.14	1.00
Sum	17.00	1.58	7.31	14.17

Y1	Y2	Y3	Y4	Sum	Weight
0.24	0.63	0.82	0.42	2.11	0.5278
0.35	0.11	0.14	0.49	1.09	0.2723
0.35	0.11	0.02	0.07	0.55	0.1371
					1

Y1	Y2	Y3	Y4	Sum	Average
0.25	0.53	0.27	0.82	1.87	3.5503
0.38	0.09	0.27	0.14	0.87	3.2109
0.38	0.09	0.04	0.14	0.64	4.6751
1.07	0.84	0.63	1.12	λmax =	3.9057
				CI =	-0.031
				RI =	0.9
				CR1 =	-0.035 CR<0.1

CR151 5 8 8 0.17 0 0.14

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.20	0.13	0.13
Y2	5.00	1.00	6.00	6.00
Y3	8.00	0.17	1.00	7.00
Y4	8.00	0.17	0.14	1.00
Sum	22.00	1.53	7.27	14.13

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.05	0.13	0.02	0.01	0.2	0.0505
0.23	0.65	0.83	0.42	2.13	0.5324
0.36	0.11	0.14	0.5	1.11	0.2764
0.36	0.11	0.02	0.07	0.56	0.1407
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.05	0.11	0.03	0.02	0.21	4.142
0.25	0.53	0.28	0.84	1.91	3.5786
0.4	0.09	0.28	0.14	0.91	3.2915
0.4	0.09	0.04	0.14	0.67	4.7819
1.11	0.82	0.63	1.14	λmax =	3.9485
				CI =	-0.017
				RI =	0.9
				CR1 =	-0.019 CR<0.1

CR152 7 6 6 0.17 0 0.17

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.14	0.17	0.17
Y2	7.00	1.00	6.00	6.00
Y3	6.00	0.17	1.00	6.00
Y4	6.00	0.17	0.17	1.00
Sum	20.00	1.48	7.33	13.17

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.05	0.1	0.02	0.01	0.18	0.0455
0.35	0.68	0.82	0.46	2.3	0.5753
0.3	0.11	0.14	0.46	1	0.2512
0.3	0.11	0.02	0.08	0.51	0.1279
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.05	0.08	0.04	0.02	0.19	4.1923
0.32	0.58	0.25	0.13	1.27	2.2131
0.27	0.1	0.25	0.77	1.39	5.5235
0.27	0.1	0.04	0.13	0.54	4.2136
0.91	0.85	0.59	1.04	λmax =	4.0356
				CI =	0.0119
				RI =	0.9
				CR1 =	0.0132 CR<0.1

CR153 8 5 1 1 0 1

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.13	0.20	1.00
Y2	8.00	1.00	1.00	4.00
Y3	5.00	1.00	1.00	1.00
Y4	1.00	0.25	1.00	1.00
Sum	15.00	2.38	3.20	7.00

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.07	0.05	0.06	0.14	0.32	0.0812
0.53	0.42	0.31	0.57	1.84	0.4596
0.33	0.42	0.31	0.14	1.21	0.3024
0.07	0.11	0.31	0.14	0.63	0.1568
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.08	0.06	0.06	0.16	0.36	4.3852
0.32	0.46	0.3	0.63	1.71	3.7294
0.41	0.46	0.3	0.16	1.32	4.38
0.08	0.11	0.3	0.16	0.66	4.1787
0.89	1.09	0.97	1.1	λmax =	4.1683
				CI =	0.0561
				RI =	0.9
				CR1 =	0.0623 CR<0.1

CR154 6 5 1 0.5 0 0.33

	Pairwise Comparison				Standardized Matrix						Consistency Matrix					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.17	0.20	1.00	0.08	0.09	0.06	0.11	0.33	0.0829	0.08	0.08	0.06	0.1	0.33	4.0081
Y2	6.00	1.00	2.00	4.00	0.46	0.52	0.57	0.44	1.99	0.4984	0.5	0.5	0.63	0.41	2.04	4.0919
Y3	5.00	0.50	1.00	3.00	0.38	0.26	0.28	0.33	1.26	0.3155	0.41	0.25	0.32	0.31	1.29	4.0854
Y4	1.00	0.25	0.33	1.00	0.08	0.13	0.09	0.11	0.41	0.1032	0.08	0.12	0.11	0.1	0.42	4.0296
Sum	13.00	1.92	3.53	9.00						1	1.08	0.96	1.11	0.93	λmax =	4.0537
															CI =	0.0179
															RI =	0.9
															CR1 =	0.0199 CR<0.1

CR155 9 8 8 0.13 0 0.14

	Pairwise Comparison				Standardized Matrix						Consistency Matrix					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.11	0.13	0.13	0.04	0.08	0.01	0.01	0.14	0.0353	0.04	0.07	0.03	0.01	0.15	4.1729
Y2	9.00	1.00	8.00	8.00	0.35	0.73	0.86	0.5	2.44	0.61	0.57	0.53	0.24	0.12	1.45	2.3733
Y3	8.00	0.13	1.00	7.00	0.31	0.09	0.11	0.43	0.94	0.2354	0.5	0.07	0.24	0.01	0.82	3.4787
Y4	8.00	0.13	0.14	1.00	0.31	0.09	0.02	0.06	0.48	0.1192	0.5	0.07	0.03	0.12	0.72	6.0501
Sum	26.00	1.36	9.27	16.13						1	1.61	0.73	0.53	1.92	λmax =	4.0188
															CI =	0.0063
															RI =	0.9
															CR1 =	0.0069 CR<0.1

CR156 9 9 9 0.11 0 0.11

	Pairwise Comparison				Standardized Matrix						Consistency Matrix					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.11	0.11	0.11	0.04	0.08	0.01	0.01	0.14	0.0339	0.03	0.07	0.03	0.01	0.14	4.1633
Y2	9.00	1.00	9.00	9.00	0.32	0.75	0.88	0.47	2.42	0.6057	0.31	0.61	0.24	0.12	1.27	2.0992
Y3	9.00	0.11	1.00	9.00	0.32	0.08	0.1	0.47	0.97	0.2434	0.31	0.07	0.24	0.12	0.73	3.012
Y4	9.00	0.11	0.11	1.00	0.32	0.08	0.01	0.05	0.47	0.117	0.31	0.07	0.03	0.12	0.52	4.4169
Sum	28.00	1.33	10.22	19.11						1	0.95	0.81	0.54	0.36	λmax =	3.4228
															CI =	-0.192
															RI =	0.9
															CR1 =	-0.214 CR<0.1

CR157 8 8 9 0.11 0 0.11

	Pairwise Comparison				Standardized Matrix						Consistency Matrix					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.13	0.13	0.17	0.04	0.09	0.01	0.01	0.16	0.0393	0.04	0.08	0.03	0.02	0.16	4.164
Y2	8.00	1.00	9.00	9.00	0.35	0.74	0.88	0.47	2.44	0.6097	0.31	0.61	0.25	0.1	1.28	2.0912
Y3	8.00	0.11	1.00	9.00	0.35	0.08	0.1	0.47	1	0.2494	0.31	0.07	0.25	0.91	1.55	6.1984
Y4	6.00	0.11	0.11	1.00	0.26	0.08	0.01	0.05	0.41	0.1016	0.24	0.07	0.03	0.1	0.43	4.2602
Sum	23.00	1.35	10.24	19.17						1	0.9	0.82	0.56	1.13	λmax =	4.1784
															CI =	0.0595
															RI =	0.9

CR1 = 0.0661CR<0.1

CR158 1 1 1 1 1 1

	Pairwise Comparison				**Standardized Matrix**						**Consistency Matrix**						
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average	
Y1	1.00	1.00	1.00	1.00	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	1	4	
Y2	1.00	1.00	1.00	1.00	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	1	4	
Y3	1.00	1.00	1.00	1.00	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	1	4	
Y4	1.00	1.00	1.00	1.00	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	1	4	
Sum	4.00	4.00	4.00	4.00						1	1	1	1	1	λmax =	4	
															CI =	0	
															RI =	0.9	
															CR1 =	0	CR<0.1

CR159 8 7 8 0.13 0 0.13

	Pairwise Comparison				**Standardized Matrix**						**Consistency Matrix**						
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average	
Y1	1.00	0.13	0.14	0.13	0.04	0.09	0.02	0.01	0.16	0.039	0.04	0.08	0.03	0.02	0.16	4.1909	
Y2	8.00	1.00	8.00	9.00	0.33	0.73	0.86	0.5	2.43	0.6069	0.31	0.61	0.23	0.12	1.27	2.0969	
Y3	7.00	0.13	1.00	8.00	0.29	0.09	0.11	0.44	0.93	0.2332	0.27	0.08	0.23	0.12	0.7	3.0131	
Y4	8.00	0.11	0.13	1.00	0.33	0.08	0.01	0.06	0.48	0.1209	0.31	0.07	0.03	0.12	0.53	4.3763	
Sum	24.00	1.36	9.27	18.13						1	0.93	0.83	0.53	0.38	λmax =	3.4193	
															CI =	-0.194	
															RI =	0.9	
															CR1 =	-0.215	CR<0.1

CR160 7 8 8 0.11 0 0.13

	Pairwise Comparison				**Standardized Matrix**						**Consistency Matrix**						
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average	
Y1	1.00	0.14	0.13	0.13	0.04	0.1	0.01	0.01	0.16	0.041	0.04	0.08	0.03	0.02	0.17	4.1787	
Y2	7.00	1.00	9.00	7.00	0.29	0.72	0.88	0.43	2.32	0.5799	0.29	0.58	0.25	0.89	2.01	3.4669	
Y3	8.00	0.11	1.00	8.00	0.33	0.08	0.1	0.5	1.01	0.2516	0.33	0.06	0.25	0.13	0.77	3.0651	
Y4	8.00	0.14	0.13	1.00	0.33	0.1	0.01	0.06	0.51	0.1275	0.33	0.08	0.03	0.13	0.57	4.4685	
Sum	24.00	1.40	10.25	16.13						1	0.98	0.81	0.57	1.16	λmax =	3.7948	
															CI =	-0.068	
															RI =	0.9	
															CR1 =	-0.076	CR<0.1

CR161 0.11 0.11 0.11 7 7 8

	Pairwise Comparison				**Standardized Matrix**						**Consistency Matrix**					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	9.00	9.00	9.00	0.75	0.38	0.5	0.88	2.5	0.6244	0.62	0.33	0.11	0.23	1.29	2.0717
Y2	0.11	1.00	0.14	0.14	0.08	0.04	0.01	0.01	0.15	0.0367	0.07	0.04	0.02	0.03	0.15	4.2099
Y3	0.11	7.00	1.00	0.13	0.08	0.29	0.06	0.01	0.44	0.1106	0.07	0.26	0.11	0.03	0.47	4.2087
Y4	0.11	7.00	8.00	1.00	0.08	0.29	0.44	0.1	0.91	0.2283	0.07	0.26	0.88	0.23	1.44	6.3029

	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Sum	1.33	24.00	18.14	10.27						1	0.83	0.88	1.12	0.52	λmax =	4.1983
															CI =	0.0661
															RI =	0.9
															CR1 =	0.0734CR<0.1

CR162 0.17 0.17 8 8 8 8

Pairwise Comparison	Y1	Y2	Y3	Y4	Standardized Matrix Y1	Y2	Y3	Y4	Sum	Weight	Consistency Matrix Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	6.00	6.00	0.13	0.11	0.26	0.4	0.09	0.86	0.2139	0.21	0.24	0.78	0.08	1.32	6.1506
Y2	0.17	1.00	0.13	0.13	0.02	0.04	0.01	0.09	0.16	0.0401	0.04	0.04	0.02	0.08	0.17	4.2122
Y3	0.17	8.00	1.00	0.13	0.02	0.35	0.07	0.09	0.52	0.1307	0.04	0.32	0.13	0.08	0.56	4.318
Y4	8.00	8.00	8.00	1.00	0.86	0.35	0.53	0.73	2.46	0.6153	0.21	0.32	0.13	0.62	1.28	2.0818
Sum	9.33	23.00	15.13	1.38						1	0.5	0.92	1.06	0.85	λmax =	4.1906
															CI =	0.0635
															RI =	0.9
															CR1 =	0.0706CR<0.1

CR163 1 1 1 1 1 1

Pairwise Comparison	Y1	Y2	Y3	Y4	Standardized Matrix Y1	Y2	Y3	Y4	Sum	Weight	Consistency Matrix Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	1.00	1.00	1.00	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	1	4
Y2	1.00	1.00	1.00	1.00	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	1	4
Y3	1.00	1.00	1.00	1.00	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	1	4
Y4	1.00	1.00	1.00	1.00	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	1	4
Sum	4.00	4.00	4.00	4.00						1	1	1	1	1	λmax =	4
															CI =	0
															RI =	0.9
															CR1 =	0CR<0.1

CR164 1 1 1 1 1 1

Pairwise Comparison	Y1	Y2	Y3	Y4	Standardized Matrix Y1	Y2	Y3	Y4	Sum	Weight	Consistency Matrix Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	1.00	1.00	1.00	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	1	4
Y2	1.00	1.00	1.00	1.00	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	1	4
Y3	1.00	1.00	1.00	1.00	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	1	4
Y4	1.00	1.00	1.00	1.00	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	1	4
Sum	4.00	4.00	4.00	4.00						1	1	1	1	1	λmax =	4
															CI =	0
															RI =	0.9
															CR1 =	0CR<0.1

CR165 7 8 7 0.2 0 0.14

Pairwise Comparison	Y1	Y2	Y3	Y4	Standardized Matrix Y1	Y2	Y3	Y4	Sum	Weight	Consistency Matrix Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.14	0.13	0.14	0.04	0.09	0.02	0.01	0.17	0.042	0.04	0.08	0.04	0.02	0.17	4.1348

	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y2	7.00	1.00	5.00	6.00	0.3	0.66	0.8	0.42	2.19	0.5472	0.29	0.55	0.28	0.13	1.25	2.2885
Y3	8.00	0.20	1.00	7.00	0.35	0.13	0.16	0.49	1.13	0.2837	0.34	0.11	0.28	0.89	1.62	5.7064
Y4	7.00	0.17	0.14	1.00	0.3	0.11	0.02	0.07	0.51	0.1271	0.29	0.09	0.04	0.13	0.55	4.3527
Sum	23.00	1.51	6.27	14.14						1	0.97	0.83	0.64	1.16	λmax =	4.1206
															CI =	0.0402
															RI =	0.9
															CR1 =	0.0447 CR<0.1

CR166 9 9 9 0.11 0 0.11

Pairwise Comparison | **Standardized Matrix** | **Consistency Matrix**

	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.11	0.11	0.11	0.04	0.08	0.01	0.01	0.14	0.0339	0.03	0.07	0.03	0.01	0.14	4.1633
Y2	9.00	1.00	9.00	9.00	0.32	0.75	0.88	0.47	2.42	0.6057	0.31	0.61	0.24	0.12	1.27	2.0992
Y3	9.00	0.11	1.00	9.00	0.32	0.08	0.1	0.47	0.97	0.2434	0.31	0.07	0.24	0.12	0.73	3.012
Y4	9.00	0.11	0.11	1.00	0.32	0.08	0.01	0.05	0.47	0.117	0.31	0.07	0.03	0.12	0.52	4.4169
Sum	28.00	1.33	10.22	19.11						1	0.95	0.81	0.54	0.36	λmax =	3.4228
															CI =	-0.192
															RI =	0.9
															CR1 =	-0.214 CR<0.1

CR167 8 7 8 0.11 0 0.11

Pairwise Comparison | **Standardized Matrix** | **Consistency Matrix**

	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.13	0.14	0.13	0.04	0.09	0.01	0.01	0.15	0.0384	0.04	0.07	0.04	0.02	0.16	4.2471
Y2	8.00	1.00	9.00	7.00	0.33	0.73	0.88	0.41	2.34	0.5862	0.31	0.59	0.25	0.89	2.03	3.4592
Y3	7.00	0.11	1.00	9.00	0.29	0.08	0.1	0.53	1	0.2488	0.27	0.07	0.25	0.13	0.71	2.8502
Y4	8.00	0.14	0.11	1.00	0.33	0.1	0.01	0.06	0.51	0.1265	0.31	0.08	0.03	0.13	0.55	4.3072
Sum	24.00	1.38	10.25	17.13						1	0.92	0.81	0.56	1.15	λmax =	3.7159
															CI =	-0.095
															RI =	0.9
															CR1 =	-0.105 CR<0.1

CR168 9 9 9 0.11 9 0.11

Pairwise Comparison | **Standardized Matrix** | **Consistency Matrix**

	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.11	0.11	0.11	0.04	0.01	0.01	0.01	0.07	0.0171	0.02	0.04	0.04	0.04	0.13	7.3939
Y2	9.00	1.00	9.00	0.11	0.32	0.1	0.88	0.01	1.31	0.3276	0.15	0.33	0.33	0.04	0.85	2.5803
Y3	9.00	0.11	1.00	9.00	0.32	0.01	0.1	0.88	1.31	0.3276	0.15	0.04	0.33	0.33	0.85	2.5803
Y4	9.00	9.00	0.11	1.00	0.32	0.88	0.01	0.1	1.31	0.3276	0.15	0.33	0.04	0.33	0.85	2.5803
Sum	28.00	10.22	10.22	10.22						1	0.48	0.73	0.73	0.73	λmax =	3.7837
															CI =	-0.072
															RI =	0.9
															CR1 =	-0.08 CR<0.1

CR169 9 9 9 0.11 6 0.2

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.11	0.11	0.11
Y2	9.00	1.00	9.00	0.17
Y3	9.00	0.11	1.00	5.00
Y4	9.00	6.00	0.20	1.00
Sum	28.00	7.22	10.31	6.28

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.04	0.02	0.01	0.02	0.08	0.0199
0.32	0.14	0.87	0.03	1.36	0.3398
0.32	0.02	0.1	0.8	1.23	0.3076
0.32	0.83	0.02	0.16	1.33	0.3327
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.02	0.04	0.03	0.04	0.13	6.4742
0.18	0.34	0.31	0.06	0.88	2.5951
0.18	0.04	0.31	0.33	0.86	2.7867
0.18	0.34	0.06	0.33	0.91	2.7443
0.56	0.76	0.71	0.76	λmax =	3.6501
				CI =	-0.117
				RI =	0.9
				CR1 =	-0.13 CR<0.1

CR170 5 5 5 5 5 5

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	0.20	0.20	0.20
Y2	5.00	1.00	0.20	0.20
Y3	5.00	5.00	1.00	0.20
Y4	5.00	5.00	5.00	1.00
Sum	16.00	11.20	6.40	1.60

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.06	0.02	0.03	0.13	0.24	0.0592
0.31	0.09	0.03	0.13	0.56	0.1395
0.31	0.45	0.16	0.13	1.04	0.26
0.31	0.45	0.78	0.63	2.17	0.5413
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.06	0.03	0.05	0.11	0.25	4.1811
0.3	0.14	0.05	0.11	0.6	4.2688
0.3	0.7	0.26	0.11	1.36	5.2361
0.3	0.7	0.26	0.54	1.79	3.3155
0.95	1.56	0.62	0.87	λmax =	4.2504
				CI =	0.0835
				RI =	0.9
				CR1 =	0.0927 CR<0.1

CR171 1 1 1 1 1 1

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	1.00	1.00	1.00
Y2	1.00	1.00	1.00	1.00
Y3	1.00	1.00	1.00	1.00
Y4	1.00	1.00	1.00	1.00
Sum	4.00	4.00	4.00	4.00

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.25	0.25	0.25	0.25	1	0.25
0.25	0.25	0.25	0.25	1	0.25
0.25	0.25	0.25	0.25	1	0.25
0.25	0.25	0.25	0.25	1	0.25
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.25	0.25	0.25	0.25	1	4
0.25	0.25	0.25	0.25	1	4
0.25	0.25	0.25	0.25	1	4
0.25	0.25	0.25	0.25	1	4
1	1	1	1	λmax =	4
				CI =	0
				RI =	0.9
				CR1 =	0 CR<0.1

CR172 1 1 1 1 1 1

Pairwise Comparison

	Y1	Y2	Y3	Y4
Y1	1.00	1.00	1.00	1.00
Y2	1.00	1.00	1.00	1.00
Y3	1.00	1.00	1.00	1.00
Y4	1.00	1.00	1.00	1.00
Sum	4.00	4.00	4.00	4.00

Standardized Matrix

Y1	Y2	Y3	Y4	Sum	Weight
0.25	0.25	0.25	0.25	1	0.25
0.25	0.25	0.25	0.25	1	0.25
0.25	0.25	0.25	0.25	1	0.25
0.25	0.25	0.25	0.25	1	0.25
					1

Consistency Matrix

Y1	Y2	Y3	Y4	Sum	Average
0.25	0.25	0.25	0.25	1	4
0.25	0.25	0.25	0.25	1	4
0.25	0.25	0.25	0.25	1	4
0.25	0.25	0.25	0.25	1	4
1	1	1	1	λmax =	4
				CI =	0
				RI =	0.9

CR1 = 0 CR<0.1

CR173 7 8 7 5 0 0.14

	Pairwise Comparison				**Standardized Matrix**						**Consistency Matrix**					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.14	0.13	0.25	0.05	0.02	0.09	0.02	0.17	0.0436	0.04	0.04	0.07	0.02	0.18	4.1337
Y2	7.00	1.00	0.20	7.00	0.35	0.16	0.14	0.46	1.1	0.2761	0.3	0.28	0.12	0.67	1.37	4.972
Y3	8.00	5.00	1.00	7.00	0.4	0.8	0.68	0.46	2.34	0.5839	0.35	0.28	0.58	0.67	1.88	3.2254
Y4	4.00	0.14	0.14	1.00	0.2	0.02	0.1	0.07	0.39	0.0964	0.17	0.04	0.08	0.1	0.39	4.0822
Sum	20.00	6.29	1.47	15.25						1	0.87	0.63	0.86	8.25	λmax =	4.1033
															CI =	0.0344
															RI =	0.9
															CR1 =	0.0383 CR<0.1

CR174 1 1 1 1 1 1

	Pairwise Comparison				**Standardized Matrix**						**Consistency Matrix**					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	1.00	1.00	1.00	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	1	4
Y2	1.00	1.00	1.00	1.00	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	1	4
Y3	1.00	1.00	1.00	1.00	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	1	4
Y4	1.00	1.00	1.00	1.00	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	1	4
Sum	4.00	4.00	4.00	4.00						1	1	1	1	1	λmax =	4
															CI =	0
															RI =	0.9
															CR1 =	0 CR<0.1

CR175 8 8 9 6 6 6

	Pairwise Comparison				**Standardized Matrix**						**Consistency Matrix**					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.13	0.13	0.11	0.04	0.01	0.02	0.08	0.14	0.0355	0.04	0.02	0.03	0.06	0.15	4.1682
Y2	8.00	1.00	0.17	0.17	0.31	0.08	0.02	0.12	0.52	0.1305	0.28	0.13	0.04	0.1	0.55	4.2413
Y3	8.00	6.00	1.00	0.17	0.31	0.46	0.14	0.12	1.02	0.2543	0.28	0.13	0.25	0.1	0.77	3.01
Y4	9.00	6.00	6.00	1.00	0.35	0.46	0.82	0.69	2.32	0.5796	0.32	0.78	0.25	0.58	1.94	3.3415
Sum	26.00	13.13	7.29	1.44						1	0.92	1.06	0.58	0.78	λmax =	3.6903
															CI =	-0.103
															RI =	0.9
															CR1 =	-0.115 CR<0.1

CR176 7 7 8 7 8 7

	Pairwise Comparison				**Standardized Matrix**						**Consistency Matrix**					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.14	0.14	0.13	0.04	0.01	0.02	0.09	0.16	0.0398	0.04	0.02	0.03	0.08	0.17	4.1743
Y2	7.00	1.00	0.14	0.13	0.3	0.06	0.02	0.09	0.47	0.1183	0.28	0.12	0.03	0.08	0.51	4.2819
Y3	7.00	7.00	1.00	0.14	0.3	0.43	0.12	0.1	0.96	0.2403	0.28	0.83	0.24	0.09	1.43	5.9644
Y4	8.00	8.00	7.00	1.00	0.35	0.5	0.84	0.72	2.41	0.6015	0.32	0.12	0.24	0.6	1.28	2.1259
Sum	23.00	16.14	8.29	1.39						1	0.92	1.08	0.55	0.75	λmax =	4.1366

CI = 0.0455
RI = 0.9
CR1 = 0.0506CR<0.1

CR177 8 7 8 7 8 7

	Pairwise Comparison				Standardized Matrix						Consistency Matrix					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.13	0.14	0.13	0.04	0.01	0.02	0.09	0.16	0.0391	0.04	0.02	0.03	0.07	0.16	4.1802
Y2	8.00	1.00	0.14	0.13	0.33	0.06	0.02	0.09	0.5	0.1256	0.31	0.13	0.03	0.07	0.55	4.356
Y3	7.00	7.00	1.00	0.14	0.29	0.43	0.12	0.1	0.95	0.2373	0.27	0.88	0.24	0.09	1.48	6.2189
Y4	8.00	8.00	7.00	1.00	0.33	0.5	0.84	0.72	2.39	0.5981	0.31	0.13	0.24	0.6	1.27	2.1297
Sum	24.00	16.13	8.29	1.39						1	0.94	1.15	0.54	0.75	λmax =	4.2212

CI = 0.0737
RI = 0.9
CR1 = 0.0819CR<0.1

CR178 8 8 8 9 7 7

	Pairwise Comparison				Standardized Matrix						Consistency Matrix					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.13	0.13	0.13	0.04	0.01	0.02	0.09	0.15	0.0378	0.04	0.02	0.03	0.08	0.17	4.4182
Y2	8.00	1.00	0.11	0.14	0.32	0.06	0.02	0.1	0.5	0.1243	0.3	0.12	0.03	0.09	0.55	4.406
Y3	8.00	9.00	1.00	0.14	0.32	0.53	0.16	0.1	1.1	0.2758	0.3	0.12	0.28	0.09	0.79	2.8742
Y4	8.00	7.00	7.00	1.00	0.32	0.41	1.09	0.71	2.53	0.6328	0.3	0.87	0.28	0.63	2.08	3.2876
Sum	25.00	17.13	8.24	1.41						1.07	0.94	1.13	0.62	0.76	λmax =	3.7465

CI = -0.085
RI = 0.9
CR1 = -0.094CR<0.1

CR179 7 7 6 8 6 8

	Pairwise Comparison				Standardized Matrix						Consistency Matrix					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.14	0.14	0.17	0.05	0.01	0.02	0.11	0.19	0.0467	0.05	0.02	0.04	0.09	0.2	4.2014
Y2	7.00	1.00	0.13	0.17	0.33	0.07	0.01	0.11	0.53	0.1318	0.33	0.13	0.03	0.09	0.58	4.4355
Y3	7.00	8.00	1.00	0.13	0.33	0.53	0.11	0.09	1.06	0.2638	0.33	0.13	0.26	0.07	0.79	3.0026
Y4	6.00	6.00	8.00	1.00	0.29	0.4	0.86	0.69	2.23	0.5577	0.28	0.79	0.26	0.56	1.89	3.3931
Sum	21.00	15.14	9.27	1.46						1	0.98	1.07	0.6	0.79	λmax =	3.7581

CI = -0.081
RI = 0.9
CR1 = -0.09CR<0.1

CR180 1 2 0.5 1 3 0.5

	Pairwise Comparison				Standardized Matrix						Consistency Matrix					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	1.00	0.50	2.00	0.22	0.17	0.17	0.38	0.93	0.2326	0.23	0.2	0.16	0.24	0.84	3.5896
Y2	1.00	1.00	1.00	0.33	0.22	0.17	0.33	0.06	0.78	0.1962	0.23	0.2	0.33	0.08	0.84	4.2773

	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y3	2.00	1.00	1.00	2.00	0.44	0.17	0.33	0.38	1.32	0.3299	0.47	0.2	0.33	0.48	1.47	4.4684
Y4	0.50	3.00	0.50	1.00	0.11	0.5	0.17	0.19	0.97	0.2413	0.12	0.59	0.16	0.24	1.11	4.6043
Sum	4.50	6.00	3.00	5.33						1	1.05	1.18	0.99	1.05	λmax =	4.2349
															CI =	0.0783
															RI =	0.9
															CR1 =	0.087 CR<0.1

CR181 8 7 8 7 8 7

Pairwise Comparison | **Standardized Matrix** | **Consistency Matrix**

	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.13	0.14	0.13	0.04	0.01	0.02	0.09	0.16	0.0391	0.04	0.02	0.03	0.07	0.16	4.1802
Y2	8.00	1.00	0.14	0.13	0.33	0.06	0.02	0.09	0.5	0.1256	0.31	0.13	0.03	0.07	0.55	4.356
Y3	7.00	7.00	1.00	0.14	0.29	0.43	0.12	0.1	0.95	0.2373	0.27	0.13	0.24	0.09	0.72	3.043
Y4	8.00	8.00	7.00	1.00	0.33	0.5	0.84	0.72	2.39	0.5981	0.31	0.13	0.24	0.6	1.27	2.1297
Sum	24.00	16.13	8.29	1.39						1	0.94	0.39	0.54	0.83	λmax =	3.4272
															CI =	-0.191
															RI =	0.9
															CR1 =	-0.212 CR<0.1

CR182 9 7 9 8 8 7

Pairwise Comparison | **Standardized Matrix** | **Consistency Matrix**

	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.11	0.14	0.11	0.04	0.01	0.02	0.08	0.14	0.0357	0.04	0.01	0.03	0.07	0.15	4.2147
Y2	9.00	1.00	0.13	0.13	0.35	0.06	0.02	0.09	0.51	0.1276	0.32	0.13	0.03	0.07	0.55	4.3381
Y3	7.00	8.00	1.00	0.14	0.27	0.47	0.12	0.1	0.96	0.2403	0.25	0.13	0.24	0.09	0.7	2.9253
Y4	9.00	8.00	7.00	1.00	0.35	0.47	0.85	0.73	2.39	0.5964	0.32	1.02	0.24	0.6	2.18	3.6533
Sum	26.00	17.11	8.27	1.38						1	0.93	1.29	0.55	0.75	λmax =	3.7829
															CI =	-0.072
															RI =	0.9
															CR1 =	-0.08 CR<0.1

CR183 1 3 0.5 1 1 1

Pairwise Comparison | **Standardized Matrix** | **Consistency Matrix**

	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	1.00	0.33	2.00	0.18	0.25	0.1	0.4	0.93	0.233	0.23	0.23	0.08	0.42	0.96	4.1382
Y2	1.00	1.00	1.00	1.00	0.18	0.25	0.3	0.2	0.93	0.233	0.23	0.23	0.23	0.21	0.91	3.9024
Y3	3.00	1.00	1.00	1.00	0.55	0.25	0.3	0.2	1.3	0.3239	0.7	0.23	0.23	0.21	1.38	4.2456
Y4	0.50	1.00	1.00	1.00	0.09	0.25	0.3	0.2	0.84	0.2102	0.12	0.23	0.23	0.21	0.79	3.7703
Sum	5.50	4.00	3.33	5.00						1	1.28	0.93	0.78	2.71	λmax =	4.0141
															CI =	0.0047
															RI =	0.9
															CR1 =	0.0052 CR<0.1

CR184 7 8 7 7 6 8

Pairwise Comparison | **Standardized Matrix** | **Consistency Matrix**

	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average	
Y1	1.00	0.14	0.13	0.14	0.04	0.01	0.01	0.1	0.17	0.0417	0.04	0.02	0.03	0.08	0.17	4.1748	
Y2	7.00	1.00	0.14	0.17	0.3	0.07	0.02	0.12	0.51	0.1267	0.29	0.13	0.04	0.1	0.55	4.3481	
Y3	8.00	7.00	1.00	0.13	0.35	0.49	0.11	0.09	1.04	0.2595	0.33	0.13	0.26	0.07	0.79	3.0485	
Y4	7.00	6.00	8.00	1.00	0.3	0.42	0.86	0.7	2.29	0.5722	0.29	0.76	0.26	0.57	1.88	3.2912	
Sum	23.00	14.14	9.27	1.43						1	0.96	1.03	2.4	0.78	λmax =	3.7156	
															CI =	-0.095	
															RI =	0.9	
															CR1 =	-0.105	CR<0.1

CR185 1 0.5 2 3 1 1

	Pairwise Comparison				Standardized Matrix						Consistency Matrix						
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average	
Y1	1.00	1.00	2.00	0.50	0.22	0.17	0.46	0.14	0.99	0.2483	0.25	0.19	0.56	0.14	1.14	4.5947	
Y2	1.00	1.00	0.33	1.00	0.22	0.17	0.08	0.29	0.75	0.1879	0.25	0.19	0.09	0.28	0.81	4.3222	
Y3	0.50	3.00	1.00	1.00	0.11	0.5	0.23	0.29	1.13	0.2819	0.12	0.19	0.28	0.28	0.88	3.1069	
Y4	2.00	1.00	1.00	1.00	0.44	0.17	0.23	0.29	1.13	0.2819	0.5	0.19	0.28	0.28	1.25	4.4283	
Sum	4.50	6.00	4.33	3.50						1	1.12	0.75	1.22	1.89	λmax =	4.113	
															CI =	0.0377	
															RI =	0.9	
															CR1 =	0.0419	CR<0.1

CR186 1 1 1 1 1 1

	Pairwise Comparison				Standardized Matrix						Consistency Matrix						
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average	
Y1	1.00	1.00	1.00	1.00	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	1	4	
Y2	1.00	1.00	1.00	1.00	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	1	4	
Y3	1.00	1.00	1.00	1.00	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	1	4	
Y4	1.00	1.00	1.00	1.00	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	1	4	
Sum	4.00	4.00	4.00	4.00						1	1	1	1	1	λmax =	4	
															CI =	0	
															RI =	0.9	
															CR1 =	0	CR<0.1

CR187 7 7 7 7 7 7

	Pairwise Comparison				Standardized Matrix						Consistency Matrix						
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average	
Y1	1.00	0.14	0.14	0.14	0.05	0.01	0.02	0.1	0.17	0.043	0.04	0.02	0.04	0.08	0.18	4.1769	
Y2	7.00	1.00	0.14	0.14	0.32	0.07	0.02	0.1	0.5	0.1254	0.3	0.13	0.04	0.08	0.55	4.3504	
Y3	7.00	7.00	1.00	0.14	0.32	0.46	0.12	0.1	1	0.2503	0.3	0.13	0.25	0.08	0.76	3.0362	
Y4	7.00	7.00	7.00	1.00	0.32	0.46	0.84	0.7	2.33	0.5813	0.3	0.88	0.25	0.58	2.01	3.4583	
Sum	22.00	15.14	8.29	1.43						1	0.95	1.15	0.57	0.77	λmax =	3.7555	
															CI =	-0.082	
															RI =	0.9	
															CR1 =	-0.091	CR<0.1

CR188 7 7 7 7 7 7

	Pairwise Comparison				Standardized Matrix						Consistency Matrix					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.14	0.14	0.14	0.05	0.01	0.02	0.1	0.17	0.043	0.04	0.02	0.04	0.08	0.18	4.1769
Y2	7.00	1.00	0.14	0.14	0.32	0.07	0.02	0.1	0.5	0.1254	0.3	0.13	0.04	0.08	0.55	4.3504
Y3	7.00	7.00	1.00	0.14	0.32	0.46	0.12	0.1	1	0.2503	0.3	0.13	0.25	0.08	0.76	3.0362
Y4	7.00	7.00	7.00	1.00	0.32	0.46	0.84	0.7	2.33	0.5813	0.3	0.88	0.25	0.58	2.01	3.4583
Sum	22.00	15.14	8.29	1.43						1	0.95	1.15	0.57	0.77	λmax =	3.7555
															CI =	-0.082
															RI =	0.9
															CR1 =	-0.091 CR<0.1

CR189 8 8 9 8 8 8

	Pairwise Comparison				Standardized Matrix						Consistency Matrix					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.13	0.13	0.11	0.04	0.01	0.01	0.08	0.14	0.0352	0.04	0.01	0.03	0.07	0.15	4.1856
Y2	8.00	1.00	0.13	0.13	0.31	0.06	0.01	0.09	0.47	0.1179	0.28	0.12	0.03	0.08	0.51	4.2893
Y3	8.00	8.00	1.00	0.13	0.31	0.47	0.11	0.09	0.97	0.2437	0.28	0.12	0.24	0.08	0.72	2.9494
Y4	9.00	8.00	8.00	1.00	0.35	0.47	0.86	0.73	2.41	0.6032	0.32	0.94	0.24	0.6	2.11	3.4927
Sum	26.00	17.13	9.25	1.36						1	0.92	1.19	0.55	0.74	λmax =	3.7293
															CI =	-0.09
															RI =	0.9
															CR1 =	-0.1 CR<0.1

CR190 8 8 8 8 7 8

	Pairwise Comparison				Standardized Matrix						Consistency Matrix					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.13	0.13	0.13	0.04	0.01	0.01	0.09	0.15	0.0378	0.04	0.02	0.03	0.07	0.16	4.1861
Y2	8.00	1.00	0.13	0.14	0.32	0.06	0.01	0.1	0.5	0.1245	0.3	0.12	0.03	0.08	0.54	4.3501
Y3	8.00	8.00	1.00	0.13	0.32	0.5	0.11	0.09	1.01	0.2535	0.3	0.12	0.25	0.07	0.75	2.9707
Y4	8.00	7.00	8.00	1.00	0.32	0.43	0.86	0.72	2.34	0.5842	0.3	0.87	0.25	0.58	2.01	3.4428
Sum	25.00	16.13	9.25	1.39						1	0.94	1.14	0.57	0.75	λmax =	3.7374
															CI =	-0.088
															RI =	0.9
															CR1 =	-0.097 CR<0.1

CR191 8 8 8 9 8 9

	Pairwise Comparison				Standardized Matrix						Consistency Matrix					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.13	0.13	0.13	0.04	0.01	0.01	0.09	0.15	0.0377	0.04	0.01	0.03	0.07	0.16	4.1875
Y2	8.00	1.00	0.11	0.13	0.32	0.06	0.01	0.09	0.48	0.1195	0.3	0.12	0.03	0.07	0.52	4.3799
Y3	8.00	9.00	1.00	0.11	0.32	0.5	0.1	0.08	1	0.249	0.3	0.12	0.25	0.07	0.74	2.9574
Y4	8.00	8.00	9.00	1.00	0.32	0.44	0.88	0.73	2.38	0.5938	0.3	0.96	0.25	0.59	2.1	3.5371
Sum	25.00	18.13	10.24	1.36						1	0.94	1.21	0.56	0.74	λmax =	3.7655

CI = -0.078

RI = 0.9

CR1 = -0.087CR<0.1

CR192 1 0.5 3 1 1 3

	Pairwise Comparison				**Standardized Matrix**						**Consistency Matrix**					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	1.00	2.00	0.33	0.18	0.29	0.29	0.09	0.84	0.211	0.21	0.29	0.31	0.12	0.92	4.3641
Y2	1.00	1.00	1.00	2.00	0.18	0.29	0.14	0.55	1.16	0.289	0.21	0.29	0.15	0.35	1	3.4607
Y3	0.50	1.00	1.00	0.33	0.09	0.29	0.14	0.09	0.61	0.1526	0.11	0.29	0.15	0.12	0.66	4.344
Y4	3.00	0.50	3.00	1.00	0.55	0.14	0.43	0.27	1.39	0.3474	0.63	0.14	0.46	0.35	1.58	4.5561
Sum	5.50	3.50	7.00	3.67						1	1.16	1.01	1.07	0.93	λmax =	4.1812

CI = 0.0604

RI = 0.9

CR1 = 0.0671CR<0.1

CR193 1 0.5 3 1 1 3

	Pairwise Comparison				**Standardized Matrix**						**Consistency Matrix**					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	1.00	2.00	0.33	0.18	0.29	0.29	0.09	0.84	0.211	0.21	0.29	0.31	0.12	0.92	4.3641
Y2	1.00	1.00	1.00	2.00	0.18	0.29	0.14	0.55	1.16	0.289	0.21	0.29	0.15	0.35	1	3.4607
Y3	0.50	1.00	1.00	0.33	0.09	0.29	0.14	0.09	0.61	0.1526	0.11	0.29	0.15	0.12	0.66	4.344
Y4	3.00	0.50	3.00	1.00	0.55	0.14	0.43	0.27	1.39	0.3474	0.63	0.14	0.46	0.35	1.58	4.5561
Sum	5.50	3.50	7.00	3.67						1	1.16	1.01	1.07	0.93	λmax =	4.1812

CI = 0.0604

RI = 0.9

CR1 = 0.0671CR<0.1

CR194 7 6 7 5 8 6

	Pairwise Comparison				**Standardized Matrix**						**Consistency Matrix**					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.14	0.17	0.14	0.05	0.01	0.02	0.1	0.18	0.045	0.04	0.02	0.04	0.09	0.19	4.1509
Y2	7.00	1.00	0.20	0.13	0.33	0.07	0.03	0.09	0.52	0.1296	0.31	0.13	0.04	0.08	0.56	4.3551
Y3	6.00	5.00	1.00	0.17	0.29	0.35	0.14	0.12	0.89	0.2228	0.27	0.65	0.22	0.1	1.24	5.5703
Y4	7.00	8.00	6.00	1.00	0.33	0.57	0.81	0.7	2.41	0.6026	0.31	0.13	0.22	0.6	1.27	2.1072
Sum	21.00	14.14	7.37	1.43						1	0.94	0.93	0.53	0.86	λmax =	4.0459

CI = 0.0153

RI = 0.9

CR1 = 0.017CR<0.1

CR195 8 8 8 9 9 9

	Pairwise Comparison				**Standardized Matrix**						**Consistency Matrix**					
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.13	0.13	0.13	0.04	0.01	0.01	0.09	0.15	0.0379	0.04	0.01	0.03	0.08	0.16	4.1747
Y2	8.00	1.00	0.11	0.11	0.32	0.05	0.01	0.08	0.47	0.1164	0.3	0.12	0.03	0.07	0.51	4.4108

	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y3	8.00	9.00	1.00	0.11	0.32	0.47	0.1	0.08	0.97	0.2427	0.3	0.12	0.24	0.07	0.73	3.0045
Y4	8.00	9.00	9.00	1.00	0.32	0.47	0.88	0.74	2.41	0.603	0.3	0.12	0.24	0.6	1.27	2.0981
Sum	25.00	19.13	10.24	1.35						1	0.95	0.36	0.54	0.81	λmax =	3.422
															CI =	-0.193
															RI =	0.9
															CR1 =	-0.214 CR<0.1

CR196 8 9 8 7 8 8

Pairwise Comparison / **Standardized Matrix** / **Consistency Matrix**

	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.13	0.11	0.13	0.04	0.01	0.01	0.09	0.15	0.0373	0.04	0.02	0.03	0.08	0.16	4.1675
Y2	8.00	1.00	0.14	0.13	0.32	0.06	0.02	0.09	0.49	0.1221	0.3	0.12	0.04	0.08	0.53	4.3497
Y3	9.00	7.00	1.00	0.13	0.36	0.43	0.11	0.09	0.99	0.2483	0.34	0.85	0.25	0.08	1.51	6.097
Y4	8.00	8.00	8.00	1.00	0.32	0.5	0.86	0.73	2.41	0.602	0.3	0.12	0.25	0.6	1.27	2.1107
Sum	26.00	16.13	9.25	1.38						1.01	0.97	1.11	0.56	0.83	λmax =	4.1812
															CI =	0.0604
															RI =	0.9
															CR1 =	0.0671 CR<0.1

CR197 2 1 0.5 0.5 1 1

Pairwise Comparison / **Standardized Matrix** / **Consistency Matrix**

	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.50	1.00	2.00	0.22	0.17	0.2	0.4	0.99	0.2472	0.25	0.17	0.2	0.42	1.04	4.2022
Y2	2.00	1.00	2.00	1.00	0.44	0.33	0.4	0.2	1.38	0.3444	0.49	0.34	0.39	0.21	1.44	4.1935
Y3	1.00	0.50	1.00	1.00	0.22	0.17	0.2	0.2	0.79	0.1972	0.25	0.17	0.2	0.21	0.83	4.1972
Y4	0.50	1.00	1.00	1.00	0.11	0.33	0.2	0.2	0.84	0.2111	0.12	0.34	0.2	0.21	0.88	4.1513
Sum	4.50	3.00	5.00	5.00						1	1.11	1.03	0.99	1.06	λmax =	4.1861
															CI =	0.062
															RI =	0.9
															CR1 =	0.0689 CR<0.1

CR198 2 1 0.5 0.5 1 3

Pairwise Comparison / **Standardized Matrix** / **Consistency Matrix**

	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average
Y1	1.00	0.50	1.00	2.00	0.22	0.2	0.14	0.38	0.94	0.235	0.24	0.19	0.16	0.12	0.7	2.9613
Y2	2.00	1.00	2.00	2.00	0.44	0.4	0.29	0.38	1.51	0.3763	0.47	0.38	0.31	0.23	1.39	3.6991
Y3	1.00	0.50	1.00	0.33	0.22	0.2	0.14	0.06	0.63	0.1569	0.24	0.19	0.16	0.12	0.7	4.4358
Y4	0.50	0.50	3.00	1.00	0.11	0.2	0.43	0.19	0.93	0.2318	0.12	0.19	0.47	0.12	0.89	3.8492
Sum	4.50	2.50	7.00	5.33						1	1.06	0.94	1.1	0.58	λmax =	3.7363
															CI =	-0.088
															RI =	0.9
															CR1 =	-0.098 CR<0.1

CR199 5 8 7 5 8 8

Pairwise Comparison / **Standardized Matrix** / **Consistency Matrix**

	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average	
Y1	1.00	0.20	0.13	0.14	0.04	0.01	0.01	0.1	0.17	0.0421	0.04	0.02	0.03	0.08	0.17	4.0577	
Y2	5.00	1.00	0.20	0.13	0.2	0.06	0.02	0.09	0.37	0.0933	0.21	0.09	0.04	0.07	0.42	4.4894	
Y3	8.00	5.00	1.00	0.13	0.32	0.31	0.11	0.09	0.83	0.207	0.34	0.47	0.21	0.07	1.08	5.239	
Y4	7.00	8.00	8.00	1.00	0.28	0.5	0.86	0.72	2.36	0.5897	0.29	0.75	0.21	0.59	1.84	3.1172	
Sum	21.00	14.20	9.33	1.39						0.93	0.88	1.33	0.48	0.82	λmax =	4.2258	
															CI =	0.0753	
															RI =	0.9	
															CR1 =	0.0836	CR<0.1

CR200 5 7 5 8 7 8

Pairwise Comparison					**Standardized Matrix**						**Consistency Matrix**						
	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Sum	Weight	Y1	Y2	Y3	Y4	Sum	Average	
Y1	1.00	0.20	0.14	0.20	0.06	0.01	0.02	0.14	0.22	0.0549	0.05	0.02	0.04	0.11	0.23	4.1635	
Y2	5.00	1.00	0.13	0.14	0.28	0.06	0.01	0.1	0.45	0.1126	0.27	0.11	0.03	0.08	0.5	4.4517	
Y3	7.00	8.00	1.00	0.13	0.39	0.49	0.11	0.09	1.08	0.2689	0.38	0.11	0.27	0.07	0.84	3.1093	
Y4	5.00	7.00	8.00	1.00	0.28	0.43	0.86	0.68	2.25	0.5636	0.27	0.79	1.34	0.56	2.97	5.2713	
Sum	18.00	16.20	9.27	1.47						1	0.99	1.04	1.69	0.79	λmax =	4.2489	
															CI =	0.083	
															RI =	0.9	
															CR1 =	0.0922	CR<0.1

Marginal Effects

$$\frac{\partial PA_i}{\partial X_{ki}} = PA_i(1 - PA_i)\beta_{X1LnY2Y1} - PA_iPB_i\beta_{X1LnY3Y1} - PA_iPC_i\beta_{X1LnY4Y1}$$

$$\frac{\partial PB_i}{\partial X_{ki}} = PA_iPB_i\beta_{X1LnY2Y1} - PB_i(1 - PB_i)\beta_{X1LnY3Y1} - PB_iPC_i\beta_{X1LnY4Y1}$$

$$\frac{\partial PC_i}{\partial X_{ki}} = PA_iPC_i\beta_{X1LnY2Y1} - PB_iPC_i\beta_{X1LnY3Y1} - PC_i(1 - PC_i)\beta_{X1LnY4Y1}$$

$$\frac{\partial PD_i}{\partial X_{ki}} = -\left(\frac{\partial PA_i}{\partial X_{ki}} + \frac{\partial PB_i}{\partial X_{ki}} + \frac{\partial PC_i}{\partial X_{ki}}\right)$$

PA_i (Y=2 product)	PBi (Y=3 product)	PCi (Y=4 product)	PDi (Y=1 product)	$\frac{\partial PA_i}{\partial X_{PCP}}$	$\frac{\partial PB_i}{\partial X_{PCP}}$	$\frac{\partial PC_i}{\partial X_{PCP}}$	$\frac{\partial PD_i}{\partial X_{PCP}}$	$\frac{\partial PA_i}{\partial X_{PCB}}$	$\frac{\partial PB_i}{\partial X_{PCB}}$	$\frac{\partial PC_i}{\partial X_{PCB}}$	$\frac{\partial PD_i}{\partial X_{PCB}}$	$\frac{\partial PA_i}{\partial X_{PCS}}$	$\frac{\partial PB_i}{\partial X_{PCS}}$	$\frac{\partial PC_i}{\partial X_{PCS}}$	$\frac{\partial PD_i}{\partial X_{PCS}}$	$\frac{\partial PA_i}{\partial X_{PCC}}$	$\frac{\partial PB_i}{\partial X_{PCC}}$	$\frac{\partial PC_i}{\partial X_{PCC}}$	$\frac{\partial PD_i}{\partial X_{PCC}}$	$\frac{\partial PA_i}{\partial X_{PCT}}$	$\frac{\partial PB_i}{\partial X_{PCT}}$	$\frac{\partial PC_i}{\partial X_{PCT}}$	$\frac{\partial PD_i}{\partial X_{PCT}}$	$\frac{\partial PA_i}{\partial X_{PCK}}$	$\frac{\partial PB_i}{\partial X_{PCK}}$	$\frac{\partial PC_i}{\partial X_{PCK}}$	$\frac{\partial PD_i}{\partial X_{PCK}}$
0.196	0.158	0.568	0.078	0.003	-0.030	-0.047	0.075	-0.014	-0.005	0.020	-0.001	-0.016	-0.007	0.038	-0.014	0.022	0.014	-0.030	-0.006	-0.017	0.013	0.071	-0.066	0.007	0.011	-0.016	-0.002
0.238	0.210	0.474	0.079	0.004	-0.043	-0.045	0.083	-0.015	-0.006	0.020	-0.000	-0.017	-0.007	0.038	-0.014	0.024	0.016	-0.030	-0.009	-0.019	0.021	0.070	-0.072	0.007	0.015	-0.015	-0.008
0.186	0.147	0.571	0.096	0.002	-0.028	-0.048	0.074	-0.013	-0.005	0.020	-0.002	-0.016	-0.007	0.038	-0.015	0.021	0.013	-0.030	-0.004	-0.016	0.012	0.071	-0.068	0.007	0.010	-0.016	-0.001
0.173	0.186	0.591	0.050	0.004	-0.032	-0.037	0.066	-0.013	-0.007	0.019	0.000	-0.015	-0.010	0.036	-0.011	0.021	0.017	-0.030	-0.008	-0.017	0.011	0.063	-0.057	0.006	0.012	-0.012	-0.005
0.190	0.224	0.536	0.051	0.005	-0.039	-0.036	0.070	-0.013	-0.007	0.020	0.001	-0.015	-0.010	0.036	-0.011	0.021	0.018	-0.031	-0.009	-0.018	0.016	0.062	-0.060	0.006	0.014	-0.012	-0.008
0.199	0.204	0.542	0.055	0.005	-0.037	-0.040	0.073	-0.014	-0.007	0.020	0.001	-0.016	-0.009	0.037	-0.012	0.022	0.017	-0.030	-0.009	-0.018	0.016	0.066	-0.063	0.006	0.014	-0.013	-0.007
0.229	0.209	0.504	0.059	0.005	-0.041	-0.044	0.079	-0.015	-0.006	0.020	0.001	-0.017	-0.008	0.038	-0.012	0.024	0.016	-0.030	-0.010	-0.020	0.019	0.069	-0.068	0.007	0.015	-0.015	-0.007
0.230	0.239	0.471	0.060	0.006	-0.046	-0.039	0.080	-0.015	-0.006	0.020	0.001	-0.017	-0.008	0.037	-0.012	0.023	0.018	-0.030	-0.010	-0.019	0.022	0.065	-0.068	0.007	0.017	-0.013	-0.010
0.160	0.165	0.621	0.055	0.003	-0.028	-0.038	0.063	-0.012	-0.006	0.019	0.000	-0.015	-0.009	0.035	-0.011	0.020	0.015	-0.029	-0.006	-0.016	0.009	0.062	-0.056	0.006	0.010	-0.013	-0.003
0.298	0.357	0.293	0.053	0.012	-0.074	-0.029	0.091	-0.015	-0.005	0.016	0.003	-0.015	-0.004	0.030	-0.011	0.021	0.019	-0.025	-0.015	-0.021	0.046	0.051	-0.076	0.006	0.026	-0.010	-0.022
0.197	0.238	0.519	0.046	0.006	-0.042	-0.035	0.071	-0.014	-0.007	0.020	0.001	-0.016	-0.010	0.036	-0.011	0.021	0.019	-0.031	-0.010	-0.019	0.018	0.062	-0.061	0.006	0.015	-0.012	-0.010
0.233	0.192	0.489	0.086	0.003	-0.040	-0.047	0.083	-0.015	-0.005	0.020	0.000	-0.017	-0.007	0.038	-0.014	0.024	0.015	-0.030	-0.008	-0.018	0.019	0.072	-0.073	0.008	0.014	-0.016	-0.006
0.117	0.162	0.688	0.033	0.003	-0.024	-0.027	0.048	-0.010	-0.007	0.017	0.000	-0.012	-0.011	0.031	-0.008	0.016	0.016	-0.027	-0.005	-0.013	0.005	0.050	-0.042	0.004	0.009	-0.009	-0.005

0.145	0.177	0.637	0.040	0.004	-0.028	-0.032	0.057	-0.012	-0.007	0.018	0.000	-0.014	-0.011	0.034	-0.009	0.018	0.017	-0.028	-0.007	-0.015	0.008	0.057	-0.050	0.005	0.011	-0.011	-0.005
0.185	0.179	0.579	0.057	0.004	-0.032	-0.041	0.070	-0.014	-0.006	0.020	0.000	-0.016	-0.009	0.037	-0.012	0.021	0.016	-0.030	-0.007	-0.017	0.012	0.066	-0.061	0.006	0.012	-0.014	-0.004
0.114	0.152	0.699	0.035	0.003	-0.023	-0.027	0.047	-0.010	-0.007	0.017	0.000	-0.012	-0.011	0.030	-0.008	0.016	0.015	-0.026	-0.005	-0.013	0.004	0.050	-0.042	0.004	0.008	-0.009	-0.004
0.128	0.174	0.662	0.036	0.003	-0.027	-0.028	0.052	-0.010	-0.007	0.018	0.000	-0.013	-0.011	0.032	-0.009	0.017	0.017	-0.028	-0.006	-0.014	0.006	0.053	-0.045	0.005	0.010	-0.009	-0.005
0.234	0.307	0.429	0.030	0.009	-0.056	-0.031	0.077	-0.014	-0.008	0.019	0.003	-0.016	-0.009	0.035	-0.010	0.022	0.021	-0.030	-0.013	-0.021	0.028	0.058	-0.064	0.006	0.020	-0.010	-0.016
0.260	0.193	0.469	0.078	0.004	-0.042	-0.050	0.087	-0.016	-0.005	0.020	0.001	-0.018	-0.006	0.038	-0.014	0.025	0.015	-0.030	-0.010	-0.020	0.022	0.074	-0.075	0.008	0.015	-0.017	-0.006
0.202	0.203	0.520	0.074	0.004	-0.039	-0.041	0.076	-0.014	-0.006	0.020	0.000	-0.016	-0.008	0.037	-0.013	0.022	0.016	-0.031	-0.007	-0.017	0.017	0.067	-0.067	0.007	0.014	-0.014	-0.007
0.228	0.161	0.486	0.125	0.001	-0.035	-0.052	0.086	-0.014	-0.004	0.021	-0.002	-0.016	-0.005	0.039	-0.017	0.023	0.012	-0.030	-0.005	-0.016	0.018	0.075	-0.077	0.008	0.012	-0.017	-0.003
0.133	0.157	0.661	0.050	0.003	-0.025	-0.033	0.055	-0.011	-0.007	0.018	-0.001	-0.013	-0.010	0.033	-0.010	0.017	0.015	-0.028	-0.005	-0.014	0.006	0.057	-0.049	0.005	0.009	-0.011	-0.003
0.176	0.198	0.582	0.044	0.004	-0.034	-0.036	0.066	-0.013	-0.007	0.019	-0.001	-0.015	-0.010	0.036	-0.010	0.021	0.017	-0.030	-0.008	-0.017	0.012	0.062	-0.057	0.006	0.013	-0.012	-0.006
0.130	0.143	0.678	0.049	0.002	-0.023	-0.034	0.054	-0.011	-0.006	0.018	-0.001	-0.013	-0.009	0.032	-0.010	0.017	0.014	-0.027	-0.005	-0.014	0.006	0.057	-0.048	0.005	0.008	-0.011	-0.002
0.136	0.154	0.651	0.058	0.002	-0.025	-0.035	0.057	-0.011	-0.006	0.018	-0.001	-0.013	-0.009	0.034	-0.011	0.018	0.015	-0.028	-0.004	-0.014	0.007	0.059	-0.052	0.005	0.009	-0.011	-0.003
0.131	0.182	0.650	0.037	0.003	-0.028	-0.028	0.053	-0.011	-0.008	0.018	0.000	-0.013	-0.011	0.033	-0.009	0.017	0.017	-0.028	-0.006	-0.014	0.007	0.053	-0.046	0.005	0.010	-0.009	-0.006
0.113	0.130	0.700	0.057	0.002	-0.020	-0.032	0.050	-0.010	-0.006	0.017	-0.002	-0.012	-0.009	0.031	-0.011	0.015	0.013	-0.026	-0.003	-0.012	0.004	0.054	-0.046	0.004	0.008	-0.010	-0.001

0.154	0.142	0.632	0.072	0.002	-0.025	-0.041	0.064	-0.012	-0.006	0.019	-0.002	-0.014	-0.008	0.035	-0.013	0.019	0.013	-0.029	-0.004	-0.015	0.008	0.065	-0.058	0.006	0.009	-0.014	-0.001
0.265	0.261	0.415	0.060	0.007	-0.054	-0.040	0.086	-0.015	-0.006	0.019	0.002	-0.017	-0.007	0.036	-0.012	0.024	0.018	-0.029	-0.012	-0.021	0.029	0.065	-0.073	0.007	0.019	-0.014	-0.013
0.183	0.190	0.577	0.050	0.004	-0.034	-0.039	0.068	-0.013	-0.007	0.019	0.001	-0.016	-0.010	0.036	-0.011	0.021	0.017	-0.030	-0.008	-0.018	0.013	0.064	-0.059	0.006	0.012	-0.013	-0.005
0.292	0.272	0.375	0.061	0.008	-0.059	-0.040	0.091	-0.016	-0.005	0.019	0.002	-0.017	-0.005	0.035	-0.012	0.024	0.017	-0.028	-0.013	-0.021	0.034	0.064	-0.076	0.007	0.021	-0.014	-0.015
0.154	0.154	0.622	0.070	0.002	-0.027	-0.039	0.064	-0.012	-0.006	0.019	-0.001	-0.014	-0.009	0.035	-0.013	0.019	0.014	-0.029	-0.004	-0.015	0.009	0.063	-0.057	0.006	0.010	-0.013	-0.002
0.160	0.190	0.591	0.058	0.003	-0.032	-0.035	0.064	-0.012	-0.007	0.019	0.000	-0.014	-0.010	0.036	-0.011	0.019	0.017	-0.030	-0.006	-0.016	0.011	0.061	-0.056	0.006	0.012	-0.012	-0.006
0.143	0.163	0.651	0.044	0.003	-0.026	-0.034	0.057	-0.011	-0.007	0.018	0.000	-0.014	-0.010	0.033	-0.010	0.018	0.016	-0.028	-0.006	-0.015	0.007	0.058	-0.050	0.005	0.010	-0.011	-0.004
0.138	0.163	0.661	0.038	0.003	-0.026	-0.032	0.055	-0.011	-0.007	0.018	0.000	-0.013	-0.010	0.033	-0.009	0.018	0.016	-0.028	-0.006	-0.015	0.006	0.056	-0.048	0.005	0.010	-0.011	-0.004
0.152	0.165	0.626	0.057	0.003	-0.028	-0.037	0.061	-0.012	-0.006	0.019	-0.001	-0.014	-0.009	0.035	-0.011	0.019	0.015	-0.029	-0.005	-0.015	0.009	0.061	-0.055	0.005	0.010	-0.012	-0.004
0.141	0.144	0.665	0.049	0.003	-0.024	-0.036	0.057	-0.011	-0.006	0.018	0.000	-0.014	-0.009	0.033	-0.010	0.018	0.014	-0.027	-0.005	-0.015	0.006	0.059	-0.051	0.005	0.009	-0.012	-0.002
0.156	0.174	0.614	0.056	0.003	-0.029	-0.036	0.062	-0.012	-0.007	0.019	0.000	-0.014	-0.010	0.035	-0.011	0.019	0.016	-0.029	-0.006	-0.016	0.009	0.061	-0.055	0.006	0.011	-0.012	-0.004
0.166	0.169	0.597	0.068	0.003	-0.030	-0.040	0.067	-0.012	-0.006	0.020	-0.001	-0.015	-0.009	0.036	-0.012	0.020	0.015	-0.030	-0.005	-0.016	0.011	0.064	-0.059	0.006	0.011	-0.013	-0.004
0.166	0.166	0.604	0.064	0.003	-0.029	-0.040	0.066	-0.013	-0.006	0.019	-0.001	-0.015	-0.009	0.036	-0.012	0.020	0.015	-0.029	-0.006	-0.016	0.010	0.064	-0.059	0.006	0.011	-0.013	-0.003
0.169	0.169	0.591	0.071	0.003	-0.030	-0.040	0.068	-0.013	-0.006	0.020	-0.001	-0.015	-0.009	0.036	-0.013	0.020	0.015	-0.030	-0.005	-0.016	0.011	0.065	-0.060	0.006	0.011	-0.013	-0.003

0.197	0.156	0.528	0.119	0.001	-0.032	-0.049	0.079	-0.013	-0.005	0.021	-0.003	-0.015	-0.006	0.038	-0.017	0.021	0.013	-0.031	-0.003	-0.015	0.015	0.073	-0.073	0.007	0.011	-0.016	-0.002
0.152	0.155	0.622	0.070	0.002	-0.027	-0.039	0.063	-0.012	-0.006	0.019	-0.001	-0.014	-0.009	0.035	-0.013	0.019	0.014	-0.029	-0.004	-0.015	0.009	0.063	-0.057	0.006	0.010	-0.013	-0.002
0.174	0.173	0.582	0.071	0.003	-0.031	-0.041	0.069	-0.013	-0.006	0.020	-0.001	-0.015	-0.009	0.037	-0.013	0.020	0.015	-0.030	-0.006	-0.016	0.012	0.066	-0.061	0.006	0.011	-0.014	-0.004
0.142	0.145	0.641	0.072	0.002	-0.025	-0.038	0.061	-0.011	-0.006	0.019	-0.002	-0.013	-0.009	0.035	-0.013	0.018	0.014	-0.028	-0.003	-0.014	0.007	0.062	-0.056	0.005	0.009	-0.013	-0.002
0.145	0.160	0.653	0.043	0.003	-0.026	-0.034	0.057	-0.012	-0.007	0.018	0.000	-0.014	-0.010	0.033	-0.010	0.019	0.015	-0.028	-0.006	-0.015	0.007	0.058	-0.050	0.005	0.010	-0.011	-0.003
0.141	0.147	0.665	0.047	0.003	-0.024	-0.036	0.057	-0.011	-0.006	0.018	0.000	-0.014	-0.009	0.033	-0.010	0.018	0.014	-0.027	-0.005	-0.015	0.006	0.059	-0.050	0.005	0.009	-0.012	-0.002
0.144	0.155	0.650	0.051	0.003	-0.026	-0.036	0.058	-0.012	-0.006	0.018	0.000	-0.014	-0.009	0.034	-0.011	0.018	0.015	-0.028	-0.005	-0.015	0.007	0.059	-0.052	0.005	0.009	-0.012	-0.003
0.140	0.146	0.658	0.057	0.002	-0.024	-0.036	0.058	-0.011	-0.006	0.018	-0.001	-0.014	-0.009	0.034	-0.011	0.018	0.014	-0.028	-0.005	-0.014	0.007	0.060	-0.052	0.005	0.009	-0.012	-0.002
0.130	0.139	0.681	0.050	0.002	-0.022	-0.034	0.054	-0.011	-0.006	0.018	-0.001	-0.013	-0.009	0.032	-0.010	0.017	0.014	-0.027	-0.004	-0.014	0.005	0.057	-0.048	0.005	0.008	-0.011	-0.002
0.168	0.191	0.599	0.042	0.004	-0.032	-0.036	0.064	-0.013	-0.007	0.019	-0.001	-0.015	-0.010	0.035	-0.010	0.020	0.017	-0.029	-0.008	-0.017	0.011	0.061	-0.055	0.006	0.012	-0.012	-0.006
0.185	0.174	0.561	0.080	0.003	-0.032	-0.043	0.073	-0.013	-0.006	0.020	-0.001	-0.015	-0.008	0.037	-0.014	0.021	0.015	-0.030	-0.006	-0.016	0.013	0.068	-0.065	0.006	0.012	-0.014	-0.004
0.149	0.170	0.641	0.040	0.003	-0.028	-0.034	0.058	-0.012	-0.007	0.018	0.000	-0.014	-0.010	0.034	-0.009	0.019	0.016	-0.028	-0.007	-0.016	0.008	0.058	-0.051	0.005	0.010	-0.011	-0.004
0.149	0.167	0.631	0.054	0.003	-0.028	-0.035	0.060	-0.012	-0.007	0.019	0.000	-0.014	-0.010	0.034	-0.011	0.019	0.016	-0.029	-0.006	-0.015	0.008	0.060	-0.053	0.005	0.010	-0.012	-0.004
0.139	0.142	0.657	0.063	0.002	-0.024	-0.037	0.059	-0.011	-0.006	0.018	-0.001	-0.013	-0.009	0.034	-0.012	0.018	0.014	-0.028	-0.004	-0.014	0.007	0.060	-0.053	0.005	0.009	-0.012	-0.002

0.156	0.141	0.629	0.075	0.002	-0.025	-0.042	0.065	-0.012	-0.005	0.019	-0.002	-0.014	-0.008	0.035	-0.013	0.019	0.013	-0.029	-0.004	-0.015	0.008	0.065	-0.059	0.006	0.009	-0.014	-0.001
0.144	0.136	0.653	0.068	0.002	-0.023	-0.040	0.061	-0.011	-0.006	0.019	-0.002	-0.014	-0.008	0.034	-0.012	0.018	0.013	-0.028	-0.004	-0.014	0.007	0.063	-0.055	0.005	0.008	-0.013	-0.001
0.148	0.145	0.642	0.065	0.002	-0.025	-0.039	0.062	-0.012	-0.006	0.019	-0.001	-0.014	-0.009	0.035	-0.012	0.019	0.014	-0.028	-0.004	-0.015	0.008	0.063	-0.055	0.006	0.009	-0.013	-0.002
0.152	0.147	0.641	0.060	0.003	-0.025	-0.039	0.062	-0.012	-0.006	0.019	-0.001	-0.014	-0.009	0.035	-0.012	0.019	0.014	-0.028	-0.005	-0.015	0.008	0.063	-0.055	0.006	0.009	-0.013	-0.002
0.279	0.184	0.426	0.111	0.002	-0.043	-0.052	0.092	-0.016	-0.004	0.020	0.000	-0.018	-0.004	0.038	-0.016	0.025	0.013	-0.029	-0.009	-0.018	0.024	0.075	-0.081	0.009	0.015	-0.018	-0.006
0.126	0.124	0.681	0.069	0.002	-0.020	-0.037	0.056	-0.010	-0.005	0.018	-0.002	-0.012	-0.008	0.033	-0.012	0.017	0.012	-0.027	-0.002	-0.013	0.005	0.059	-0.051	0.005	0.008	-0.012	0.000
0.237	0.170	0.508	0.085	0.003	-0.036	-0.051	0.084	-0.015	-0.005	0.021	0.000	-0.018	-0.006	0.039	-0.015	0.025	0.014	-0.030	-0.008	-0.019	0.017	0.075	-0.073	0.008	0.013	-0.017	-0.003
0.137	0.148	0.669	0.047	0.003	-0.024	-0.035	0.056	-0.011	-0.006	0.018	0.000	-0.013	-0.009	0.033	-0.010	0.018	0.015	-0.027	-0.005	-0.015	0.006	0.058	-0.049	0.005	0.009	-0.011	-0.003
0.258	0.187	0.476	0.079	0.004	-0.040	-0.050	0.087	-0.016	-0.005	0.020	0.001	-0.018	-0.006	0.038	-0.014	0.025	0.014	-0.030	-0.010	-0.020	0.021	0.074	-0.075	0.008	0.014	-0.017	-0.005
0.234	0.200	0.502	0.065	0.005	-0.040	-0.046	0.081	-0.015	-0.006	0.020	0.001	-0.018	-0.007	0.038	-0.013	0.024	0.016	-0.030	-0.010	-0.020	0.019	0.070	-0.070	0.007	0.014	-0.015	-0.006
0.290	0.201	0.409	0.101	0.003	-0.047	-0.050	0.093	-0.016	-0.004	0.020	0.000	-0.018	-0.004	0.037	-0.015	0.025	0.014	-0.029	-0.010	-0.019	0.027	0.073	-0.081	0.009	0.016	-0.017	-0.008
0.260	0.167	0.454	0.119	0.001	-0.038	-0.053	0.090	-0.015	-0.004	0.021	-0.001	-0.017	-0.005	0.039	-0.017	0.025	0.012	-0.030	-0.007	-0.017	0.021	0.076	-0.080	0.009	0.013	-0.018	-0.004
0.271	0.188	0.445	0.096	0.003	-0.042	-0.051	0.090	-0.016	-0.004	0.020	0.000	-0.018	-0.005	0.038	-0.015	0.025	0.014	-0.030	-0.009	-0.019	0.023	0.075	-0.079	0.008	0.015	-0.017	-0.006
0.144	0.145	0.660	0.050	0.003	-0.024	-0.037	0.058	-0.012	-0.006	0.018	0.000	-0.014	-0.009	0.034	-0.011	0.019	0.014	-0.027	-0.005	-0.015	0.007	0.060	-0.052	0.005	0.009	-0.012	-0.002

0.157	0.166	0.628	0.049	0.003	-0.028	-0.037	0.062	-0.012	-0.006	0.019	0.000	-0.015	-0.010	0.035	-0.011	0.019	0.015	-0.029	-0.006	-0.016	0.009	0.061	-0.054	0.006	0.010	-0.012	-0.004
0.141	0.144	0.665	0.049	0.003	-0.024	-0.036	0.057	-0.011	-0.006	0.018	0.000	-0.014	-0.009	0.033	-0.010	0.018	0.014	-0.027	-0.005	-0.015	0.006	0.059	-0.051	0.005	0.009	-0.012	-0.002
0.264	0.183	0.430	0.123	0.001	-0.042	-0.051	0.091	-0.015	-0.004	0.020	-0.001	-0.017	-0.004	0.038	-0.017	0.024	0.013	-0.030	-0.007	-0.016	0.023	0.074	-0.081	0.009	0.015	-0.017	-0.006
0.255	0.184	0.479	0.081	0.004	-0.040	-0.050	0.086	-0.016	-0.005	0.020	0.000	-0.018	-0.006	0.039	-0.014	0.025	0.014	-0.030	-0.010	-0.020	0.020	0.074	-0.075	0.008	0.014	-0.017	-0.005
0.273	0.226	0.434	0.067	0.006	-0.049	-0.046	0.088	-0.016	-0.005	0.020	0.002	-0.018	-0.006	0.037	-0.013	0.025	0.016	-0.029	-0.012	-0.021	0.026	0.070	-0.075	0.008	0.017	-0.016	-0.009
0.193	0.222	0.520	0.065	0.004	-0.040	-0.037	0.073	-0.013	-0.007	0.020	0.000	-0.015	-0.009	0.037	-0.012	0.021	0.018	-0.031	-0.008	-0.017	0.017	0.064	-0.063	0.006	0.015	-0.012	-0.008
0.136	0.216	0.612	0.037	0.004	-0.033	-0.025	0.054	-0.011	-0.008	0.018	0.001	-0.013	-0.013	0.034	-0.009	0.017	0.019	-0.030	-0.006	-0.014	0.009	0.052	-0.047	0.005	0.012	-0.008	-0.008
0.141	0.140	0.651	0.068	0.002	-0.024	-0.038	0.060	-0.011	-0.006	0.019	-0.002	-0.013	-0.008	0.034	-0.012	0.018	0.013	-0.028	-0.003	-0.014	0.007	0.062	-0.055	0.005	0.009	-0.013	-0.001
0.119	0.152	0.673	0.056	0.002	-0.024	-0.031	0.052	-0.010	-0.006	0.018	-0.001	-0.012	-0.010	0.032	-0.011	0.016	0.015	-0.027	-0.003	-0.013	0.005	0.054	-0.047	0.005	0.009	-0.010	-0.003
0.193	0.196	0.536	0.075	0.004	-0.037	-0.041	0.074	-0.013	-0.006	0.020	-0.001	-0.016	-0.009	0.037	-0.013	0.021	0.016	-0.031	-0.007	-0.017	0.016	0.067	-0.065	0.006	0.013	-0.014	-0.006
0.102	0.170	0.704	0.024	0.003	-0.024	-0.021	0.042	-0.009	-0.008	0.016	0.001	-0.011	-0.012	0.029	-0.007	0.014	0.017	-0.026	-0.005	-0.012	0.003	0.045	-0.036	0.004	0.009	-0.007	-0.006
0.160	0.197	0.594	0.049	0.004	-0.033	-0.034	0.063	-0.012	-0.007	0.019	0.000	-0.014	-0.011	0.035	-0.010	0.019	0.017	-0.030	-0.007	-0.016	0.011	0.060	-0.054	0.005	0.012	-0.011	-0.006
0.248	0.261	0.429	0.061	0.007	-0.052	-0.038	0.084	-0.015	-0.006	0.020	0.002	-0.017	-0.007	0.036	-0.012	0.023	0.018	-0.030	-0.011	-0.020	0.027	0.064	-0.071	0.007	0.019	-0.013	-0.012
0.141	0.167	0.646	0.046	0.003	-0.027	-0.033	0.057	-0.011	-0.007	0.018	0.000	-0.013	-0.010	0.034	-0.010	0.018	0.016	-0.028	-0.006	-0.015	0.007	0.057	-0.050	0.005	0.010	-0.011	-0.004

0.178	0.178	0.563	0.081	0.003	-0.033	-0.041	0.071	-0.013	-0.006	0.020	-0.001	-0.015	-0.008	0.037	-0.014	0.020	0.015	-0.030	-0.005	-0.016	0.013	0.066	-0.064	0.006	0.012	-0.014	-0.004
0.159	0.186	0.598	0.057	0.003	-0.031	-0.036	0.064	-0.012	-0.007	0.019	0.000	-0.014	-0.010	0.035	-0.011	0.019	0.017	-0.030	-0.006	-0.016	0.011	0.061	-0.056	0.006	0.011	-0.012	-0.005
0.160	0.217	0.585	0.039	0.005	-0.035	-0.030	0.061	-0.012	-0.008	0.019	0.001	-0.014	-0.012	0.035	-0.009	0.019	0.019	-0.030	-0.008	-0.016	0.011	0.057	-0.052	0.005	0.013	-0.010	-0.008
0.116	0.156	0.692	0.036	0.003	-0.023	-0.027	0.048	-0.010	-0.007	0.017	0.000	-0.012	-0.011	0.031	-0.008	0.016	0.016	-0.026	-0.005	-0.013	0.004	0.051	-0.042	0.004	0.009	-0.009	-0.004
0.206	0.205	0.505	0.085	0.003	-0.039	-0.042	0.078	-0.014	-0.006	0.020	-0.001	-0.016	-0.008	0.038	-0.014	0.022	0.016	-0.031	-0.007	-0.017	0.018	0.067	-0.069	0.007	0.014	-0.014	-0.007
0.132	0.184	0.642	0.042	0.003	-0.028	-0.029	0.054	-0.011	-0.008	0.018	0.000	-0.013	-0.011	0.033	-0.009	0.017	0.017	-0.029	-0.006	-0.014	0.007	0.054	-0.047	0.005	0.011	-0.009	-0.006
0.149	0.164	0.619	0.068	0.002	-0.028	-0.037	0.062	-0.011	-0.006	0.019	-0.001	-0.014	-0.009	0.035	-0.012	0.018	0.015	-0.029	-0.004	-0.014	0.009	0.062	-0.056	0.005	0.010	-0.012	-0.003
0.144	0.169	0.634	0.053	0.003	-0.028	-0.034	0.059	-0.011	-0.007	0.019	0.000	-0.013	-0.010	0.034	-0.011	0.018	0.016	-0.029	-0.005	-0.015	0.008	0.059	-0.052	0.005	0.010	-0.011	-0.004
0.137	0.171	0.649	0.043	0.003	-0.027	-0.032	0.055	-0.011	-0.007	0.018	0.000	-0.013	-0.011	0.033	-0.010	0.018	0.016	-0.028	-0.006	-0.015	0.007	0.056	-0.049	0.005	0.010	-0.010	-0.005
0.155	0.228	0.569	0.048	0.004	-0.037	-0.029	0.061	-0.012	-0.008	0.019	0.000	-0.013	-0.012	0.035	-0.010	0.018	0.019	-0.031	-0.007	-0.015	0.012	0.056	-0.053	0.005	0.013	-0.010	-0.009
0.213	0.264	0.460	0.063	0.006	-0.049	-0.034	0.077	-0.014	-0.007	0.020	0.001	-0.015	-0.009	0.036	-0.012	0.021	0.019	-0.031	-0.009	-0.018	0.023	0.061	-0.066	0.006	0.018	-0.012	-0.012
0.143	0.140	0.659	0.057	0.002	-0.024	-0.038	0.059	-0.012	-0.006	0.018	-0.001	-0.014	-0.009	0.034	-0.011	0.018	0.014	-0.028	-0.005	-0.015	0.007	0.061	-0.053	0.005	0.009	-0.013	-0.002
0.110	0.109	0.717	0.065	0.001	-0.017	-0.035	0.051	-0.009	-0.005	0.017	-0.002	-0.011	-0.008	0.031	-0.012	0.015	0.011	-0.025	-0.001	-0.012	0.004	0.055	-0.047	0.004	0.006	-0.011	0.000
0.131	0.147	0.678	0.044	0.003	-0.023	-0.033	0.054	-0.011	-0.006	0.017	0.000	-0.013	-0.010	0.032	-0.010	0.017	0.015	-0.027	-0.005	-0.014	0.006	0.056	-0.047	0.005	0.009	-0.011	-0.003

0.145	0.136	0.658	0.061	0.002	-0.023	-0.039	0.060	-0.012	-0.006	0.018	-0.001	-0.014	-0.008	0.034	-0.012	0.019	0.013	-0.028	-0.004	-0.015	0.007	0.062	-0.054	0.005	0.008	-0.013	-0.001
0.143	0.153	0.656	0.048	0.003	-0.025	-0.035	0.058	-0.012	-0.006	0.018	0.000	-0.014	-0.009	0.034	-0.010	0.018	0.015	-0.028	-0.006	-0.015	0.007	0.059	-0.051	0.005	0.009	-0.012	-0.003
0.141	0.143	0.661	0.055	0.002	-0.024	-0.037	0.058	-0.011	-0.006	0.018	-0.001	-0.014	-0.009	0.034	-0.011	0.018	0.014	-0.027	-0.005	-0.015	0.007	0.060	-0.052	0.005	0.009	-0.012	-0.002
0.146	0.152	0.653	0.050	0.003	-0.025	-0.036	0.059	-0.012	-0.006	0.018	0.000	-0.014	-0.009	0.034	-0.010	0.019	0.015	-0.028	-0.006	-0.015	0.007	0.060	-0.052	0.005	0.009	-0.012	-0.003
0.154	0.149	0.633	0.064	0.002	-0.026	-0.040	0.063	-0.012	-0.006	0.019	-0.001	-0.014	-0.009	0.035	-0.012	0.019	0.014	-0.028	-0.005	-0.015	0.008	0.063	-0.056	0.006	0.009	-0.013	-0.002
0.164	0.167	0.611	0.058	0.003	-0.029	-0.039	0.065	-0.013	-0.006	0.019	0.000	-0.015	-0.009	0.036	-0.012	0.020	0.015	-0.029	-0.006	-0.016	0.010	0.063	-0.057	0.006	0.011	-0.013	-0.004
0.141	0.146	0.660	0.053	0.003	-0.024	-0.036	0.058	-0.011	-0.006	0.018	-0.001	-0.014	-0.009	0.034	-0.011	0.018	0.014	-0.028	-0.005	-0.015	0.007	0.060	-0.052	0.005	0.009	-0.012	-0.002
0.148	0.158	0.642	0.053	0.003	-0.026	-0.036	0.060	-0.012	-0.006	0.018	0.000	-0.014	-0.009	0.034	-0.011	0.019	0.015	-0.028	-0.005	-0.015	0.008	0.060	-0.053	0.005	0.010	-0.012	-0.003
0.151	0.150	0.641	0.058	0.003	-0.026	-0.038	0.061	-0.012	-0.006	0.019	-0.001	-0.014	-0.009	0.035	-0.011	0.019	0.014	-0.028	-0.005	-0.015	0.008	0.062	-0.055	0.006	0.009	-0.013	-0.002
0.148	0.145	0.652	0.056	0.003	-0.024	-0.038	0.060	-0.012	-0.006	0.018	-0.001	-0.014	-0.009	0.034	-0.011	0.019	0.014	-0.028	-0.005	-0.015	0.007	0.061	-0.053	0.005	0.009	-0.013	-0.002
0.159	0.142	0.628	0.071	0.002	-0.025	-0.042	0.065	-0.012	-0.005	0.019	-0.001	-0.015	-0.008	0.035	-0.013	0.020	0.013	-0.029	-0.005	-0.015	0.008	0.065	-0.059	0.006	0.009	-0.014	-0.001
0.206	0.187	0.517	0.090	0.003	-0.037	-0.044	0.078	-0.014	-0.006	0.020	-0.001	-0.016	-0.007	0.038	-0.015	0.022	0.015	-0.031	-0.006	-0.017	0.017	0.070	-0.070	0.007	0.013	-0.015	-0.005
0.201	0.199	0.527	0.072	0.004	-0.038	-0.042	0.075	-0.014	-0.006	0.020	0.000	-0.016	-0.008	0.037	-0.013	0.022	0.016	-0.030	-0.007	-0.017	0.016	0.067	-0.066	0.007	0.014	-0.014	-0.006
0.146	0.163	0.647	0.044	0.003	-0.027	-0.035	0.058	-0.012	-0.007	0.018	0.000	-0.014	-0.010	0.034	-0.010	0.019	0.016	-0.028	-0.006	-0.015	0.007	0.059	-0.051	0.005	0.010	-0.011	-0.004

0.190	0.177	0.553	0.080	0.003	-0.033	-0.043	0.074	-0.013	-0.006	0.020	-0.001	-0.016	-0.008	0.037	-0.014	0.021	0.015	-0.030	-0.006	-0.017	0.014	0.068	-0.066	0.007	0.012	-0.015	-0.004
0.222	0.196	0.484	0.099	0.003	-0.040	-0.045	0.082	-0.014	-0.005	0.020	-0.001	-0.016	-0.007	0.038	-0.015	0.022	0.015	-0.031	-0.007	-0.017	0.020	0.070	-0.073	0.007	0.014	-0.015	-0.006
0.226	0.194	0.488	0.092	0.003	-0.040	-0.046	0.083	-0.015	-0.005	0.020	-0.001	-0.017	-0.007	0.038	-0.015	0.023	0.015	-0.030	-0.007	-0.017	0.019	0.071	-0.073	0.007	0.014	-0.016	-0.006
0.199	0.226	0.515	0.060	0.005	-0.041	-0.037	0.074	-0.014	-0.007	0.020	0.001	-0.016	-0.009	0.037	-0.012	0.021	0.018	-0.031	-0.008	-0.018	0.018	0.064	-0.064	0.006	0.015	-0.013	-0.009
0.209	0.192	0.524	0.075	0.004	-0.037	-0.044	0.077	-0.014	-0.006	0.020	0.000	-0.016	-0.008	0.038	-0.013	0.022	0.016	-0.030	-0.008	-0.018	0.017	0.069	-0.068	0.007	0.013	-0.015	-0.006
0.215	0.283	0.458	0.044	0.007	-0.051	-0.032	0.075	-0.014	-0.008	0.019	0.002	-0.016	-0.010	0.036	-0.010	0.021	0.020	-0.031	-0.011	-0.019	0.024	0.059	-0.063	0.006	0.018	-0.011	-0.013
0.162	0.159	0.605	0.075	0.002	-0.028	-0.041	0.066	-0.012	-0.006	0.020	-0.001	-0.014	-0.008	0.036	-0.013	0.020	0.014	-0.029	-0.005	-0.015	0.010	0.065	-0.060	0.006	0.010	-0.014	-0.003
0.117	0.126	0.708	0.049	0.002	-0.020	-0.033	0.051	-0.010	-0.006	0.017	-0.001	-0.012	-0.009	0.031	-0.010	0.016	0.013	-0.025	-0.004	-0.013	0.004	0.054	-0.046	0.005	0.007	-0.011	-0.001
0.238	0.188	0.474	0.100	0.003	-0.040	-0.048	0.085	-0.015	-0.005	0.021	-0.001	-0.017	-0.006	0.038	-0.015	0.024	0.014	-0.030	-0.008	-0.017	0.020	0.073	-0.075	0.008	0.014	-0.016	-0.006
0.157	0.170	0.618	0.056	0.003	-0.029	-0.037	0.063	-0.012	-0.006	0.019	0.000	-0.014	-0.010	0.035	-0.011	0.019	0.016	-0.029	-0.006	-0.016	0.009	0.062	-0.055	0.006	0.011	-0.012	-0.004
0.256	0.242	0.429	0.073	0.006	-0.050	-0.042	0.086	-0.015	-0.006	0.020	0.001	-0.017	-0.007	0.037	-0.013	0.024	0.017	-0.030	-0.011	-0.020	0.027	0.067	-0.074	0.007	0.018	-0.014	-0.011
0.150	0.157	0.630	0.063	0.003	-0.027	-0.038	0.062	-0.012	-0.006	0.019	-0.001	-0.014	-0.009	0.035	-0.012	0.019	0.015	-0.029	-0.005	-0.015	0.008	0.062	-0.055	0.006	0.010	-0.013	-0.003
0.206	0.187	0.517	0.090	0.003	-0.037	-0.044	0.078	-0.014	-0.006	0.020	-0.001	-0.016	-0.007	0.038	-0.015	0.022	0.015	-0.031	-0.006	-0.017	0.017	0.070	-0.070	0.007	0.013	-0.015	-0.005
0.184	0.170	0.555	0.091	0.002	-0.032	-0.044	0.074	-0.013	-0.006	0.020	-0.002	-0.015	-0.008	0.037	-0.015	0.021	0.014	-0.030	-0.005	-0.016	0.013	0.069	-0.066	0.007	0.012	-0.015	-0.003

0.166	0.246	0.555	0.033	0.005	-0.039	-0.028	0.062	-0.012	-0.008	0.019	0.001	-0.014	-0.012	0.035	-0.009	0.019	0.021	-0.031	-0.009	-0.017	0.014	0.056	-0.052	0.005	0.015	-0.009	-0.010
0.203	0.243	0.514	0.040	0.006	-0.043	-0.035	0.072	-0.014	-0.007	0.020	0.002	-0.016	-0.010	0.036	-0.010	0.022	0.019	-0.031	-0.010	-0.019	0.018	0.062	-0.061	0.006	0.016	-0.012	-0.010
0.182	0.182	0.569	0.067	0.003	-0.033	-0.041	0.070	-0.013	-0.006	0.020	0.000	-0.015	-0.009	0.037	-0.012	0.021	0.016	-0.030	-0.007	-0.017	0.013	0.066	-0.062	0.006	0.012	-0.014	-0.005
0.245	0.253	0.385	0.116	0.004	-0.053	-0.039	0.089	-0.014	-0.005	0.019	-0.001	-0.015	-0.005	0.035	-0.016	0.021	0.016	-0.029	-0.008	-0.016	0.030	0.063	-0.078	0.007	0.019	-0.013	-0.013
0.183	0.186	0.543	0.088	0.003	-0.035	-0.041	0.073	-0.013	-0.006	0.020	-0.002	-0.015	-0.008	0.037	-0.014	0.020	0.015	-0.031	-0.005	-0.016	0.015	0.067	-0.066	0.006	0.012	-0.014	-0.005
0.142	0.154	0.656	0.048	0.003	-0.025	-0.035	0.057	-0.011	-0.006	0.018	0.000	-0.014	-0.010	0.033	-0.010	0.018	0.015	-0.028	-0.005	-0.015	0.007	0.059	-0.051	0.005	0.009	-0.012	-0.003
0.196	0.208	0.500	0.096	0.003	-0.040	-0.040	0.077	-0.013	-0.006	0.020	-0.002	-0.015	-0.008	0.037	-0.015	0.020	0.016	-0.031	-0.006	-0.016	0.018	0.066	-0.069	0.007	0.014	-0.014	-0.007
0.199	0.189	0.495	0.117	0.002	-0.038	-0.044	0.080	-0.013	-0.005	0.021	-0.003	-0.015	-0.007	0.038	-0.016	0.021	0.014	-0.031	-0.004	-0.015	0.018	0.069	-0.072	0.007	0.013	-0.015	-0.006
0.221	0.221	0.433	0.126	0.002	-0.046	-0.042	0.085	-0.013	-0.005	0.020	-0.002	-0.014	-0.006	0.037	-0.017	0.021	0.015	-0.030	-0.006	-0.015	0.024	0.067	-0.076	0.007	0.016	-0.014	-0.009
0.210	0.180	0.477	0.133	0.001	-0.037	-0.047	0.083	-0.013	-0.005	0.021	-0.003	-0.015	-0.006	0.038	-0.018	0.021	0.013	-0.031	-0.004	-0.014	0.019	0.071	-0.076	0.008	0.013	-0.016	-0.005
0.224	0.285	0.438	0.053	0.007	-0.053	-0.033	0.078	-0.014	-0.007	0.019	-0.002	-0.016	-0.009	0.036	-0.011	0.021	0.020	-0.030	-0.011	-0.019	0.026	0.060	-0.066	0.006	0.019	-0.011	-0.014
0.225	0.216	0.420	0.140	0.001	-0.046	-0.043	0.087	-0.013	-0.005	0.020	-0.003	-0.014	-0.005	0.037	-0.017	0.021	0.014	-0.030	-0.005	-0.014	0.025	0.067	-0.078	0.008	0.016	-0.014	-0.009
0.200	0.203	0.472	0.125	0.002	-0.041	-0.042	0.081	-0.013	-0.005	0.021	-0.003	-0.014	-0.007	0.038	-0.017	0.020	0.015	-0.031	-0.004	-0.014	0.020	0.068	-0.074	0.007	0.014	-0.014	-0.007
0.214	0.207	0.452	0.128	0.002	-0.042	-0.043	0.084	-0.013	-0.005	0.020	-0.002	-0.014	-0.006	0.037	-0.017	0.021	0.015	-0.031	-0.005	-0.014	0.022	0.068	-0.076	0.007	0.015	-0.015	-0.008

0.170	0.215	0.545	0.070	0.004	-0.037	-0.035	0.068	-0.012	-0.007	0.020	-0.001	-0.014	-0.010	0.036	-0.012	0.019	0.018	-0.031	-0.006	-0.016	0.014	0.061	-0.060	0.006	0.013	-0.012	-0.008
0.205	0.203	0.483	0.109	0.002	-0.040	-0.043	0.081	-0.013	-0.005	0.020	-0.002	-0.015	-0.007	0.038	-0.016	0.021	0.015	-0.031	-0.005	-0.015	0.019	0.068	-0.072	0.007	0.014	-0.014	-0.007
0.213	0.208	0.448	0.131	0.001	-0.043	-0.043	0.084	-0.013	-0.005	0.020	-0.003	-0.014	-0.006	0.037	-0.017	0.021	0.015	-0.031	-0.005	-0.014	0.022	0.068	-0.076	0.007	0.015	-0.014	-0.008
0.172	0.170	0.578	0.080	0.002	-0.031	-0.041	0.070	-0.013	-0.006	0.020	-0.001	-0.015	-0.008	0.037	-0.014	0.020	0.015	-0.030	-0.005	-0.016	0.012	0.066	-0.063	0.006	0.011	-0.014	-0.004
0.216	0.214	0.439	0.130	0.002	-0.044	-0.042	0.085	-0.013	-0.005	0.020	-0.002	-0.014	-0.006	0.037	-0.017	0.021	0.015	-0.031	-0.005	-0.014	0.023	0.067	-0.076	0.007	0.015	-0.014	-0.009
0.198	0.195	0.479	0.128	0.001	-0.039	-0.043	0.081	-0.013	-0.005	0.021	-0.003	-0.014	-0.007	0.038	-0.017	0.020	0.014	-0.031	-0.004	-0.014	0.019	0.068	-0.074	0.007	0.014	-0.015	-0.006
0.215	0.200	0.470	0.115	0.002	-0.041	-0.044	0.083	-0.013	-0.005	0.021	-0.002	-0.015	-0.007	0.038	-0.016	0.021	0.015	-0.031	-0.005	-0.015	0.020	0.069	-0.074	0.007	0.014	-0.015	-0.007
0.227	0.212	0.454	0.107	0.003	-0.044	-0.043	0.084	-0.014	-0.005	0.020	-0.001	-0.016	-0.006	0.037	-0.016	0.022	0.015	-0.030	-0.007	-0.016	0.023	0.068	-0.075	0.007	0.015	-0.015	-0.008
0.183	0.186	0.543	0.088	0.003	-0.035	-0.041	0.073	-0.013	-0.006	0.020	-0.002	-0.015	-0.008	0.037	-0.014	0.020	0.015	-0.031	-0.005	-0.016	0.015	0.067	-0.066	0.006	0.012	-0.014	-0.005
0.221	0.302	0.431	0.045	0.008	-0.054	-0.030	0.077	-0.014	-0.007	0.019	-0.002	-0.015	-0.009	0.035	-0.011	0.021	0.021	-0.030	-0.011	-0.019	0.027	0.057	-0.065	0.006	0.020	-0.010	-0.015
0.263	0.295	0.384	0.058	0.008	-0.059	-0.035	0.086	-0.015	-0.006	0.019	-0.002	-0.016	-0.007	0.035	-0.012	0.023	0.019	-0.029	-0.013	-0.020	0.033	0.060	-0.073	0.007	0.021	-0.012	-0.016
0.172	0.283	0.520	0.025	0.007	-0.044	-0.025	0.062	-0.012	-0.009	0.019	-0.002	-0.014	-0.013	0.035	-0.008	0.019	0.022	-0.031	-0.010	-0.018	0.016	0.053	-0.052	0.005	0.016	-0.008	-0.013
0.181	0.197	0.558	0.064	0.004	-0.035	-0.038	0.070	-0.013	-0.007	0.020	-0.000	-0.015	-0.009	0.037	-0.012	0.021	0.017	-0.030	-0.007	-0.017	0.014	0.064	-0.061	0.006	0.013	-0.013	-0.006
0.233	0.250	0.456	0.061	0.006	-0.049	-0.038	0.081	-0.015	-0.006	0.020	-0.001	-0.017	-0.008	0.037	-0.012	0.023	0.018	-0.030	-0.010	-0.019	0.024	0.064	-0.069	0.007	0.017	-0.013	-0.011

0.204	0.227	0.508	0.061	0.005	-0.042	-0.038	0.075	-0.014	-0.007	0.020	0.001	-0.016	-0.009	0.037	-0.012	0.022	0.018	-0.031	-0.009	-0.018	0.018	0.064	-0.065	0.006	0.015	-0.013	-0.009
0.141	0.144	0.665	0.049	0.003	-0.024	-0.036	0.057	-0.011	-0.006	0.018	0.000	-0.014	-0.009	0.033	-0.010	0.018	0.014	-0.027	-0.005	-0.015	0.006	0.059	-0.051	0.005	0.009	-0.012	-0.002
0.252	0.176	0.477	0.095	0.003	-0.038	-0.051	0.087	-0.016	-0.005	0.021	0.000	-0.018	-0.006	0.039	-0.015	0.025	0.013	-0.030	-0.008	-0.018	0.020	0.075	-0.077	0.008	0.014	-0.017	-0.004
0.088	0.090	0.782	0.040	0.001	-0.013	-0.028	0.040	-0.008	-0.005	0.014	-0.001	-0.010	-0.007	0.026	-0.008	0.013	0.010	-0.021	-0.002	-0.010	0.001	0.046	-0.036	0.004	0.005	-0.009	0.000
0.141	0.144	0.665	0.049	0.003	-0.024	-0.036	0.057	-0.011	-0.006	0.018	0.000	-0.014	-0.009	0.033	-0.010	0.018	0.014	-0.027	-0.005	-0.015	0.006	0.059	-0.051	0.005	0.009	-0.012	-0.002
0.284	0.223	0.373	0.119	0.003	-0.052	-0.045	0.094	-0.015	-0.004	0.019	0.000	-0.016	-0.004	0.036	-0.016	0.024	0.014	-0.028	-0.009	-0.017	0.031	0.068	-0.082	0.009	0.018	-0.015	-0.011
0.207	0.164	0.516	0.113	0.001	-0.034	-0.049	0.081	-0.014	-0.005	0.021	-0.002	-0.016	-0.006	0.038	-0.016	0.022	0.013	-0.031	-0.005	-0.015	0.016	0.073	-0.073	0.007	0.012	-0.016	-0.003
0.143	0.139	0.657	0.061	0.002	-0.023	-0.038	0.060	-0.011	-0.006	0.018	-0.001	-0.014	-0.009	0.034	-0.012	0.018	0.013	-0.028	-0.004	-0.014	0.007	0.061	-0.054	0.005	0.009	-0.013	-0.001
0.148	0.147	0.650	0.054	0.003	-0.025	-0.038	0.060	-0.012	-0.006	0.018	-0.001	-0.014	-0.009	0.034	-0.011	0.019	0.014	-0.028	-0.005	-0.015	0.007	0.061	-0.053	0.005	0.009	-0.013	-0.002
0.207	0.164	0.516	0.113	0.001	-0.034	-0.049	0.081	-0.014	-0.005	0.021	-0.002	-0.016	-0.006	0.038	-0.016	0.022	0.013	-0.031	-0.005	-0.015	0.016	0.073	-0.073	0.007	0.012	-0.016	-0.003
0.141	0.144	0.665	0.049	0.003	-0.024	-0.036	0.057	-0.011	-0.006	0.018	0.000	-0.014	-0.009	0.033	-0.010	0.018	0.014	-0.027	-0.005	-0.015	0.006	0.059	-0.051	0.005	0.009	-0.012	-0.002
0.141	0.144	0.665	0.049	0.003	-0.024	-0.036	0.057	-0.011	-0.006	0.018	0.000	-0.014	-0.009	0.033	-0.010	0.018	0.014	-0.027	-0.005	-0.015	0.006	0.059	-0.051	0.005	0.009	-0.012	-0.002
0.141	0.144	0.665	0.049	0.003	-0.024	-0.036	0.057	-0.011	-0.006	0.018	0.000	-0.014	-0.009	0.033	-0.010	0.018	0.014	-0.027	-0.005	-0.015	0.006	0.059	-0.051	0.005	0.009	-0.012	-0.002
0.166	0.158	0.608	0.067	0.003	-0.028	-0.041	0.066	-0.013	-0.006	0.019	-0.001	-0.015	-0.009	0.036	-0.012	0.020	0.014	-0.029	-0.005	-0.016	0.010	0.065	-0.059	0.006	0.010	-0.014	-0.003

0.141	0.144	0.665	0.049	0.003	-0.024	-0.036	0.057	-0.011	-0.006	0.018	0.000	-0.014	-0.009	0.033	-0.010	0.018	0.014	-0.027	-0.005	-0.015	0.006	0.059	-0.051	0.005	0.009	-0.012	-0.002
0.265	0.203	0.462	0.070	0.005	-0.044	-0.048	0.087	-0.016	-0.005	0.020	0.001	-0.019	-0.006	0.038	-0.013	0.026	0.015	-0.030	-0.011	-0.021	0.023	0.073	-0.075	0.008	0.016	-0.016	-0.007
0.159	0.159	0.612	0.069	0.003	-0.028	-0.040	0.065	-0.012	-0.006	0.019	-0.001	-0.014	-0.009	0.036	-0.013	0.019	0.015	-0.029	-0.005	-0.015	0.009	0.064	-0.058	0.006	0.010	-0.013	-0.003
0.201	0.197	0.553	0.050	0.005	-0.036	-0.041	0.072	-0.014	-0.007	0.020	0.001	-0.017	-0.009	0.037	-0.011	0.022	0.017	-0.030	-0.009	-0.019	0.015	0.066	-0.062	0.006	0.013	-0.014	-0.006
0.172	0.168	0.587	0.073	0.003	-0.030	-0.041	0.069	-0.013	-0.006	0.020	-0.001	-0.015	-0.009	0.036	-0.013	0.020	0.015	-0.030	-0.005	-0.016	0.011	0.066	-0.061	0.006	0.011	-0.014	-0.003
0.234	0.208	0.489	0.069	0.005	-0.042	-0.044	0.082	-0.015	-0.006	0.020	0.001	-0.017	-0.007	0.038	-0.013	0.024	0.016	-0.030	-0.010	-0.019	0.020	0.069	-0.070	0.007	0.015	-0.015	-0.007
0.264	0.221	0.443	0.072	0.005	-0.047	-0.045	0.087	-0.016	-0.005	0.020	0.001	-0.018	-0.006	0.037	-0.013	0.025	0.016	-0.030	-0.011	-0.020	0.025	0.070	-0.075	0.008	0.017	-0.015	-0.009
0.176	0.153	0.592	0.079	0.002	-0.028	-0.044	0.070	-0.013	-0.005	0.020	-0.001	-0.015	-0.008	0.037	-0.014	0.021	0.014	-0.029	-0.005	-0.016	0.011	0.068	-0.063	0.006	0.010	-0.015	-0.002
0.177	0.180	0.585	0.059	0.004	-0.032	-0.040	0.068	-0.013	-0.006	0.020	0.000	-0.015	-0.009	0.036	-0.012	0.021	0.016	-0.030	-0.007	-0.017	0.012	0.065	-0.060	0.006	0.012	-0.013	-0.004
0.153	0.170	0.632	0.046	0.003	-0.028	-0.035	0.060	-0.012	-0.007	0.019	0.000	-0.014	-0.010	0.034	-0.010	0.019	0.016	-0.029	-0.006	-0.016	0.008	0.060	-0.052	0.005	0.010	-0.012	-0.004
0.153	0.140	0.640	0.067	0.002	-0.024	-0.041	0.063	-0.012	-0.006	0.019	-0.001	-0.014	-0.008	0.035	-0.012	0.019	0.013	-0.028	-0.004	-0.015	0.008	0.064	-0.057	0.006	0.009	-0.014	-0.001
0.170	0.181	0.585	0.064	0.003	-0.032	-0.039	0.067	-0.013	-0.006	0.020	-0.001	-0.015	-0.009	0.036	-0.012	0.020	0.016	-0.030	-0.006	-0.016	0.012	0.064	-0.059	0.006	0.012	-0.013	-0.005
0.229	0.210	0.471	0.089	0.004	-0.043	-0.044	0.083	-0.014	-0.005	0.020	0.000	-0.016	-0.007	0.038	-0.014	0.023	0.016	-0.030	-0.008	-0.018	0.021	0.069	-0.073	0.007	0.015	-0.015	-0.008
0.183	0.169	0.581	0.067	0.003	-0.031	-0.043	0.070	-0.013	-0.006	0.020	0.000	-0.016	-0.008	0.037	-0.013	0.021	0.015	-0.030	-0.006	-0.017	0.012	0.067	-0.062	0.006	0.011	-0.014	-0.003

0.183	0.169	0.581	0.067	0.003	-0.031	-0.043	0.070	-0.013	-0.006	0.020	0.000	-0.016	-0.008	0.037	-0.013	0.021	0.015	-0.030	-0.006	-0.017	0.012	0.067	-0.062	0.006	0.011	-0.014	-0.003
0.147	0.172	0.633	0.048	0.003	-0.028	-0.034	0.059	-0.012	-0.007	0.019	0.000	-0.014	-0.010	0.034	-0.010	0.018	0.016	-0.029	-0.006	-0.015	0.008	0.059	-0.052	0.005	0.010	-0.011	-0.004
0.160	0.164	0.614	0.062	0.003	-0.028	-0.039	0.064	-0.012	-0.006	0.019	-0.001	-0.015	-0.009	0.035	-0.012	0.020	0.015	-0.029	-0.005	-0.016	0.009	0.063	-0.057	0.006	0.010	-0.013	-0.003
0.152	0.151	0.619	0.078	0.002	-0.026	-0.040	0.064	-0.012	-0.006	0.019	-0.002	-0.014	-0.008	0.035	-0.013	0.019	0.014	-0.029	-0.003	-0.014	0.009	0.064	-0.058	0.006	0.010	-0.013	-0.002
0.180	0.172	0.595	0.053	0.004	-0.031	-0.041	0.068	-0.013	-0.006	0.019	0.000	-0.016	-0.009	0.036	-0.011	0.021	0.015	-0.029	-0.007	-0.017	0.011	0.065	-0.059	0.006	0.011	-0.014	-0.004
0.148	0.158	0.648	0.045	0.003	-0.026	-0.036	0.059	-0.012	-0.006	0.018	0.000	-0.014	-0.010	0.034	-0.010	0.019	0.015	-0.028	-0.006	-0.016	0.007	0.060	-0.051	0.005	0.010	-0.012	-0.003
0.143	0.142	0.657	0.058	0.002	-0.024	-0.038	0.059	-0.011	-0.006	0.018	-0.001	-0.014	-0.009	0.034	-0.011	0.018	0.014	-0.028	-0.005	-0.015	0.007	0.061	-0.053	0.005	0.009	-0.012	-0.002
0.143	0.158	0.650	0.049	0.003	-0.026	-0.035	0.058	-0.011	-0.006	0.018	0.000	-0.014	-0.010	0.034	-0.010	0.018	0.015	-0.028	-0.006	-0.015	0.007	0.059	-0.051	0.005	0.010	-0.012	-0.003
0.152	0.158	0.632	0.057	0.003	-0.027	-0.038	0.062	-0.012	-0.006	0.019	-0.001	-0.014	-0.009	0.035	-0.011	0.019	0.015	-0.029	-0.005	-0.015	0.008	0.062	-0.055	0.006	0.010	-0.012	-0.003
0.138	0.140	0.667	0.054	0.002	-0.023	-0.037	0.057	-0.011	-0.006	0.018	-0.001	-0.014	-0.009	0.033	-0.011	0.018	0.014	-0.027	-0.005	-0.014	0.006	0.059	-0.051	0.005	0.009	-0.012	-0.002
0.176	0.197	0.578	0.049	0.004	-0.034	-0.037	0.066	-0.013	-0.007	0.019	-0.001	-0.015	-0.010	0.036	-0.011	0.020	0.017	-0.030	-0.008	-0.017	0.012	0.062	-0.058	0.006	0.013	-0.012	-0.006
0.169	0.165	0.601	0.065	0.003	-0.029	-0.041	0.067	-0.013	-0.006	0.019	-0.001	-0.015	-0.009	0.036	-0.012	0.020	0.015	-0.029	-0.006	-0.016	0.010	0.065	-0.059	0.006	0.011	-0.014	-0.003
0.157	0.147	0.613	0.082	0.002	-0.026	-0.042	0.066	-0.012	-0.005	0.020	-0.002	-0.014	-0.008	0.036	-0.014	0.019	0.013	-0.029	-0.003	-0.015	0.009	0.066	-0.060	0.006	0.010	-0.014	-0.002
0.161	0.163	0.616	0.060	0.003	-0.028	-0.039	0.064	-0.012	-0.006	0.019	-0.001	-0.015	-0.009	0.035	-0.012	0.020	0.015	-0.029	-0.006	-0.016	0.009	0.063	-0.057	0.006	0.010	-0.013	-0.003

0.146	0.163	0.644	0.048	0.003	-0.027	-0.035	0.059	-0.012	-0.007	0.018	0.000	-0.014	-0.010	0.034	-0.010	0.019	0.015	-0.028	-0.006	-0.015	0.008	0.059	-0.051	0.005	0.010	-0.012	-0.004
0.160	0.145	0.622	0.072	0.002	-0.026	-0.042	0.066	-0.012	-0.006	0.019	-0.001	-0.015	-0.008	0.036	-0.013	0.020	0.013	-0.029	-0.004	-0.015	0.009	0.066	-0.059	0.006	0.009	-0.014	-0.001
0.145	0.143	0.629	0.083	0.002	-0.025	-0.040	0.063	-0.011	-0.006	0.019	-0.002	-0.013	-0.008	0.035	-0.014	0.018	0.013	-0.029	-0.003	-0.014	0.008	0.064	-0.058	0.006	0.009	-0.013	-0.001
0.161	0.137	0.585	0.117	0.000	-0.026	-0.046	0.071	-0.012	-0.005	0.020	-0.004	-0.014	-0.007	0.037	-0.017	0.019	0.012	-0.030	-0.001	-0.013	0.010	0.070	-0.067	0.006	0.009	-0.015	0.000
0.147	0.183	0.633	0.037	0.004	-0.029	-0.032	0.057	-0.012	-0.007	0.018	0.001	-0.014	-0.011	0.034	-0.009	0.018	0.017	-0.029	-0.007	-0.016	0.008	0.057	-0.049	0.005	0.011	-0.010	-0.005

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
	Constant	Beta	PCP	PCB	PCK	PCS	PCC	PCT	Constant	SCD	SCI	SCW	Constant	KCH	KES	KWT	WTP
LnY2Y1	-0.379		-0.203	-0.013	0.095	0.02	0.042	0.164	-0.671	0.178			0.244	0.122			
LnY3Y1	-0.334		-0.329	0.03	0.092	0.049	-0.002	0.267	-1.068	0.246			0.242		0.151		
LnY4Y1	-0.602		-0.219	0.099	0.047	0.162	-0.141	0.312	-1.6	0.24			-0.633		0.15		

W	X	Y	Z	AA	AB	AC	AD
ME		PCP	PCB	PCK	PCS	PCC	PCT
ME to Y1 =		0.068409	-0.00046	-0.00498	-0.01219	-0.00634	-0.06033
ME to Y2 =		0.00323	-0.01267	0.006039	-0.01475	0.020082	-0.016
ME to Y3 =		-0.03284	-0.00602	0.011893	-0.00849	0.015314	0.063227
ME to Y4 =		-0.0388	0.019148	-0.01295	0.035421	-0.02905	0.063227

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