

**A PREDICTION OF OPERATION AND SUPPLY CHAIN
MANAGEMENT IN POST COVID 19 ERA: IN THE CASE OF
MANUFACTURERS IN THAILAND**



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ABSTRACT

Operation and supply chain of manufacturer in Thailand cannot be operated as normal during the pandemic of Covid 19 in year 2020. The country lockdown and state of emergency law massively interrupt the whole supply chain network resulting in several changes in business activity. In the past, when facing with crisis, industry move toward a new trend. For example, the outbreak of SARS in China in year 2003 accelerate advancement of e-commerce in the country. The crisis this time plays the same role again in changing business momentum. In the case of manufacturer in Thailand, companies are forced to do something differently in order to cope with challenges in operation and supply chain management. A lot of changes in business activity implemented during the Covid 19 lead to new perception and industrial trend.

This thematic paper study changes in business activity within the context of operation and supply chain management in Thailand during the period of March – July 2020 when the Covid 19 had heavily affected to the country. Trend of business practices in future after the crisis end is predicted according to the change in perception of participating business executives. The paper presents potential change in operation and supply chain management in Thailand after these businesses recover from economic downturn.

KEY WORDS: Covid 19/ Operation Management/ Supply Chain Management/
Manufacturer in Thailand

38 pages

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CHAPTER I

INTRODUCTION

1.1 Background

The outbreak of Covid 19 in 2020 broadly changes not only people's daily routines but also business practices and behaviors all over the world. In Thailand, after the government announced state of emergency on 23rd March 2020 in order to lock down the country controlling the outbreak people were asked to work from home, transportation was limited, goods and services which were not necessary for living were closed, food shops and restaurants were allowed to operate only if takeaway and so forth. All these restrictions lead to change in people behaviors as they try to adapt to "new normal". Thai consumers tend to familiarize with cashless payment and e-commerce as the statistic suggests that Thai consumer by 52 percent subscribe entertainment streaming and 44 percent use food delivery service. In addition, ordering food and beverage through online channel increase by 116 percent during the lockdown period.

Industry sector cannot avoid such the impact too because the restrictions intervene the whole supply chain from upstream to downstream. Demand was vastly swiped away from markets and it result in shocking decline in revenue. Delivery of some imported raw materials were postponed or even being cancelled due to similar attempt to control the disease by exporter countries especially in China. For example; when Wuhan, China took an aggressive measure to control the pandemic, factories producing automobile parts could not supply to their customers leading to a halt in some car productions in many countries such as South Korea, Japan, and Thailand. Moreover, business meeting between supplier and buyer cannot organize in traditional way as travelling across country is prohibited. Many factories in Thailand do not allow visitors entering facilities in order to protect their employees from the disease. Therefore, face to face meeting is replaced by remote meeting using digital tools.

Operation managers in an organization hold a crucial role as they must cope with these challenges. For example, when an organization plans to increase production capacity, new machine is imported and arrives at the factory but an engineer team from exporting country is not allowed to enter the plant due to travelling ban policy. Operation managers will not be able to get the machine installed according to committed timeline. On the other hand, when demand become soft, production capacity is left abandoned and that will raise a concern about production cost. Thereby, managing operation during the pandemic period is a real challenging work. In order to mitigate business impact, managers apply mix of managing tools like TQM, Lean, Kaizen, Supplier Relationship Management, Risk Management, TPM, DOE, Quality at the Source, Design Thinking, Digital Transformation, and so forth. And that idea will bring several changes into operation environment, many of them are not temporary but permanent practices.

We learn from the history that business practices and behaviors in operation could be transformed as a result from crisis. The flip side of crisis is that it always leads to a new business practices changing operation behaviors (Reeves et al, 2020). For example, the 9/11 terrorist attack in the U.S. changes security protocol worldwide, the 2003 SARS outbreak in China accelerates e-commerce trend and transforms distribution channel toward home delivery, financial crisis in 2008 when a crude oil price spiked and that changed crude oil drilling technique from conventional production to hydraulic fracturing production process, World War II accelerated development and commercialization of the jet engine, pressurized aircraft cabins, helicopters, atomic technology, computers, synthetic rubber, radar, and penicillin, with lasting effects. All these examples highlight a permanently positive change influenced by a crisis in the past. Therefore, the Covid 19 pandemic crisis possibly creates an innovation, new technique, new process, and new way of working in a context of operation and supply chain management.

1.2 Research questions

1. What are changes in operation and supply chain process that resilient organization in Thailand make as a result of pandemic crisis?

2. What are changes in operation and supply chain process made by resilient organization in Thailand as a result of pandemic crisis that potentially become a long-term practice after the crisis?

1.3 An objective of the study

1. To explore changes in operation and supply chain process that resilient organizations in Thailand develop as a result of pandemic crisis.

2. To identify a potentially permanent changes in business practices regarding operation and supply chain management after period of Covid 19 pandemic crisis.

1.4 The benefit of this study

Operation management practitioners learn best practices from resilient organization and apply the knowledge in order to improve business performance. They foresee the business opportunities emerged from this trend and then prepare in advance to catch up with it.

CHAPTER II

LITERATURE REVIEW

2.1 Important of Operation Management

An organization consists of the four primary functions (Russell&Tayler,2009), they are marketing, finance, human resource, and operation. Operation function plays a crucial role in any organization as it involves in majority of primary activities within a business value chain. It is considered as hub of the organization because it is interacting with the other functions, suppliers, and customers, as shown in Figure 2.1



Figure 2.1 Operations as the Technical Core (Russell & Tayler, 2009, p.4)

Operation managers works together with other functions within a company's value chain to implement business strategy. For example, an operation manager anticipates a future demand compare with current production capacity and then

define future required additional capacity, works out the plan to determine required capital budgeting. The manager discusses with finance department in order to allocate the budget for coming year. Demand side, marketing department supply the operation manager with accurate sales forecast, customer orders, and promotion plan then the operation manager analyze data and schedule the production plan accordingly. Supply side, the operation manager monitors level of inventory and define the gap with customer orders, then inform suppliers about raw material requirements both quantity and quality. Working with suppliers through purchasing function to ensure consistent supply of production input. In order implement operation strategy, the operation manager should to define job design with required skill sets of staffs and that the human resource department recruit talents with the right skill set accordingly.

2.2 Definition of Operation Management

Operation is often defined as a transformation process (Russell&Tayler,2009), as shown in Figure2 that transforming input such as material, machines, labor, and capital into output in the form of goods and services thereby the operation add value into inputs to meet customer's requirements. In order to meet customer's requirement, the transformation process need to be controlled by measurement and feedback.

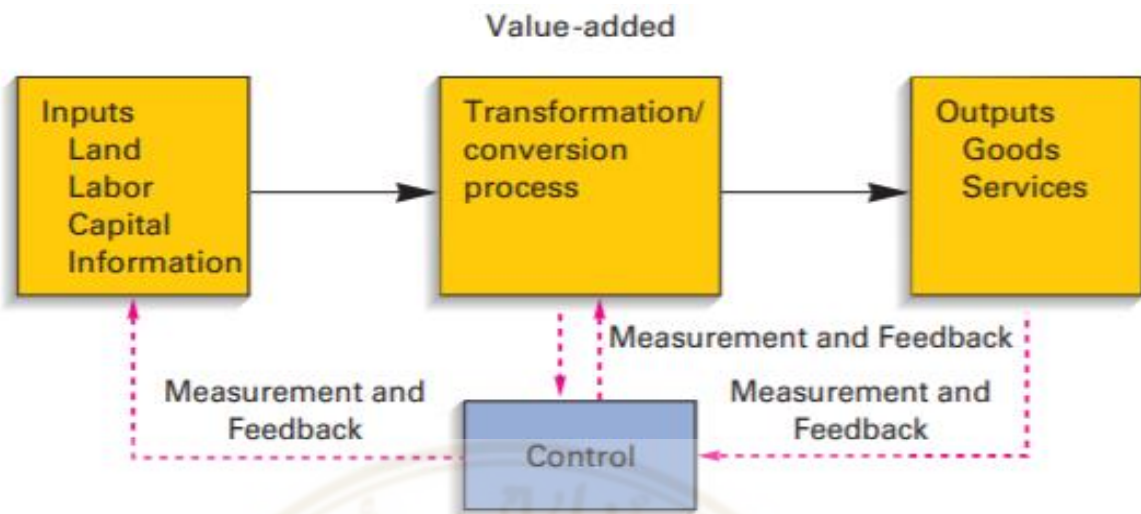


Figure 2.2 Operation as a Transformation Process (Stevenson,2012)

The transformation process can be characterized widely subject to products or services in which businesses offer to their customers. For example, in an automobile manufacturer business, the transformation process consists of forming car's body, assembly all parts together, painting and finishing. Inputs of the process can be physical material like steel sheet, component parts, engines, color paint and information like customer order, raw material stock level, design, regulatory requirements etc. eventually, outputs of the process are finished cars ready to deliver to customers

All primary activities within a business's value chain are operation related activities, thereby operation is key factor driving business performance. On the other hand, business performance relies on how effective a business manages the three factors (inputs, transformation process, and outputs) in operation. Competing in the same market, with the same market condition, some companies can achieve higher efficiency, better cost, and higher customer satisfaction than others, it because the companies manage the three factors in operation better than competitors. Commonly, a goal of managing the three factors is achieving high productivity especially businesses in industry sector. Managing these activities to meet such the goal is widely accepted as a meaning of operation management (Russell&Tayler,2009).

2.3 Supply Chain Management

Supply chain is a set of at least three entities (individual or organization) involving in upstream and downstream flow of products or services (Mentzer et al., 2001). There are three level of complexity of supply chain, direct supply chain Figure 1a, extended supply chain Figure 1b, and ultimate supply chain Figure 1c. A direct supply chain consists of a company, a supplier, and a customer involved in the upstream and/or downstream flows of products, services, finances, and/or information. An extended supply chain includes suppliers of the immediate supplier and customers of the immediate customer, all involved in the upstream and/or downstream flows of products, services, finances, and/or information. An ultimate supply chain includes all the organizations involved in all the upstream and downstream flows of products, services, finances, and information from the ultimate supplier to the ultimate customer.

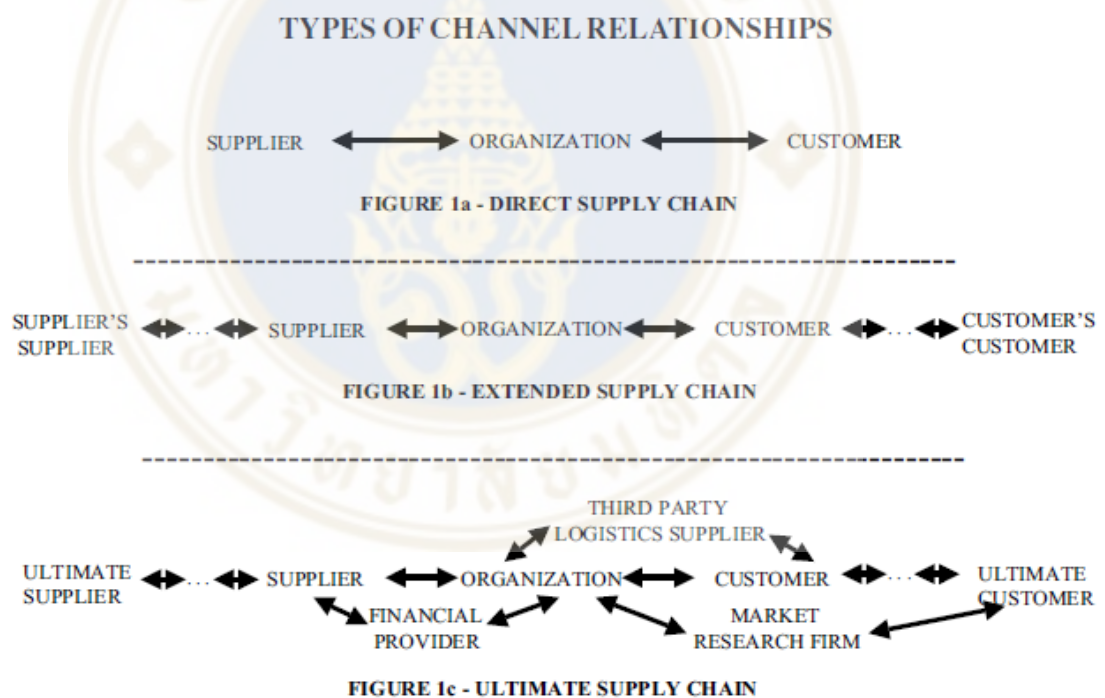


Figure 2.3 Types of channel relationships in supply chain (Mentzer et al., 2001)

Supply chain management (Mentzer et al., 2001) is defined as the systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply

chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole.

2.4 Operation and supply chain management during the pandemic

During the Covid 19 pandemic, almost all businesses seek for ways to improve business resilience or recovery plan before they collapse. Changes in activities and working behaviors noticeably emerge in almost all businesses. Many of them shift to teleworking models almost overnight (Baig et al., McKinsey & Company, June 2020). Some businesses, especially in industry sector, transform organizations to be more agile improving its flexibility aiming for two goals, one is productivity the other is response to change in customer demand and behaviors. Digital solutions and automation become more useful than before because the tools have been proved that they could improve business resilience. According to the survey conducted by Fortune magazine, 75 percent of CEOs of top 500 businesses believe that the crisis accelerate the technological transformation (Murrey, Fortune 500 CEO survey,2020)

Replacing labors with automation was already occurring in late 2017 before Covid 19 (Baig et al., June 2020). The Covid 19 pandemic accelerates pace of change, the latest estimated by the McKinsey Global Institute, 60 percent of all jobs in the world could see more than 30 percent become automated tasks and that 400 million to 800 million people will lose their jobs by 2030. In line with the Fortune surveyed the CEOs of the 2020 Fortune 500 list that reports that 72.6 percent of the CEOs expect to reduce total employment by January 2021.

Response to change in customer behavior lead to accelerating e-commerce popularity. The study of U.S. consumer during the pandemic in April 2020 (Baig et al., June 2020), 75 percent of people in U.S. try digital channels for the first time and likely to continue using them after the pandemic. Figure 4 shows digital adoption by industry, surveyed during April 25 – 28, 2020.

US consumers are accelerating adoption of digital channels, a trend seen across global regions.

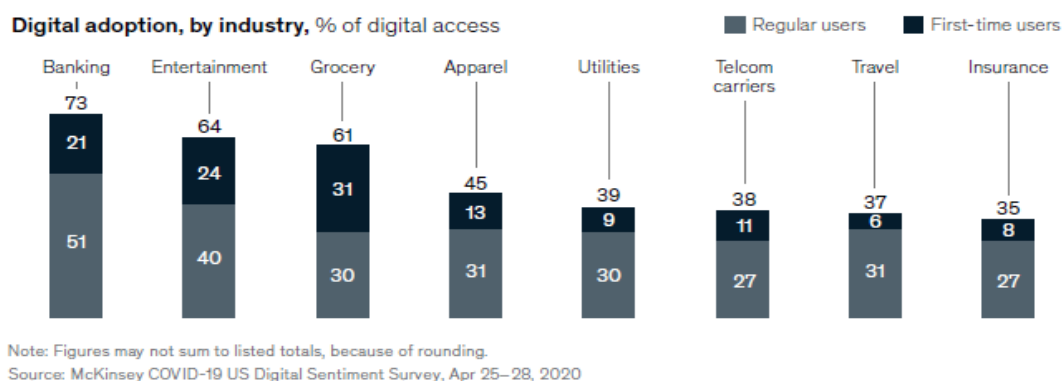


Figure 2.4 Digital adoption by industry (Baig et al.,2020)

The prediction is likely to be accurate because this assumption has already been proved since 2003 when SARS pandemic crisis in China. E-commerce in China market became the biggest in the world resulting from the SARS crisis (Reeves et al., 2020). Any company that quickly adapt to catch up with the trend is likely to survive but the adaptation requires sufficient level of flexibility in organization to make a quick change.

When the Covid 19 pandemic reach its peak in March 2020, 86 percent of supply chain is impacted by the crisis (Hoek, June 2020). Many businesses try several approaches subject to supply chain interruption they are facing. However, popular approaches that are commonly implemented during such the period are collaboration with suppliers, accelerating technology implementation, increasing inventory buffer, reducing reliance to key suppliers by increasing supplier base. Hence, after the pandemic, businesses tend to have multiple sources nearer to business's location than before. Low-cost suppliers will be less popular because sourcing strategy would aim toward mitigation of supply risk (Hoek, June 2020)

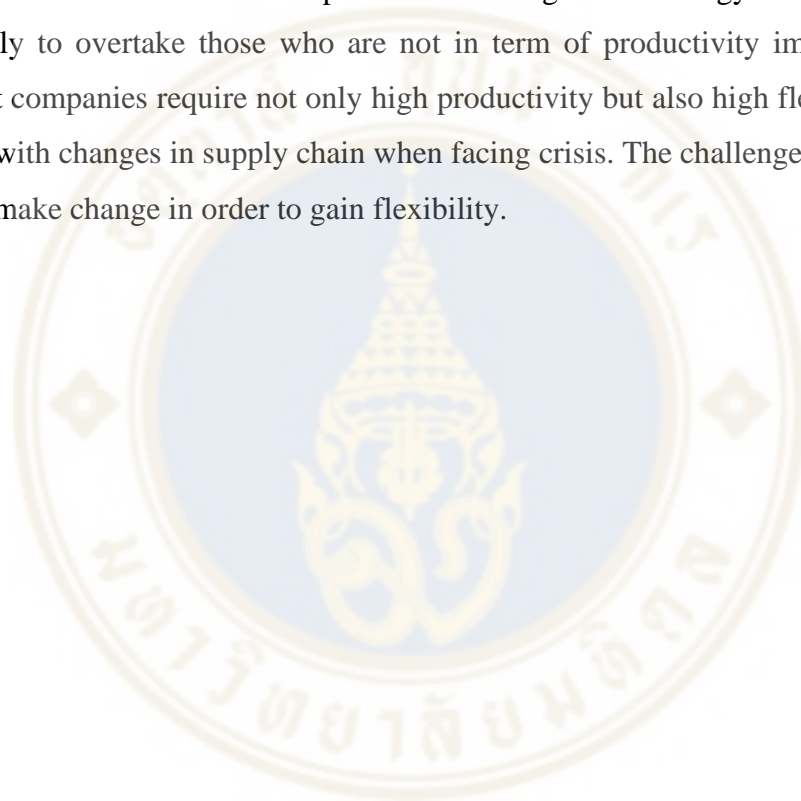
2.5 Building resilient operations

Political and economic tensions, digital disruption and technology recently lead to transformation in many aspects (Lelièvre et al., 2020) such as product, process, and business model of companies in multiple sectors. From the study of resilient

companies who successfully recover from economic crisis in year 2007, the companies mostly made decision to do the following.

- Reducing debt
- Improving operational effectiveness
- Managing cash carefully
- Focusing customer relationship
- Looking for an opportunity to acquire competitors

Manufacturers that tap with trend of digital technology and internet of thing are likely to overtake those who are not in term of productivity improvement. The resilient companies require not only high productivity but also high flexibility in order to deal with changes in supply chain when facing crisis. The challenge is that how they should make change in order to gain flexibility.



CHAPTER III

RESEARCH METHODOLOGY

3.1 Research Design

This thematic paper aims to explore changes in business activities within the context of operation and supply chain management during Covid 19 pandemic, in addition, it aims to identify potentially permanent changes after the crisis. Even though, the objectives specifically relate the crisis with the context of operation and supply chain management, however, in order to cover as many as possible changes in business activities that may exist in real situation the study avoid linking a research methodology with any of previous researches mentioned in literature review. Qualitative approach by in-dept interview with senior managers of manufacturers in Thailand is chosen to be the research methodology. Open-end question is a key technique as it will not limit scope of answers and that will help to explore as many as we can a creativity, technology, a new way of working, a new behavior, a new business strategy, or any unexpected solution which occurring at the sample manufacturers. Senior managements who directly involve with operation and supply chain strategy of the companies and well understand their business context and insight are chosen to be interviewees because it is more likely to gain insightful information from people who see a full picture of the situation.

3.2 Research Sample

In order to gain high degree of variety in business context, five manufacturers from different industry segments are chosen. All of them are manufacturers that have locations in Thailand, size of business is relatively big because there are employees more than 500, supply chain interaction involves both domestic and overseas, most of senior managers are Thai, and they are operating in Thailand for

longer than 20 years. Information about the manufacturers and interviewees in brief is as follow.

Company A - Beverage

Interviewee: Factory Manager

About the company:

The company is producing pasteurized fruit juices from variety of fruits planted domestically in Thailand such as lime, orange, pineapple, guava, apple, berry etc under the several brands. It was found in 1992, the factory is located at Bangplee Samutprakan. The products are selling through six different market segments, they are consumer, hotel & catering, export, industrial, OEM service, and catering.

Company B - Flexible packaging

Interviewee: General Director

About the company:

The company is producing flexible packaging supplying to other manufactures in several segments, mainly food product. It was originated in Finland 100 years ago but started business in Thailand in 1995 located at Samutsakorn industrial estate. Because it is B2B model, the business is considered to play an important role in upstream process of other businesses.

Company C - Textile

Interviewee: VP- Procurement and Logistics

About the company:

The company is a well-known textile company in Thailand, most of Thai people know its brand for longer than 60 years. It was established since 1958 as a small garment factory, step by step expanding its business aiming to connect the entire value chain by using vertical integration strategy, now business of the company covers the entire production from yarn, fabric, and apparel.

Company D - Canned seafood

Interviewee: Senior VP – Strategic Office & Global Sourcing

About the company:

The company was established in 1971, is one of the leading seafood manufacturer and distributor in Thailand. The main factory is located in Samutsakorn

producing canned Tuna and other shelf stable seafood (sterilized seafood in can and retort pouch) under several well-known brands.

Company E - Beauty and hair care product

Interviewee: CEO

About the company:

Established since 1980, as the retail store distributing full range of beauty products in Thailand. The founder built the manufacturer in year 1987, in Teparak rd, Sumutprakarn province. Over 30 years, the manufacturer has been expanding. Area of 2,060 sqm in the beginning, now it is expanded to 9,600 sqm. The company's well-known products are hair spray, gel, shampoo, conditioner, mousse, serum etc.

All of participants hold a high position in management and they are directly responsible for operation and supply chain strategy of the companies. Each of them has long experiences in operation and supply chain field at least 20 years. List of interviewee characteristics are in Table 3.1.

Table 3.1 Interviewee list

Position	Experience (years)	Company	Industry	Ownership
Factory Manager	20	A	Food & Beverage	Thai
General Director	20	B	Food Packaging	Finnish
Vice President: Procurement and Logistics	25	C	Textile	Thai
Senior Vice President: Strategic Office & Global Sourcing	25	D	Seafood/ OEM	Thai

Table 3.1 Interviewee list (cont.)

Position	Experience (years)	Company	Industry	Ownership
CEO	20	E	Beauty Products	Thai

Semi Structure In-depth Interview

To answer research question no. 1: What are changes in operation and supply chain process that resilient organization in Thailand make as a result of pandemic crisis? Interview with the senior management of sample businesses will focus on change in business activities occurring during the pandemic period.

Interview questions are developed following the topic of impact of Covid 19, operation management, and supply chain management but the structure keeps all questions open for free discussion. All questions are open-end question that leave the interviewee bring his/her own area of interest. Follow up question will be asked to the interviewee without predefined in order to explore interested area in-depth. The interview session is face to face meeting between interviewer and interviewee at his/her working place, however, in case that the face to face meeting is not the most convenience to the interviewee the virtual interview session is optional.

Audio record will be used throughout the interview session with permission by all participants.

Main interview questions are predefined covering broad discussion in the four topics. They are listed as shown in Table 3.2.

Table 3.2 Interview questions

Topics	Questions
Impact of Covid 19	1. Please give an introduction of your business in brief. (Focus about key customers, key suppliers, key process which transform raw material to product)

Table 3.2 Interview questions (cont.)

Topics	Questions
Impact of Covid 19	2. How does Covid 19 impact to your business in overall?
	3. Which business activities in the context of operation and supply chain are impacted by Covid-19? How?
Operation Management	1. What are key challenges in managing operation during the pandemic?
	2. How is your company responding to the key challenges.
	3. What change in operation does your company make in order to cope with the key challenges? (if it needs, inquiries about flexibility, productivity, customer relationship, and cost improvement)
	4. Who are involving with the change? How do they adjust to it?
	5. What result do your company expect to see? What is your ultimate goal?
	6. Do your company plan to implement a digitalization or automation as a tool to improve business performance? If so, what it is. Why does your company plan to do it?
Supply Chain Management	1. How does the pandemic impact to your supply chain?
	2. What supply risk does the pandemic pose to your company both upstream and downstream?
	3. How do your company mitigate the risks?
	4. Does your company have a contingency plan in place that could be deployed? If so, what are key actions your business give priority to?
	5. What change in supply chain does your company make during the pandemic? (if it needs, inquiries about inventory buffer, collaboration with suppliers, reducing reliance to key suppliers, location of alternative suppliers)
	6. Who are involving with the change? How do they adjust to it?
Post Covid 19	1. What operation management will be looked like after the pandemic period?
	2. What supply chain management will be looked like after the pandemic period?

To answer research question no.2: What are changes in operation and supply chain process made by resilient organization in Thailand as a result of pandemic crisis that potentially become a long-term practice after the crisis? This study applies content analysis using interpretative approach that will be discussed in chapter 4. The study

focuses on similarity of participant's answers together with answering to the two focused questions in topic "Post Covid 19" in Table 3.2.



CHAPTER IV

DATA ANALYSIS AND FINDING

4.1 Data analysis

This chapter will use data collected from interview session as discussed in chapter 3 to analyze with content analysis method as it is the most suitable with qualitative research data. In this study, the interpretative approach is chosen because it helps to sort data looking for a similarity of answer, a pattern of activities that can be categorized into the same group easier than other approach. Even though, all participants are chosen based on their professional experience that are directly related to operation and supply chain management field within scope of this study, but they are working in different industries. So, with different business context, participants might use different terms expressing similar main idea. The interpretative approach requires pre-screening of those answer and making sense of data in relation to the research questions prior to systematically analyze. Thereby, the research could draw a conclusion in a systematic way.

After interview session the audio record will be fully transcript into written text, and then interpretative code will be assigned to a phrase that having the same meaning with the code. The code in this study is designed mainly to answer the two research questions in combination with some theories mentioned in literature review chapter 2. Some of predefined codes can be demonstrated as the following.

- OM: Security
 - A procedure managing outsider activities to prevent employees from infection
- OM: Health & hygiene
 - Company policy aiming to protect employee's health from the disease
- OM: Crisis management
 - Establishing crisis management team

- OM: Cost improvement
 - Activity that is implemented in order improve business cost
- OM: Change manufacturer
 - Relocate manufacturer location
- OM: Teleworking
 - Working from home or remote location
- OM: Cash management
 - Any business activity that ensure positive cash within the financial period for example extending supplier credit term.
- OM: Product formula
 - Change or adjust product formula to cope with raw material shortage issue
- OM: Produce hygienic product
 - Change production line to produce hygienic product such as alcohol gel, hygienic mask, etc.
- OM: Digitalization
 - Change from collecting and analyzing data from text format to digital format
- OM: Market diversification
 - Expand market segmentation, do not rely on key customers but increase number of customers from different market segment.
- OM: Customer satisfaction
 - Any activity that aim to fulfill customer requirement for example; extend credit term, readjust production schedule according to suddenly change in customer demand.
- OM: Productivity & efficiency
 - Activity or project that aim to improve productivity and efficiency of manufacturing process
- SC: Inventory management

- change in supply chain in relevant to inventory management
- SC: Source of supply
 - change in supply chain in relevant to selecting source of supply
- SC: Information
 - change in supply chain in relevant to managing information
- SC: Supplier activity
 - activity that heavily involve supplier effort
- SC: Logistics cost
 - activity that improve logistics cost

New code can be developed upon emerging of unpredicted data from participants. Answers from all five participants will be consolidated and then assigned the code for sorting. Code repeatability will be extracted as it indicated a common perspective of senior managers from different businesses. All the codes will be ranged from the highest repeatability to the lowest. In order to answer the research question no2, a prediction of future trend of operation and supply change management will rely on repeatability of codes extracted from the interview together with direct answer to the question in the topic of post Covid 19.

4.2 Research Finding

The five participants responded to the questions with insightful answer and comments, each participant kindly dedicated their valuable time from 50 to 60 minutes providing information of their business process, products, customers, and suppliers, business impact, how they cope with the situation, and finally what the business will be looked like when the pandemic end. Since the five participants are working in different industries, hence, impact to the businesses are difference. Ranking severity of impact from low, moderate, and high, the severity level is judged based on interviewee's view and it is identified in "Participant" column in Appendix 1 showing response to interview

questions each topic. Column “Impact to business” presents answer to the first topic about how their business is impacted by the pandemic, column “Supply chain” presents answer to the second topic about change in supply chain during the pandemic, column “Operation” presents answer to the third topic about change in operation during the pandemic, finally column “Outlook” presents answers to the fourth question about the interviewee’s opinion of supply chain and operation management after Covid19 era.

From the study it suggests that businesses in Thailand are impacted by the pandemic in different way subject to who is their customer and how it tight to economic factor in the country. Severity of impact to business performance from low to high can be explained as the following.

Low impact, Company D, the company produces canned sardine & mackerel in source and other seafood. Despite supply chain is interrupted due to the government’s lockdown and curfew, household consumers stockpile food and other necessary to living goods lead to surge in demand for the company’s products. So, during the pandemic, the company is busy with fulfilling sudden change in demand rather than worrying about business performance.

Moderate impact, Company B, the company produces packaging for other businesses. Since there are variety of market segmentation the company so the risk level is diversified from low to high. Customers in food and household segments need more products whereas snack and export market decline.

High impact, Company A-C-E, the three companies are severely impacted by the lockdown. Company E, producing hair saloon product, struggle with decline in revenue because saloon and beauty shops are closed. Company A, producing fresh fruit juice, revenue from hotel and restaurant segment decrease. Company C, producing textile product, demand in this segment is significantly slow down due to department store is close.

Participants shared changes in business activities policies and procedures the companies implemented in order to cope with challenges during the pandemic situation. All these changes are recorded and count. Even though business contexts are different however changes in business activity tied to supply chain and operation environment can be interpreted and grouped into the similar meaning using the interpretative code. Collected data is analyzed, hence, analysis of supply chain activity

and operation activity are demonstrated in Chart 1 and Chart 2 respectively. Thereby, the first research question “what are changes in operation and supply chain process that resilient organization in Thailand make as a result of Covid 19 pandemic” is answered by Chart 1 and Chart 2 as the following.

4.2.1 Changes in Supply Chain Activity:

Questionnaires regarding the topic of supply chain aim to explore changes in business activity which participating company make to cope with the pandemic situation. All the changes are captured and coded according to the predefined codes. When activities are in the same group, the same interpretative code is assigned. Number of interpretative codes in each activity group is summarized and analyzed with funnel chart as indicated in figure 4.1. From the graph, activities related to source of supply are repeated the most. The second highest number is inventory management and information. Supplier activity is the third popularity, and logistics cost improvement is the least popular activity.

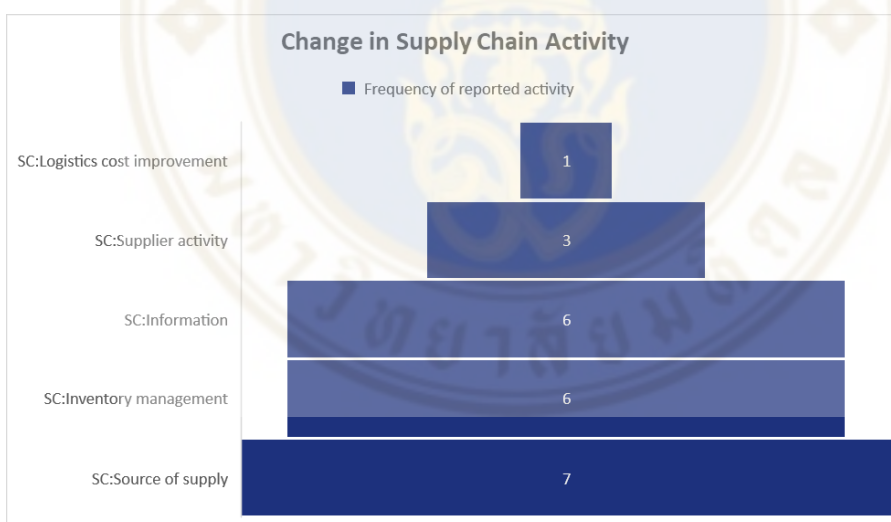


Figure 4.1 Change in supply chain activity

SC: Source of supply

During the pandemic, common issue that all participating company senior managers have to solve is material shortage due to the country lockdown. Suppliers from abroad cannot cross the country border, some of them are forced to shut down due to

the home country's policy. Finding alternative source of materials become the first priority that supply chain managers are focusing.

“Even though sourcing from China, Hong Kong, and Vietnam give a better cost than local supplier but when the transportation is interrupted, we realized that too much rely on importing low cost raw material from other countries does not work anymore”. (VP: Procurement & Logistics, Company C)

SC: Inventory management

Inventory management is the second priority, when demand in markets unexpectedly sink down finished goods inventory could become swollen if they still rely on outdated forecasting data. In the other hand, the companies tend to buffer more raw materials especially ones that they import.

“Normally we aim to use the raw material immediately once it is arrived, but the curfew affects to transportation and it forces us to increase storage container for stock buffering”. (Factory Manager, Company A)

SC: Information

The same important is supply chain information. One executive who faces the challenge of surge in demand said that

“normally we have S&OP meeting only once a week, now we are having the meeting every two days in order to update information for the whole supply chain both supply and demand side. The information must be up to date, precise, and transparent”. (SVP: Strategic Office & Global Sourcing, Company D)

Company B copes with different challenge, demand in some market segment increase while other markets slow down. The company also need the precise and up to date information across supply chain to determine which one to reduce which one to increase inventory level. If it failed to do so, they would not be able to fulfill customer demand, instead left inventory swollen.

SC: Supplier activity

The lockdown causes interruption to transportation of raw materials to the manufacturing. State of emergency announced on 23rd March prohibited any transportation during 22:00pm – 04:00am that affect Company A who normally receives fresh coconut juice from the supplier before 05:00am every day, otherwise the juice will lose its freshness. The company and its supplier work together to reschedule production

plan matching with each other in order to avoid delivery during the curfew. The supplier also has to separate one order into several deliveries that keep the juice freshness while prevent the raw material from shortage.

From the literature, 2.4 operation and supply chain management during the pandemic in chapter 2, other research suggest that there are a few common business practices during the pandemic and they are collaboration with suppliers, accelerating technology implementation, increasing inventory buffer, and reducing reliance to key suppliers. Interview with Thai executives give an insight that practices in Thailand tend to align with such the practices, the highest number of changes in business activities regarding supply chain is the searching for alternative source of supply (SC: Source of supply) or the other meaning is that businesses tend to reduce reliance to key suppliers. The second highest frequency is increasing inventory buffer (SC: Inventory management). Collaboration with suppliers come the fourth popularity (SC: Supplier activity). Except for accelerating technology implementation, none of any mentioned supply chain activity refers to accelerating the technology, however, within the scope of supply chain information, the participants agreed that managing the supply chain during this crisis having advance IT system could help them make the right decision and giving them respond to demand the situation better.

4.2.2 Changes in Operation Activity:

Questionnaires regarding the topic of operation management aim to explore changes in operation activity which participating company make to cope with the pandemic situation. All the changes are captures and coded according to the predefined codes. Number of interpretative codes in each activity group is summarized and analyzed with the column chart as indicated in Chart 2. From the chart, top six group of activities are cost improvement, heath & hygiene, cash management, teleworking, customer satisfaction, and security respectively.

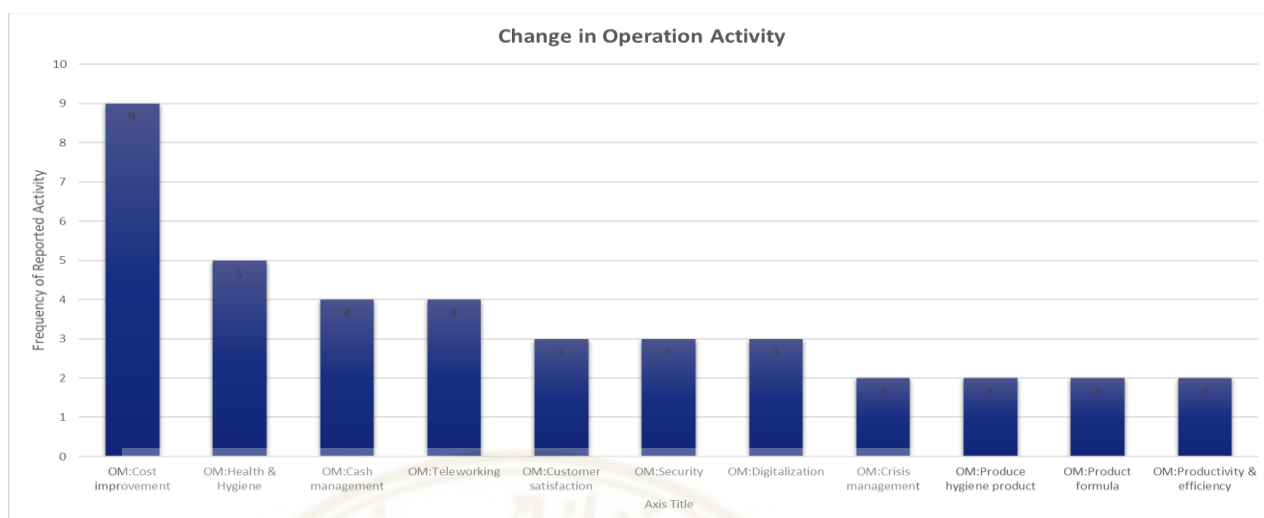


Figure 4.2 Change in operation activity

From figure 4.2, the first six activities highlighted during the interview session are the following.

OM: Cost improvement

In the situation that revenue hardly achieve the target, most of Thai executives turn to focus on business cost as it is only way to secure profit. The respondents accept that during the pandemic even though none of them lay off employees, but they freeze recruiting newcomer. Two out of five companies say they even transforms organization to be more efficient by combining roles and expanding employee's skills. During the tough time, leaders engage all employees to minimize cost by using less utility, creating cost saving projects, and rearranging production shift avoiding overtime cost.

OM: Health & Hygiene

Preventing their employees from infection by the disease is necessary. Several health and hygiene improvement procedures are launched it is not only to comply with the government instruction, but they also do beyond the minimum requirement. At initial phase when the pandemic starts in Thailand, employees are panic some of them feel insecure because the working environment in manufacturing where employees have to work in groups with close contact it is risky to pass the virus to each other. All participants talk in the same direction that they have to engage people by providing all necessary things for example hygienic mask, alcohol spray/gel, redesigned

facility complying to physical distancing concept etc. that could prevent them from the disease. Temperature scanning become normal procedure of every factory, some factory overlap working time of different process steps in order to reduce population at work space, lunch tables in canteen are separated so employees cannot eat together in group, alcohol or other disinfectant liquid is distributed across the factory etc.

OM: Cash management

Managing cash during this period is more challenging than usual. Market demand is more fluctuate than usual, products related to food or necessary to living suddenly surge in demand while unnecessary products are declining. Supply chain manager chose to increase buffer stock of products in demand and that action consume more amount of cash than normal. Meanwhile, the products in less demand the stock will be kept longer than prediction and it will take longer time to convert to cash, moreover, some customers who are affected by downturn economy ask for extending credit term as they cannot make a payment on time. According to the interviewees, common practices which they chose to do in order to mitigate the risk of insufficient cash are postponing plant improvement projects, extending supplier credit term, carefully inventory monitoring, reducing unnecessary expense, and price negotiation with supplier.

OM: Teleworking

Working from home program is encouraged by the government instruction and it is practical way of preventing employees from the infection, so it become common practices in almost all businesses. Four out of five participants confirm that they ask, except for production process, all supporting departments such as purchasing, human resource, finance, planning etc. from home. Some departments are not allowed to work in office until further notice, some can work at the office 50% another 50% at home, WFH plan is subject to how technology readiness they are. Insufficient technology provided to employees it may reduce employee's productivity.

OM: Customer satisfaction

There are two key activities in this interpretative code mentioned by two executives regarding supporting customer satisfaction. One is making a quick adjustment on customer orders when the customers realize that previous orders do not capture fast enough change in market demand. The participating company strengthen

relationship with the customer by working closely with them to understand the most update information from demand side, and immediately reflect it into raw material ordering, production schedule, and delivery plan. This action not only satisfy the customer but also help the company in managing inventory better. The other change they make in order support their customers is extending customer credit term when the customer is struggling with paying debt on time.

OM: Security

Security procedure is more tighten than normal situation because outsiders may bring in the hazard risk to their employees. Participants told that the companies do not allow visitor entering factories at least for three months since the pandemic begins. When the situation become ease and visiting the plant by outsiders is necessary, all visitors are required to submit requisition form a few days prior to the date of visit including screening questionnaires checking if they travel to high risk location.

We specify the truck driver name who deliver raw material to our factory, new driver who never been registered in our record will not be allowed to enter the plant. The driver can access only to periphery of the warehouse, once finish loading, they must leave as fast as possible. (Factory Manager, Company A)

Apart from the six groups, there are other activities emerged resulting from the pandemic. For example, two out of five participants emphasize that during the crisis, crisis management team is established (OM: crisis management) to manage overall operation in the plant ensuring all employees will be safe by mitigating potential risk of the pandemic. Another two participants who see trend of revenue is in decline, they change market channel to on-line (OM: digitalization) and the decision is worthwhile as the revenue increase after the implementation. The rest of change in business activities reported by all participants can be seen in Appendix 1.

4.2.3 Change in business practices after the crisis

In order to answer the 2nd research problem “What are changes in operation and supply chain process made by resilient organization in Thailand as a result of pandemic crisis that potentially become a long-term practice after the crisis?”, all interviewees are asked if they will continue implementing the changes after the crisis end. The changes which the interviewees plan to carry on will be count together with

their answer to the question in last topic that solicit their perception on operation and supply chain management after the pandemic.

Once the interpretative codes regarding longer term change are count, Pareto chart is applied in order to sort the ideas from the most popular to the least. See figure 4.3 potential change in business activity after Covid.

According to the chart 80% of business activities which the participants perceive that they want to maintain or develop in the future comprise of eight business activities as the following.

- Digitalization
- Automation
- Cost Improvement
- Teleworking
- Source of Supply
- Market Diversification
- Health & Hygiene

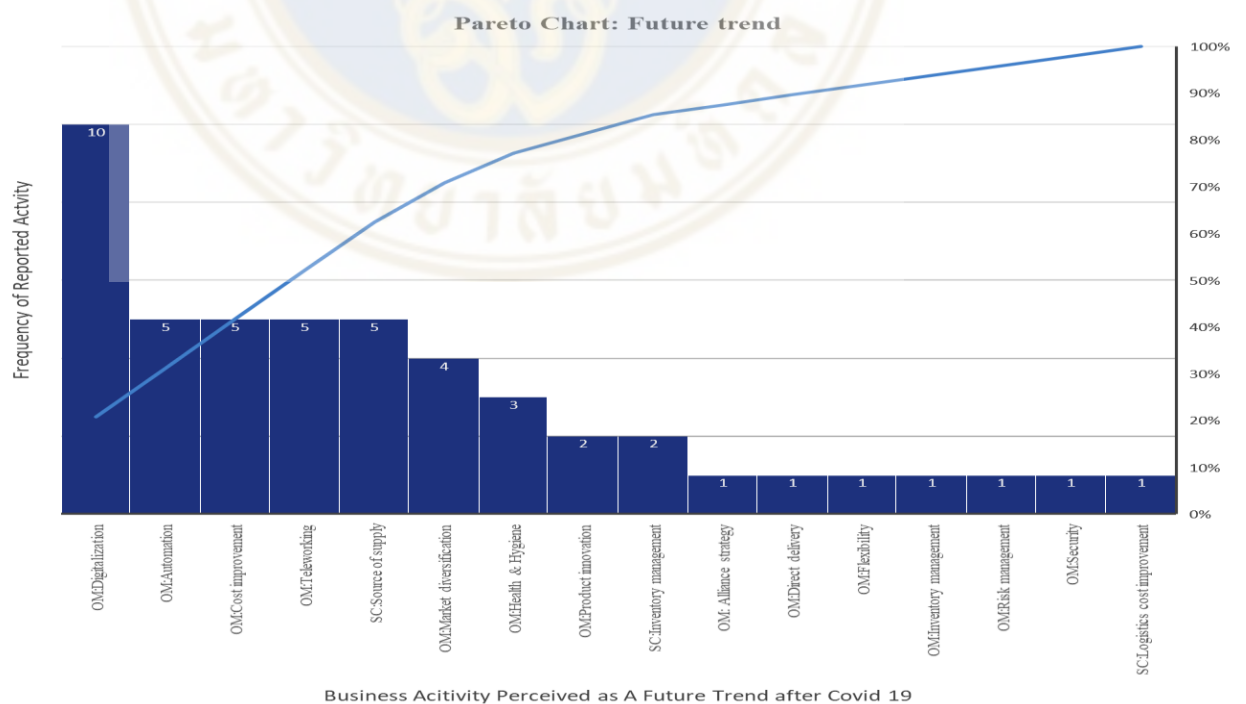


Figure 4.3 Potential change in business activity after Covid 19

Digitalization: Obviously the chart present significant number of digitalization code. All participants agreed that business operation is moving toward digitalization. Each of them mentioned about digitalization in variety of digital format. Four out of five participants said that during the crisis, they cannot sell products thorough traditional market but when they move the products into online market channel it really works. They perceive that the Covid 19 help to boot up online market channel. The participants also see that more advance ERP system would help them to deal with unusual demand and supply situation better. With efficient ERP, the decision maker could make the right decision at the right time. Company D plan to improve efficiency of ERP system next year, Company E plans to replace it with new more advance system. Company C implement AI improving back office process efficiency by having it books outbound transit both air and sea freight. The technology can book 800shipments per day. Company B is in development phase of transforming all manual paper works at shop-floor level to digital called MES (Manufacturing Execution System).

Automation: During the crisis, none of participating company invest in automation, instead they are likely to postpone the projects if there is any of them in pipeline. The reason is that businesses reserve cash to make sure it is enough for paying current debt when short in revenue is highly possible. However, many of participants perceive that the automation invested in the past year before the crisis mitigates negative impact. For example, Company D installed automatic filling machines a couple years before the crisis, during the pandemic when migrant labors return to home country the business has lesser impact than those who heavily rely on labor force. All participants gain consensus that automation is going to be more necessary than before because the more people involving in the process, the higher food safety and biological hazard risk. Cost of managing the risk eventually could be higher than investment in automation.

Cost improvement: Cost improvement activity can be seen as continuous business practices. Company E is going to add target for cost saving amount into one of manager performance evaluation criteria. Company C will gradually increase number of cost saving project year by year. Cost factory which interviewees mentioned the most is labor cost. Businesses tend to improve organization to be more agile and efficient, so they aim to reduce people in the organization. The idea is one of fundamental factor accelerating digitalization and automation trend. This opinion is aligned with survey

result conducted by Fortune magazine, *the CEOs of the 2020 Fortune list*, mentioned in chapter 2.4 that majority of CEOs foresee shrink down of employment rate in year 2021 vs 2020.

Teleworking: Even though the companies are forced to have their employees work from home that is instructed by the government authority in order to mitigate human to human disease transmission in the beginning, however, they notice other benefit of the program during the implementation as well such as reducing travelling expense, improving productivity in some activities etc. Hence, teleworking become new permanent way of working in many businesses. One of interviewee say the company add 4:1WFH program into employee benefit permanently meaning that everyone can work from home one day per week. Another company asks sales team not to come to office unless there is an important meeting.

Source of supply: Common issue that all participating company is facing is the raw material shortage issue causing by global supply chain disruption. The more complexity logistics network is the higher severity of effect. Hence, after the pandemic, businesses will change sourcing strategy from cost benefit to giving priority to simpler supplier chain network. Local supplier will be more attractive than oversea supplier. Businesses will reduce reliance to global suppliers and turn to having more suppliers by sourcing from a location where it is closer to the manufacturer.

Market diversification: Company C, the textile OEM business, heavily rely on a few key customers in the U.S. When the pandemic severely hit the country, the company is in real difficult situation. Company E, the company produce beauty and hair care products supplying to salon shops and retailers, has only a few market segmentations. When all solan shops had been closed for several months due to the lockdown policy, the company revenue is massively decline. Once, the business changes to sell the products through online channel focusing more on young customer, the revenue start to improve. Company B, the packaging company, has several market segments. When 40 percent of total segments is in decline, luckily there is still another 60 percent having positive growth. When these participants were asked what change in business activity would they plan to do after the crisis, they replied that market diversification is one of key things they are going to do.

Health & Hygiene: Since businesses perceive advantage of implementing the program during the crisis, so almost all of participants want to continue it. However, the program might not as tight as during the crisis because some activities would affect to cost and productivity. Cleaning and sanitizing working environment, visitor health screening procedure, improving hygiene of working area, inspecting individual hygiene etc., these would be some activities that many businesses keep maintaining.

The eight business activities which participants predict that they will be a trend of operation and supply chain in post Covid-19 era in Thailand are mostly alighted with the prediction in global scale, see literature chapter 2. Table 4.1 presents O/SC based on this study vs global research.

Table 4.1 Comparison O/SC after Covid 19 between this study and other research

O/SC in Thailand after Covid 19	O/SC after Covid 19 from global research
Digitalization	Digitalization
Automation	Automation
Cost improvement	Reduction in employment rate
Teleworking	Teleworking
Source of supply	Change sourcing strategy
Market diversification	Increase inventory buffer
Health & hygiene	

From the table, obviously digitalization and automation will be accelerated resulting from Covid 19. Cost improvement vs Reduction in employment rate have a close relation, even though participating companies do not specifically focus on labor cost but all of them agreed that objective of implementing digitalization and automation is that to reduce reliance to labor. In addition, freezing employment during the Covid leads to shrinking of department headcounts providing cost benefit to the companies. Therefore, it is likely to keep the smaller size of organization even when the businesses expand in the future. Teleworking and new sourcing strategy are new normal within

O/SC context. Increase inventory buffer mentioned by other research is not predicted as a new trend in this study. It is common practice in managing supply chain during the crisis by having higher inventory level but none of participant want to do it in long term because new sourcing strategy already aim to mitigate the supply risk. In the other hand, risk in demand side is anticipated thereby the businesses plan to mitigate the demand risk by having wider market segments opposing to reliance only a few groups of customers.



CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

This thematic paper provides a business insight from five participating business executives regarding change in business activity within a context of supply chain and operation management during March to July 2020 when the pandemic of Covid 19 in Thailand reaches its peak of devastation. In addition, the future trend of business activity after the pandemic ending is predicted according to a perception of the participants.

Change in supply chain during the pandemic, from this study, clearly involve changing source of supply. Even though the participants are from different industries and they are in different situation, however, it is consensus that material shortage due to transportation limitation is a common problem which all companies cannot avoid. Source of supply activity, such as changing to alternative supplier or alternative raw material, account for 30% of total changes in SC activities informed by all participants. Businesses also intensively monitor inventory level during this period of time because it hardly forecast customer demand while supply situation is unusual. As a result, change in business activity regarding inventory management and (supply & demand) information are highlighted.

Change in operation during the pandemic is focusing on cost improvement and employee health as business priority. Since the businesses see uncertainly fluctuate demand and revenue is likely to decline, therefore, reducing business cost is only way business executive should do in order to mitigate business impact. Business activities such as reducing raw material cost, changing product recipe, reducing energy cost, freezing recruiting newcomer, stop overtime cost etc are commonly applied. Preventing employee from the disease is also important. If there is anyone in the organization is infected by Covid 19, the news might spread around. It will not only affect to business reputation but also demotivate the rest of employee.

Future trend of business practices in operation and supply chain management in Thailand is mostly aligned with global trend since it moves toward digitalization and automation. Business tends to optimize utilization of human resource and keep it decreasing overtime. Sourcing strategy will focus more on location rather than cost. Teleworking become a new normal. Except for market diversification, none of other researches referred in chapter 4 identify the practice as a future trend. From this study Thai participating executives perceive that the wider market segmentation is, the lower business risk. Therefore, business in the future tend to have diversified products or services providing to wider range of distribution channel.

5.2 Recommendations

Recommendation to a company

A company should prepare resource for automation implementation and digitalization by starting from appointing a team who can capture the latest update knowledge regarding the topics such as IT and Engineering team. Then study what technology is the most suitable to the business and prepare budget. In addition, a company should be aware that competitor will heavily compete in online market, so a company should promptly change to this channel with its own strategic product.

Recommendation to operation managers

Operation managers should foresee that the automation and digitalization will decrease operation labors in the future. To avoid conflict with employees, managers should to develop medium- and long-term action plan on organizational transformation. The managers should develop employee skill having higher or multiple skill and gradually transfer people from unnecessary task to higher value tasks.

Recommendation to employee.

Businesses tend to have less people in workplace than before, automation and digital tools will replace labor force. Unskilled labor will hardly find a job so, people should to improve themselves by increasing competency which is in demand by next 10 years. New generation labor should be familiar with digital technology, AI, and robotic technology.

Recommendation to the government

Since businesses seek for opportunity to invest in automation and digital tool in order to improve productivity, the government should support the businesses by launching tax scheme or any form of subsidy that help to reduce cost of implementation. For example, BOI exempt tax for those businesses who invest in automation system in their factory or exempt tariff of imported part of automation system.

Recommendation to supplier

Buying strategy will change from cost competitive supply base to be simple supply chain network. It will be benefit to supplier who its location is close to customer's site. Business that rely on exporting should to prepare for losing some key customer by selecting only an important customer, building strong relationship with them, and proposing to develop co-strategy with them. In the other hand, business should give priority to domestic sales as it will become major source of revenue.

5.3 Limitations

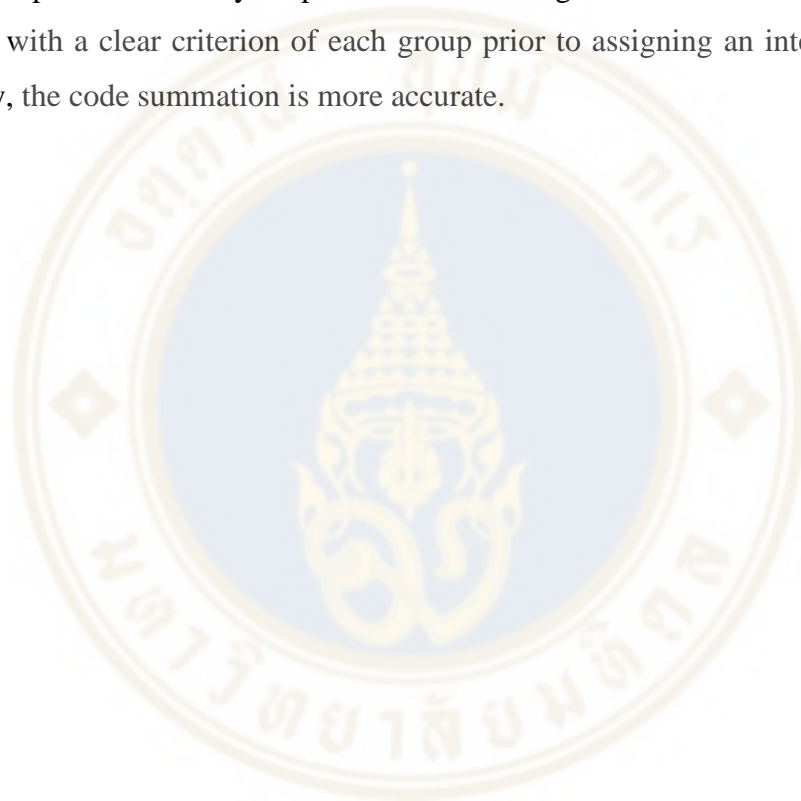
There is some limitation in this study. Firstly, sample size of this study is only five executives from different businesses, it is not big enough to represent the whole Thailand industries. The participants respond to interview questions by personal view, not organizational view. Thereby, unalignment with others in the same organization is possible. In addition, the five participating businesses can be divided into only two groups, food business (Company A and D) and non-food business (Company B, C, and E). It would be more accurate data analysis if the study could cover wider range of industry in Thailand.

Definition of predefined interpretative code is roughly defined because it allows flexibility in grouping different activities but having same purpose into the same group. However, interpreting error is possible and then it may cause either double count or short count of some code.

5.4 Future research

In order to gain wider perspective from variety of business segments, the future research should increase number of participants to at least 15 participants from different business. All participants should be top executive of the business or at least being a member of management team who directly involve with supply chain and operation.

The future research should to predefine business activity in supply chain and operation process as many as possible. Then categorize them based on similarity of activity with a clear criterion of each group prior to assigning an interpretative code. Thereby, the code summation is more accurate.



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APPENDIX 1: Answers to interview questions with interpretative code

Participant	Impact to business	Supply Chain	Operation	Outlook
Company A	Revenue in hotel and restaurant & food chain decline due to the government's lockdown policy Increase in business cost result from decrease in revenue	Change raw material delivery schedule to comply with transportation period limited by the curfew SC: Supplier activity	Stop O.T and rearrange production shift to be more efficient OM: Cost improvement	Health and hygiene OM: Health & Hygiene
High Impact	Some imported material is shortage due to the government lockdown policy Project delayed due to the government lockdown policy	Inventory buffering for some materials which the transportation is limited by the curfew SC: Inventory management Change to alternative source of material SC: Source of supply Update sales forecast more often to carefully manage inventory level SC: Information Communicate with suppliers more often SC: Supplier activity Visit customer more often than before in order to get accurately update demand SC: Information Find more alternative suppliers SC: Source of supply	Save utility cost OM: Cost improvement Health and hygiene enforcement program OM: Health & Hygiene Visitor control OM: Security Provide temporary accommodation for employees to avoid using OM: Health & Hygiene Reformulate product formula to improve production efficiency OM: Product formula Market diversification (before Covid) OM: Market diversification Focus online channel OM: Digitalization Develop new product aiming for online channel OM: Product innovation Automation (before Covid) OM: Automation Change packing process from direct printed can to shrink labelling to OM: Production process Extend customer credit term to support customers OM: Customer satisfaction Extend supplier credit term to manage cashflow OM: Cash management Freeze new investment to manage cashflow OM: Cash management	Increase supplier base SC: Source of supply E-commerce OM: Digitalization Automation OM: Automation
Company B	Over inventory Under inventory Increase in operation cost Over time cost increase Customer demand fluctuation Overdue account receivable Decrease in revenue in some market segment Projects were delayed	Increase buffer stock (raw material and finished goods) SC: Inventory management Change raw material source SC: Source of supply Updating demand & supply situation more often SC: Information Update sales forecast more often (closely monitor customer demand) SC: Information	Visitor control OM: Security Health & Hygiene OM: Health & Hygiene Order correction in response to customer demand change OM: Customer satisfaction Establish crisis management team OM: Crisis management Work from home OM: Teleworking Organizational transformation (reduce labor cost) OM: Cost improvement Freeze recruiting new employee (to manage cost) OM: Cost improvement	Automation to reduce labors and improve productivity OM: Automation Digitalization OM: Digitalization E-commerce OM: Digitalization Operational security (business risk review) OM: Risk management Alternative local suppliers SC: Source of supply Work from home OM: Teleworking Increase supplier base (reduce reliance on key supplier) SC: Source of supply Market diversification OM: Market diversification Co-strategy with business alliance to manage risks (global key account) OM: Alliance strategy Food safety standard OM: Food safety Innovation (develop new product support market trend such as shopping online, sustainability) OM: Product innovation Supply chain flexibility SC: Source of supply Operational flexibility (spare capacity) OM: Flexibility Customer geographical diversification OM: Market diversification
Company C	Raw material shortage Manufacturer shutting down (in Laos) High Impact Revenue is decline Increase in production cost Increase in logistics cost	Change raw material source location SC: Source of supply Change transportation model (from air to sea), combine raw material volume to fulfill a container. SC: Logistics cost improvement Give priority to local supplier (both TH & VN) SC: Source of supply Focus more on inventory level SC: Inventory management Reduce buffer waste on production order SC: Inventory management	Change manufacturer's location OM: Change manufacturer Reduce business cost OM: Cost improvement Change production line to produce mask, PPE to occupy idle capacity OM: Produce hygiene product Improve process efficiency OM: Productivity & efficiency Teleworking OM: Teleworking	Reduce reliance to key customer OM: Market diversification Cost improvement activity OM: Cost improvement Reduce inventory OM: Inventory management Back office worker will be replaced by Bot (use AI to book freight) OM: Digitalization Automation to reduce labor cost OM: Automation Digitalization (Big data to analyses customer information) OM: Digitalization Teleworking (meeting via Zoom) become normal OM: Teleworking Shopping online
Company D	Labor shortage Insufficient finished goods inventory due to surge in demands	Improve supply chain status monitoring system to be almost real time data (ERP) SC: Information Increase number of inbound shipments from 1 to 3 per weeks SC: Supplier activity Increase S&OP frequency SC: Information	Increase capacity utilization (nearly 100%) OM: Production capacity Improve process efficiency OM: Productivity & efficiency Pull migrant workers from other business OM: Recruit new labor Health and hygiene control OM: Health & Hygiene Visitor control OM: Security/Social distancing Work from home OM: Teleworking Establish crisis management committee OM: Crisis management	OM: Digitalization Growth in direct delivery service: OM: Direct delivery Digitalization (improve ERP efficiency) OM: Digitalization Automation to reduce reliance to labors OM: Automation
Company E	Demand drop due to lockdown High inventory High Impact Raw material delayed delivery Raw material price increase in some category such as alcohol	Adjust raw material stock due to decrease in demand OM: Cost improvement SC: Inventory management Switch to alternative source of material SC: Source of supply	Stop O.T. by reshuffle production shift (to reduce production cost) OM: Cost improvement Lean organization combine different tasks into one group. One staff OM: Cost improvement Initiate cost saving projects (to reduce business cost) OM: Cost improvement Freeze recruiting new employee (to reduce cost) OM: Cost improvement Health and hygiene enforcement program OM: Health & Hygiene Digitalization to improve productivity and update production status OM: Digitalization Teleworking OM: Teleworking Adjust product formula (as some raw material is not available) OM: Product formula Postpone unnecessary projects to secure cashflow (freeze CAPEX) OM: Cash management Extend supplier credit term to improve cashflow OM: Cash management Extend customer credit term to support customer OM: Customer satisfaction Establish crisis management committee OM: Crisis management Change production line to produce alcohol gel OM: Produce hygiene product Focus sales through online channel OM: Digitalization Transform administrative work to paperless online system (to OM: Digitalization	Automation OM: Automation Digitalization (plan to update ERP system to be more advance) OM: Digitalization Product innovation OM: Product innovation E-Commerce OM: Digitalization Reduce reliance on a few market segments OM: Market diversification