CHAPTER 2

THEORITICAL FOUNDATION

This section will deliver theories as a fundamental research foundation of the thesis proposal, as a means of upholding scientific standards. Consequently, all the various theories described introduced in the proposal section below, will be the basis of making this thesis in sequence as a critical framework of thinking.

2.1 Theoretical Foundation

The first part of chapter 2 is to describe all the theory and basic terminology that will be used in the framework methodology for the analysis and design in following chapters ahead. The supporting theories of framework and tools for Business Process Reengineering can be seen throughout this chapter.

2.1.1   Information Systems

The thesis itself mainly denotes information systems principles. Hence, it is wise to discuss the theory of information systems to look back at the major concept study. Initially, to define information systems, we need to separately discuss both terms of a system and information.

What is a system? A set of connected components or elements to accomplish goals, is a system, and how the system works is determined by the relationship between the components, as described by Stair et al. (2018). 4 major components of a system consist of input, process, output, and feedback.

What is an information? Information is something that resolute uncertainty, as defined by Claude Shannon in his book, The Mathematical Theory of Communication. To elaborate further, information is likely to be associated with data. In the article "Data vs. Information" by Diffen, it is said that data refers to random unorganized facts and value, whereas information processes and gives context attached with meaning to the data.

Combined term of information and system brings to common interpretation of traditional information systems, data as input for the system and information as the output transmitted from the system. To elaborate more, according to Valacich and Schneider (2018) information system (IS) is a "set of combinations of hardware, software, and networks of telecommunications, that is built to gather, generate and distribute useful data". Valacich and Schneider explained more on the elements used

to transform data for providing information, however the foremost definition of information systems emphasis more on the sequence of events in information systems, e.g., input, processing, output, feedback, and forecasting (Stair, et al., 2018)

Type of information systems that is commonly used in business organizations is called Business Information Systems. Large organizations use one enterprise information systems or separate to accomplish business tasks (Stair, Reynolds, & Chesney, 2018). The figure below shows the main types and the level of information systems tend to be used in business organizations.
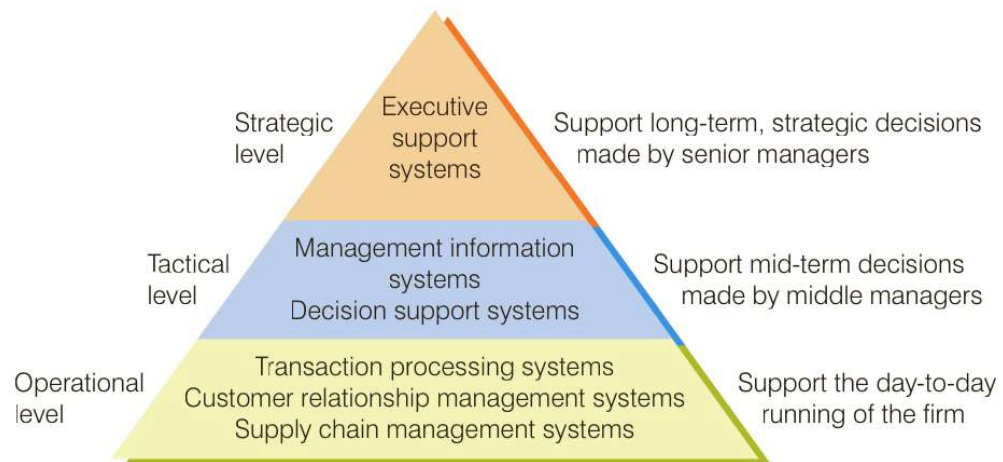
Figure 2.1. Business Information Systems Triangle (Stair, Reynolds, & Chesney, 2018)

2.1.2 Systems Development

Organizations may have a need of information systems which is usually related to their organizational strategic plan (Rainer & Prince, 2015). A system development is usually one of the options on acquiring IT through custom-build application. Rainer & Prince (2015) argued that as company goes through development process, the mindset also changes. A basic of IS custom development is the systems development life cycle or shortened as SDLC (figure 2.2)
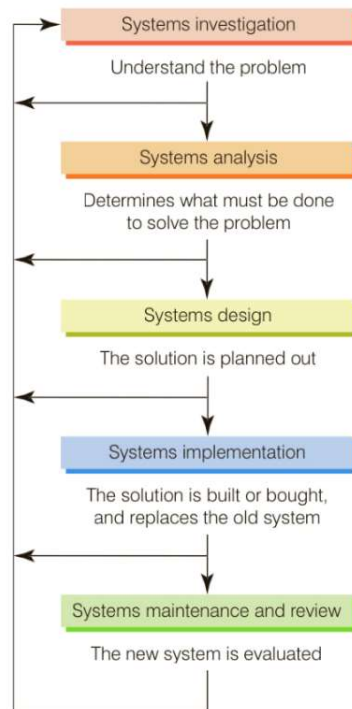
Figure 2.2. System Development Lifecycle (Stair, Reynolds, & Chesney, 2018)

Figure 2.2 gives an overview of a systems development, in an iterative process (Stair et al., 2018). The first two steps of systems development focus on investigation and analysis, in which the processes help to understand problems, select, and define the action and opportunities ahead. Next phases are planning and realization process, which include the design, implementation and review of systems.

2.1.3 Business Process

A business concisely made up of processes, and processes are a collection linked tasks that results in an output (Bhaskar, 2018). Common explanations of business process place more emphasize on delivering value as an output, i.e., service or product to customer. As said by Dumas et al. (2018), the quality of output and services delivered are affected by the way processes are designed and executed.

A business process consists of joint activities to fulfil organization goal, in which each of the business processes is enacted by single or more organizations. Prominent author Davenport considers that companies already defined organization goals at the very beginning to allow task to be carried out to fulfil those objectives (Weske, 2019).

Milan et al. argued that business process is a process that involves people and tools to transform an input to value to meet users and organization objective (as cited in Zaini & Saad, 2019, p. 69). A business processes involves three fundamental elements (Rainer & Prince, 2015), which are:

- Inputs: Materials, services, and information that travels through activities
- Resources: People and equipment that perform the activities
- Outputs: The product or services produced by the process

The figure (2.3) below gives view of business process as collection of interrelated activities that involves people as resources and changes input (customer order) to output (invoice and shipment of products).
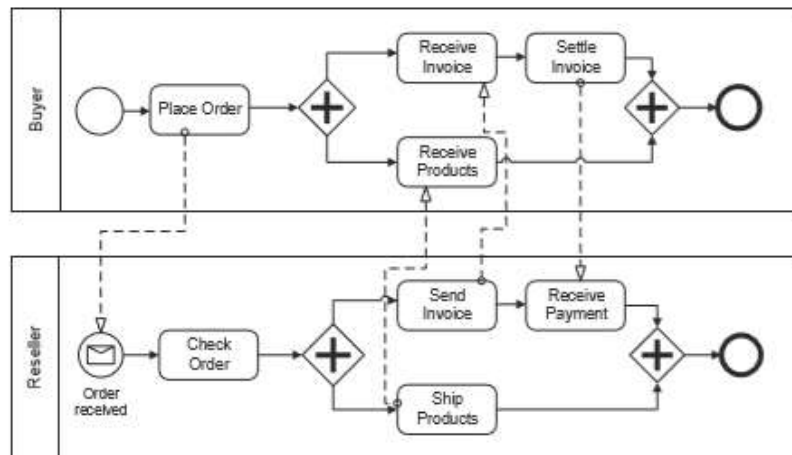

Figure 2.3. Simple Representation of Interactive Business Processes (Weske, 2019, p. 9)

2.1.4 Reengineering

Before examining the details of business process reengineering, it is essential to learn the terminology of reengineering from multiple authors that have made studies about the BPR. According to Weske (2019), many researchers agreed that a business process reengineering is a radical redesigns approach in organizational, human, and sociological aspects. Reengineering commonly revolves in business worlds, where information technology is part of restructuring processes (Bhaskar, 2018).

Reengineering finds and challenges old procedures that block major change in business process. Subsequently, enhancements in business process such as reduced delivery times, increase in quality of service and product, raise customer satisfaction which will eventually provide increase in company's revenue, is through reengineering (Stair, Reynolds, & Chesney, 2018).

2.1.5 Business Process Reengineering

Business process reengineering is undoubtedly recognized as the first and foremost process management tool, and as told by Jeston and Nelis(2013), it was promoted by Hammer and Champy in early 1990s. However, there are myriads definitions of business process reengineering BPR to begin with. The best way to explains the concepts of BPR is through the definition of given by Hammer and Champy itself, in which in the book *Reengineering the Corporation* they argued that business process reengineering is a fundamental rethinking and radical redesign of business processes in favour of improvement in cost, quality and speed (Jeston & Nelis, 2013, p. 434).

According to Bhaskar (2018), "business process reengineering is a tool for transformation of business process and unconstrained reshaping of all business processes". Furthermore, the concept of BPR is a core process redesign which focuses on enhancing business process using IT as main enabler (Zaini and Saad, 2019). This shows that business process reengineering focus is restructuring business processes to create benefits among organizations with significance use of IT, in which technology will help to reduce time cycle and accuracy. To put it simply, process, people and technology are three parts of BPR that cannot be separated, though IT is considered main key element of BPR (Rosing, Scheer, & Scheel, 2014).

Now it can be inferred from the numerous explanations above that BPR is a tool which focuses on these 4 characteristics (Zaini & Saad, 2019), namely:

1. Emphasises innovation and improvement
2. Involves radical redesign of process
3. Utilizes IT in future to-be business activities
4. Help to reduce cost and improve quality of service

2.1.6 Business Process Management

Business process management is as described by Rosing et al. (2014), from the myriad analysis and comparison of BPM definitions, is a discipline or any combination of management techniques which aim to initiate changes in business activity flows to promote enterprise objectives, viewed from entire organization and system perspective, involving management and stakeholders within the enterprise.

Compared to business process reengineering, BPM is not merely all about providing solutions of to-be process using technology and automation, BPM is more focused on the incremental process improvement the explanation by Rosing et al. (2014) that acknowledged BPM as a continuous activity through optimization, in which the improvement is constant and measured, thus eventually meet the goals of organization. . This knowledge is supported by the by Jeston (2013) asserted that BPR is a rather radical process redesign and don't emphasize continuous improvement of process control.

According to Jeston and Nelis (2013), business process management (BPM) is achieving the organization objectives through set of correction, management and control of important business processes. "It is vital to improve the business processes before automating them", Jeston and Nelis (2013) added. Bill Gates once mentioned about technology trait that automation will magnify efficiency on efficient operation, however it applies vice-versa, any automation that applied on inefficient operation will magnify its efficiency.

2.1.6.1 Drivers and Triggers of BPM

Every single organization may face different circumstances than the others. The level of organization's process maturity may vary and generates different counteract to handle and adapt from situation to situation. This opens the discussion of what are the main drivers and triggers which likely cause organisation to consider BPM as possible solution. Though some organizations often to take out some problem indications without taking fundamental to tackle the cause (Jeston & Nelis, 2013).

An organization ought to consider an automated solution depending their drivers and triggers. On the other hand, organization should never over-automate processes to the degree that an organization may loses sight of people participations,

Jeston and Nelis (2013) argued. People involvement are crucial and must be properly engineered into the process. Hence, starting a BPM project is a tricky, however, it must be done when the right number and combination of drivers and triggers befalls to the organization.

According to Jeston and Nelis (2013), there are 7 categories of the drivers and triggers that causes an organization to consider executing BPM, namely, organization, management, employees, customer/suppliers/partners, product and services, processes, and information technology.

2.1.6.2 BPM Implementation Framework

Key component of BPM project:

1. Process: An innovation or redesign of a business process must be on an appropriate level and linked to the organization strategy and process goals, and agreement of the importance processes in a corporation.
2. People: People are a significant aspect of executing the proposed of updated processes. At any rate, people aspects of a BPM project, force an organization to have proper performance indicator along with management structures across key processes.
3. Technology: This refers technology or (Information Technology) as supporting tools for both processes and people.

However, there's this fourth component, which binds 3 major components together; it is the *project management* that represent 'seat' of those 3 legs. A well-run project will always have a good project management that speaks same language in aligning the IT, business and the people.
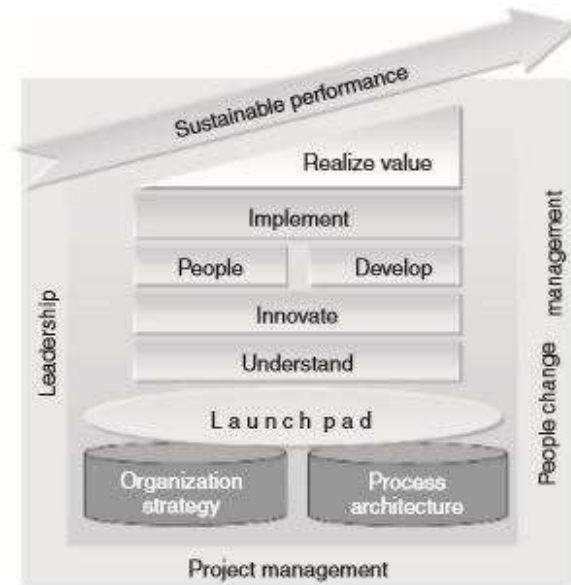
Figure 2.4. Business Process Management Implementation Framework (Jeston & Nelis, 2013, p. 51)

According to Jeston and Nelis (2013), BPM framework (2.4) is called 7FE Project Framework. BPM has 10 phases that are grouped by, as follows:

1. Foundation Phase

A foundation phase is where the BPM projects are determined to extent to which in the organization strategy and process architecture be referenced. Most of BPM projects are initiated from the Launch Pad phase.

a. Organization Strategy

This phase is an initial phase of a BPM implementation project. It includes ensuring all organization strategy, vision, and strategic goals are clearly known. All the project stakeholder must know the short-terms and long-terms gains of the project and the value proposition of the organization is understood. This will link up to a glimpse of future direction by the scope of project with the organization strategy and ensure that is adding value to it. The purpose of this phase is to describe how to the organization strategy and process relate and interact (Jeston & Nelis, 2013).

b. Process Architecture

This phase is where an architecture of process is constructed. This phase acts as a prerequisite for any organization commencing process management which has nature of sustainable and agile, to continuously meet organization objectives under any shift of circumstances. A process architecture is a way of an organization to establish set of objectives, principles, models and guidelines to enable BPM implementation in whole organization.

The design and realization of a BPM process initiatives are provided in the process architecture phase. To put it simply, process architecture is where the process, IT and business architecture brought into alignment with the organization strategy. The process must be properly associated with current IT and applications, as the IT must support the future process development. Jeston and Nelis (2013) argued that process architecture must ensure that all the information relevant to the foundation and guidelines for the process review and improvement are clear and preferable. The process architecture is the link between the organization strategy and the next phase, Launch Pad.

c. Launch Pad (BPM Foundation)

This phase demonstrates several ways to determine where and how to start a BPM project. Jeston and Nelis (2013) notes, "a process goals and vision need to be aligned with the organization strategy and process architecture". A launch pad phase is where the BPM project scope is established, and process is selected.

This phase is not limited only on providing way to start the project, it will also administer every measure necessary of a project, i.e., has expected output such as determining stakeholder, process selection matrix, identified business processes and initial metrics, project management and a list of process goals and prioritized process for the next phase, Understand phase. Process modelling and simulation of AS-IS process documented using flowchart diagram is the main objective in this phase to find optimal solution for the next phases.

2. Findings and Solution

   a. Understand

The objective of Understand phase is to help the relevant internal and external stakeholders gain sufficient understanding of the ongoing business process to enable the initiation of Innovate phase. This phase is important because it identifies the basic cost and time of process for comparison of the future.

In this phase, it is essential to understand and analyse the business processes that has been identified in the previous phase. The current process within the organization is validated by following problems and difficulties using root-cause analysis. Once the process is clearly understood, henceforth an improvement priority within the project scope can be defined by identification of possible quick wins.

   b. Innovate

This phase takes the most creative steps of BPM projects and often the most interesting. This phase includes all the associated stakeholders, both internal and external, not only the project and business team. New processes inspired by the organization strategies and process architecture are identified and after that a simulation will be created, activity-based costing is made and determine the capacity planning and feasibility studies of implementation to enable the finalization of the best choices.

3. Fulfilments

   a. Develop

This phase includes building all components for the implementation of new processes that is designed in innovate phase. It is important to understand that the context of "building" doesn't mean to build only an IT system. However, this could involve the whole infrastructure development to support the change management programs. Develop phase produces a high-level overview of the solution and detailed business requirements. It also involves the design, configuration and testing hardware and software.

b. People

The people phase is a crucial phase in BPM process implementation and must be handled systematically. People contribution and their engagement in the implementation are the most influencing factors which determines that processes will run effectively and efficiently. In BPM project, this phase is usually run at the same time as the develop phase. The develop phase creates the automated solution, whilst the people phase ensures the activities, roles and people measurement solution match the organization strategy and process goals.

c. Implement

This phase is where all the improvement of processes that have been designed and developed is 'brought to life' or executed. All aspects (such as the roll-out and testing of new processes, people, and technology) of the project are executed. An implementation plan is crucial to the performance management and measurements because a well-defined implement phase will produce trained and motivated staff and improved process that work according to initial user requirements.

4. Future
   a. Realize Value

   This second-to-last phase aims to ensure that benefits that have been specified in the project business are realized. The project may have gone live, but it must go through a series of steps such as benefits summary plan and delivery matrix. A project is genuinely completed once it has achieved all business value or benefits that are expected.

   b. Sustainable Performance

   The last phase of BPM Framework expresses that a project-based BPM framework must evolve into a business-based BPM environment. A constant sustainability of process improvement is the purpose of this phase.

2.1.6.3 Four Scenarios in Implementing BPM

In a project, it is essential to recognize what kind of implementation scenario that suits one organization. As situation may always vary in each organization, the impacted level will be different.
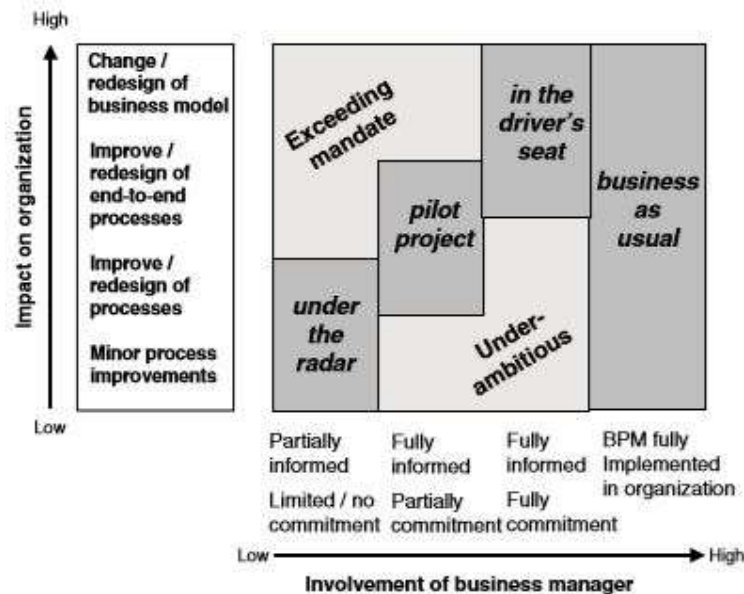

Figure 2.5. Scenarios for Process Improvement (Jeston & Nelis, 2013)

A BPM project has four implementation scenarios.

1. *Business as usual.* This type of scenario is mostly selected by an already BPM-mature organizations. All the business owner do commit to a process-centric organization.

2. *In the driver's seat.* Next level of BPM maturity, whose business owner is fully informed and totally committed of the BPM implementation. However, below the level of business as usual state.

3. *Pilot project.* Business managers is not yet totally convinced of the benefits of BPM and is trying only a small scale before attempting a full dedication.

4. *Under the radar.* Least BPM-mature organization happens to encounter occurrence of this state. It is where the parties are partially informed and not yet committed to BPM within organization. This scenario could be an improvement project resemblance of minor process improvement, not a BPM.

2.1.7 Supply Chain

As many authors commonly agree, supply chain refers to networks of companies that work and coordinate their activities on delivering product to end user (Weske, 2019). Chopra and Meindl (2015) argued that "a supply chain not only includes the manufacturer and suppliers, but also transporters, warehouses, retailers, and customers themselves". This indicates that a supply chain mainly includes three participants or more. Those participants are interconnected businesses, which involved in a stream of product and service from source to the customer (figure 2.6).
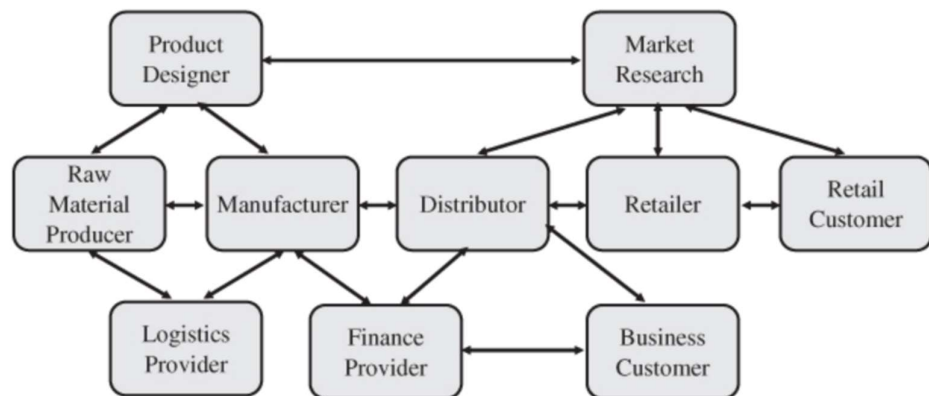

Figure 2.6. An Extended Supply Chain Structure (Hugos, 2018)

A supply chain includes all of stages involved in fulfilling customer request. According to Kozlenkova, et al. (2015), "a supply chain involves the transformation of natural resources, raw materials, and components into a finished product that is delivered to end customer". According to Daneshjo & Kravec (2015), common manufacturing supply chain objective can be identified as:

1. Increase of output.
2. Cycle time reduction.
3. Amount of inventory reduction at different stages (Raw material inventory – work-in-progress inventory – finished goods inventory).
4. Reduce the unavailable capital.
5. Suspended management.

2.1.8   Supply Chain Management Systems

A supply chain management (SCM) system helps to integrate suppliers and the customers on operational and technical level (Dumas et al., 2018). The authors then described further that SCM systems support the management of logistics, storage and inventory as well as planning and calculation on operational level.

On technical level, SCM systems support electronic data interchange (EDI) between suppliers and customer, including the use of RFID and barcode (Dumas et al. 2018). As of today, SCM encompasses all processes involved in producing and delivering product and services to the customers, thus, giving opportunities for businesses to identify bottlenecks that slow entire supply chain activities (Daneshjo & Kravec, 2015).

Hugos (2018) stated that a supply chain management is an important component of business in manufacturer and distribution companies as it coordinates production, inventory, location and transportation among participants. All activities required to get the product to customer are represented in a in the processes of product journey, with objective to deliver demand fulfilment to the best mix of efficiency and responsiveness for customer satisfaction.

2.1.9   Inventory Management System

2.1.9.1 What is Inventory

According to Afolabi, Onifade, and Olumide (2017), inventory is the list of aggregate items for some formal purpose; a quantity of materials in which an organization stores, process for sale or goods that make the sale.

Type of inventory according to Muller (2019), can be classified into three basic types which include:

1. Raw material inventory – goods that make the production; all materials used for processing
2. Work-In-Progress inventory – consists of intermediate stage of raw materials that entered production process or partly processed but not yet completed
3. Finished Goods Inventory – a finished products ready to be sold, waiting for shipment or still stored in warehouse

2.1.9.2 Inventory Management

Inventory management can be a challenging problem for businesses. Customer demand must be fulfilled by having inventories on hand however these inventories have holding cost (Sohail, 2018). Therefore, the primary notion about inventory management is to gain responsiveness and efficiency at the same time. This can be achieved by having a controlled inventory levels, especially reducing items that do not frequently sell and stock adequate level of high selling products at many locations (Hugos, 2018)

There are several techniques of inventory management according to Afolabi et al. (2017), which are:

1. The economic order quantity (EOQ),
2. Vendor-managed inventory (VMI),
3. Just-in-time (JIT)
4. and activity-based costing analysis.

One of the ways to achieve goals of good inventory management is by using inventory management systems functions. Inventory management system is, as stated by Hugos (2018), a combination of technology and procedures that support the activities of inventory management to achieve balance cost of carrying inventory and cost of running out of inventory for a company by organizing inventory data. Inventory management systems encompasses primary activities of managing firm's inventories such as inventory planning and order forecasting, inventory tracking and reporting (Dhodi, 2018). Modern inventory management systems use information technology such as business intelligence (BI) to collect, store, and analyse data from BPM systems or RFID and barcodes, then uses it to display results from complex inventory management techniques (Hugos, 2018).

Through the explanations above, we can define that inventory management system enables businesses to actualizing stock control by organizing inventory data flow and generate automated forecast report to avoid product overstocks and outage. Inventory management system is essentials for manufacturer and distribution companies to determine the optimum level of inventory and find answers to problem of safety stock and lead time (Sohail, 2018).

2.1.9.3 Planning and Replenishment Concepts

According to Hugos (2018), companies may consider stocking inventory to act as a buffer against uncertainty in supply chain, however holding inventory can be expensive. Companies may consider counting re-order level, in which the order must be placed to procure new item before it hits lowest amount of item on hand (Sohail, 2018).

Then how do companies try to determine optimal inventory levels and reorder points? Distributors and retailers consider economic order quantity (EOQ) technique and safety inventory to compensate for uncertainty and increase efficiency of procurement in supply chain.

EOQ is formula to calculate an order quantity that gives most cost-efficient amount to purchase at a time (Hugos, 2018). While the safety stock is a "safety inventory is the amount of inventory on hand for an item when the next replenishment EOQ lot arrives", stated by Hugos (2018). EOQ gives trade off options between ordering cost and storage cost in choosing quantity for replenishment, all depend to the type and nature of stock. The safety stock becomes a necessary inventory on hand that doesn't turn over, with objective to handle uncertainty of demand or delay in replenishment.

Below is explanation of relationship between re-order point (ROP), EOQ, and safety stock according to Muller (2019).

1. **To calculate re-order point (ROP)**

(Usage x Lead Time) + Safety Stock = ROP

2. **To calculate EOQ,** (as a basis for calculation)
   a. *Replenishment Cost*
   b. *Carrying Cost*
      A= Total Value of SKU per Year (or usage rate)
      K = Carrying Cost (holding cost per year)
      R = Replenishment Cost (or ordering cost per unit)
      P = Price per Unit

$$EOQ = \sqrt{\frac{2AR}{P^2K}}$$

The variations of EOQ and ROP formula enables to determine the following (Muller, 2019):

a. Optimal amount of inventory to order each time
b. Maximum inventory level
c. And when it should be ordered

2.1.10 Procurement Management System

The basic procurement, also known as sourcing, it is a practice of locating, selecting suppliers, and acquiring the goods from lowest-cost supplier (Hugos, 2018). It is one of major component used in the supply chain operation. Whereas procurement management explained by Seshu et al. (2019), therefore is a practice of planning, organizing, directing, and controlling acquisition of goods and services to of achieve value for investment such as quality and proper quantity, from the right suppliers at the right time and price.

Moreover, procurement system is a solution which naturally aids the procurement management process by using in modern information and communication technologies. According to Hugos (2018), a procurement systems or procurement management systems focus on the streamlining procurement activities between a company and its suppliers. Procurement systems allow people to keep track of product, purchasing histories, supplier data in a database, typically replace traditional supplier catalogues. Procurement system enables stakeholders to do supplier evaluation such as comparing various suppliers' price and performance. Other than that, Hugos (2018) notes, "a routine transactions that occurs in the purchasing process can be largely automated".

2.1.11 Organizational Structure

Organizational structure refers to a way to reflect process understanding within a structural or matrix reporting and functional responsibilities (Jeston & Nelis, 2013). An organizational structure is needed in business process modelling to provide clear organizational view. It defines organizational entities in hierarchical positions

associated with roles or departments in organization (Weske, 2019). Therefore, having organizational structures helps to support coordination and communication by identifying which individuals are responsible for which tasks.

By looking at the shapes of organizational structures, we can deduce that type of structure of the company must be tailored to the specific organizational goals. There are at least 3 common organizational structure applied in businesses:

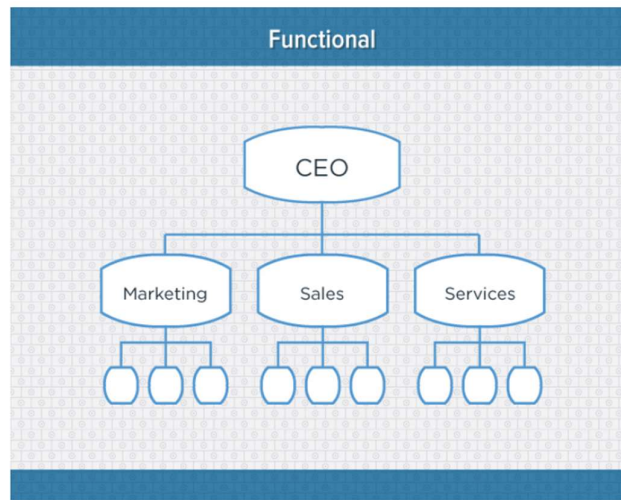1. Functional organizational structure (2.8),

Figure 2.7. Example of Functional Organizational Structure (Devaney, 2012)
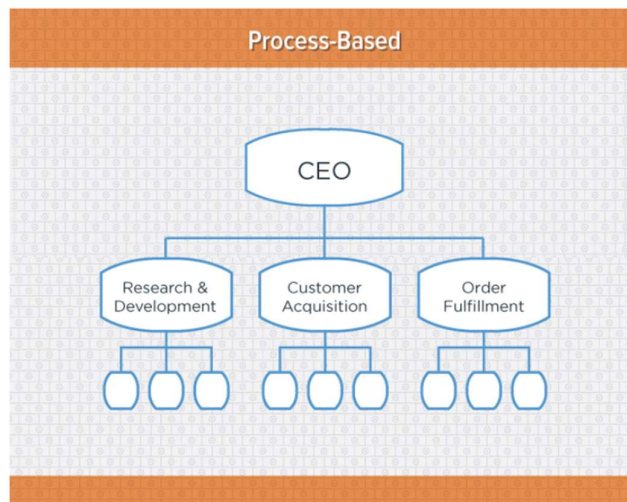
2. Process-based organizational structure (2.9),

Figure 2.8. Example of Process-Based Organizational Structure (Devaney, 2012)

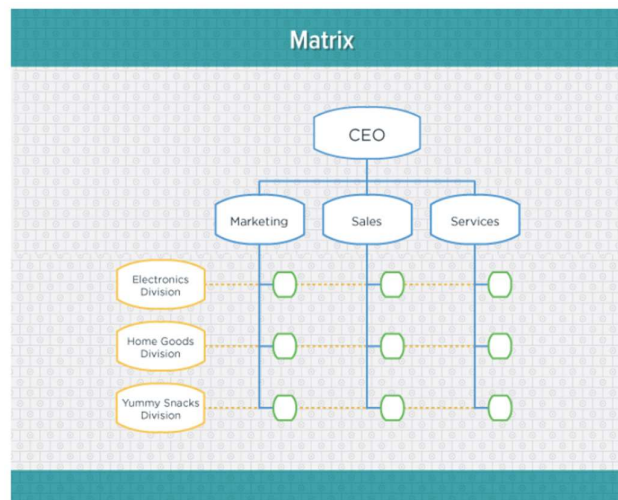3. Matrix organizational structure (2.10).

Figure 2.9. Example of Matrix Organizational Structure (Devaney, 2012)

2.1.12 Value Chain Analysis

Value chain is a famous approach in business administrative to understand how a company operates each of its function to achieve organization goals (Weske, 2019). According to Zamora (2016), the concept of value chain that was first originally introduced by Porter (1985) is to describe whole activities, which are required to generate product or service from the beginning of production to consumer. Value chain analysis assumes that as the product moves from one chain to another, it gains value, Hellin and Meijer argued (as cited in Zamora, 2016, p. 116).

According to Weske (2019), "all functions that a company performs need to contribute to the success of the company". Porter's Value chain can be used to form process architecture by distinguishing 2 categories of processes which are the core processes and support processes (Dumas et al. 2018). It can be seen through the following figure below that value chain separate two major processes in an organization.
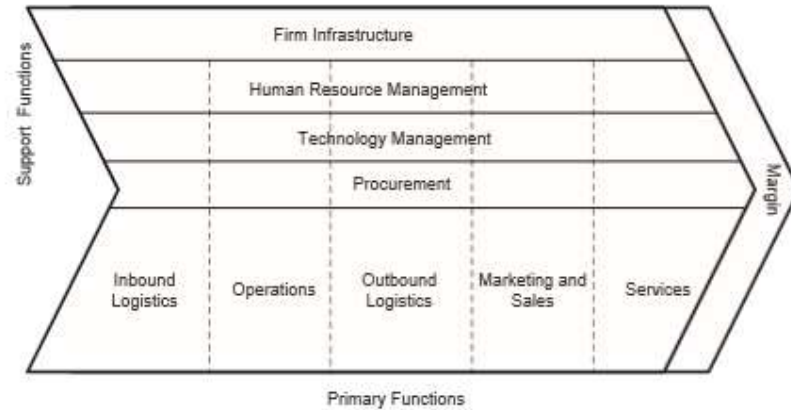
Figure 2.10. Internal Structure of Value Chain by Porter in 1985 (Weske, 2019)

2.1.13 SWOT Analysis

According to Gurel (2017), SWOT Analysis is remarkably the most used tools for strategic management in organizations. Thompson mentioned that 'SWOT Analysis used for sizing up organization's resource capabilities (strength) and weaknesses, its market opportunities and external threats, as is the acronym of SWOT. (as cited in Gurel, 2017, p. 995). Gurel argued that SWOT Analysis is such a significant tool that can be used to figure organizational strategy and achieve competitive advantage.

Jeston and Nelis (2013) agreed that "the completion of a business process SWOT Analysis may reveal some processes as being significant strengths and others significant weaknesses." As seen on the figure below, 4 components that coexist in two dimensions of SWOT: strengths and weaknesses are the internal dimensions, while opportunities and threats are external dimensions (Gurel, 2017).

Organizational Strengths	Characteristics that give advantage over others in the industry.
Organizational Weaknesses	Characteristics that place at a disadvantage relative to others.
Environmental Opportunities	External elements in the environment that give benefits for the organizations.
Environmental Threats	External elements in the environment that could cause trouble for the organizations.

Figure 2.11. Components of SWOT Analysis (Gurel, 2017)

2.1.14 Organization Process View

According to Jeston and Nelis (2013), organization process view is a visual representation of organization's high-level view from a process perspective. The depiction of process grouping is ordinarily shown in two categories, as portrayed by Porter's Value Chain model, but with added strategic processes. (Dumas et al., 2018). The categorization of process models by Dumas for process architecture is similar to what Jeston explained in his BPM frameworks, those categories are:

1. Strategic Processes – also can be called as management processes, this level provides directions, rules and practices to ensure that the underlying process keeps on meeting certain objectives.
2. Core Processes - this level describes the fundamental or main business activities of the organization. This level of process covers the essential value creation of a company.
3. Support Processes - this level describes all processes which support the main business processes within the organization.

The example of visual representation by Dumas as explained in the points above is represented in the following figure (2.13). This organization process view is often used in organizations in a compact and readable manner (Dumas et al., 2018). All the symbols used for the processes is chevron shape and often called value-chain modelling.
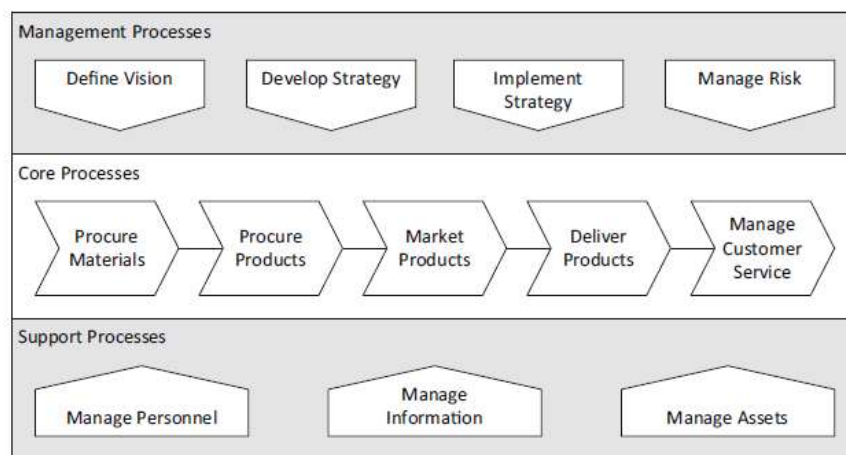

Figure 2.12. Organization Process View (Dumas et.al., 2018)

2.1.15 Process Selection Matrix

A process selection matrix (PSM) is a way to showcase all business processes in a business unit based on existing functional processes. It is continuation of an elaboration in organization process view (high-level view). Moreover, PSM is also an ideal way to understand and indicate level of process complexity, number of processes, and the high-level process metrics within the business in one page (Jeston & Nelis, 2013).
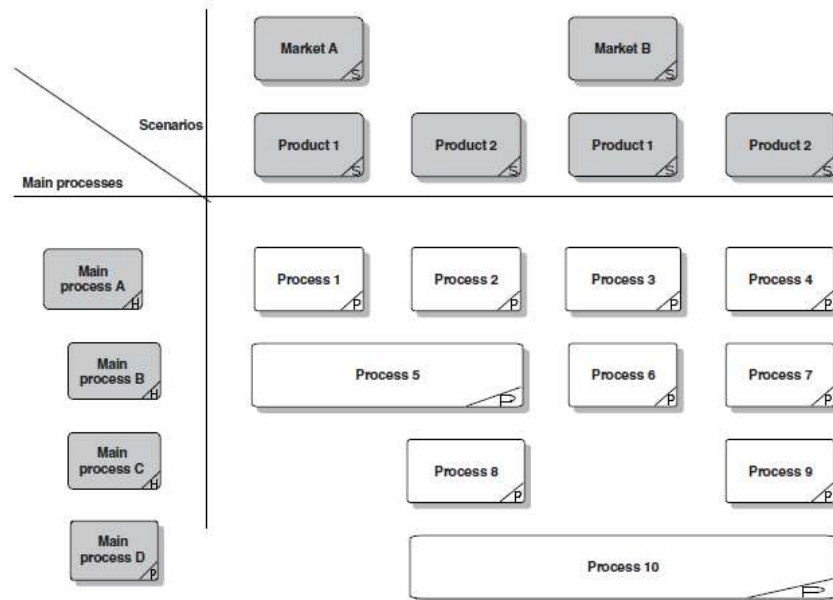

Figure 2.13. Process Selection Matrix (Jeston & Nelis, 2013)

As seen on the figure (2.14), in the matrix, the vertical axis contains main process which originated from list of end-to-end process, meanwhile the horizontal axis contains scenarios to provide detailed analysis of the process in vertical axis.

2.1.16 People Capability Matrix

According to Jeston and Nelis (2013), People Capability Matrix (PCM) can be used to analyse current skills and can give insightful information of the root causes of current process anomalies and how will they need to change in future process.

Knowledge capabilities/ skills required / Key processes	Ability to sell to customers	Communication skills	Data entry skills	Dealing with difficult customers
Notification	2	2	3	1
Assessment	1	1	3	1
Approval	3	2	3	1
Payment	2	2	3	2
Finalization	2	3	1	1

Figure 2.14. Sample of People Capability Matrix (Jeston & Nelis, 2013)

The PCM figure (2.15) above provide example of how this matrix could be completed (Jeston & Nelis, 2013). The horizontal axis represents capability or core competencies expected by a process to complete its tasks. Whereas the vertical axis is the enumerated end-to-end processes. An assessment of core competencies is made by scale of 1, 2 and 3, where 1 is mandatory skill and 3 is unessential-but-desirable skill.

Based on the following explanation above, it can be concluded that People Capability Matrix is a measurement table to understand gap between current and future individual skills that affect the company's activities.

2.1.17 RASCI Model

RASCI Model according to Jeston and Nelis (2013) is a convenient method that aid to define activities, roles and responsibilities during People phase in BPM project. RASCI model generally match roles and responsibilities with the process.

RASCI Model is very useful when launching a new change management program. Let's examine what RASCI stands for according to Cabanillas (2017):

1. R for Responsible: The person who performs the work and responsible for the activity until it is finished.
2. A for Accountable: The authorized person who approves the work and to whom 'R' is Accountable.
3. S for Support: The person who gives support and assistance to those who hold responsible. Typically, people who provide resources or information in supporting roles.

4. C for Consulted/Counsel: The person whose feedback or suggestions is seek while performing the work. Generally, in a passive way, this person contributes to activities before decision making.

5. I for Inform: The person who is kept up to date about information on activity progress and/or the result of the work.

	Business unit manager	Manager	Business unit head	Team leader	Compliance advisor
Activity 1	R		A		
Activity 2	A	R		S	C
Activity 3	RA		I		I
Activity 4	RA				C
Activity 5	A	R		S	

Figure 2.15. Simple RASCI Model/Matrix (Jeston & Nelis, 2013)

2.1.18 Root-Cause Analysis Fishbone Diagram

According to Jeston & Nelis (2013), it is important to find the actual origin of problems or non-performing process before commencing innovate phase of process. A root cause analysis is performed by an organization or project team by conducting observation, investigation, analysis, and communicate to process owner.

A root-cause analysis must include the following information: process or error sources, the implication of other process errors, design and sequence of processes, and organization's capacity to complete the process in desired standard (technology and people). One of the tools to document root-cause analysis is by using fishbone diagram.

2.1.19 Flowchart

In the Business Process Management, a flowchart is one of the types of process model used for process modelling (Jeston & Nelis, 2013). Flowchart represents graphical depictions of steps, sequence of procedures or the workflow within a process in business or company's systems. Businesses commonly use flow chart to picture high-level flowchart to store procedures and represents their processes.

Flowcharts prompt business analyst and programmers to solve problems into smaller segments and encourage in analysing alternatives in operations. Some type of

the most used flowcharts: document flowcharts or paperwork, system flowchart and program flowchart (Hall, 2018).

Flowchart component: process start and end nodes, stage or process, decision nodes and connectors (Figure 2.6). "In their most basic form, flowcharts consist of rectangles, which represent activities, and diamonds, which represent points in the process where a decision is made", argued by Dumas et al. (2018).
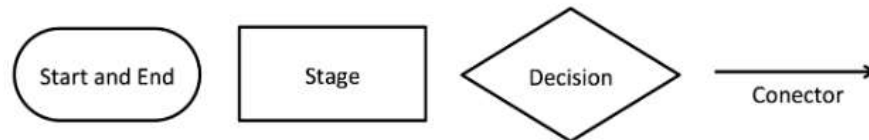

Figure 2.16. 4 Major flowchart Components (Universitat d' Alacant, n.d.)

2.1.20 Activity Diagram

One of the ways of documenting process workflow is by using activity diagram. Any workflow by its definition has the purpose to sequence a processing step that handle one business transaction activity (Burd, Satzinger & Jackson, 2015). A workflow may have complex list of processing steps and include members from different component of organization that participate in the business process. Activity diagrams is a standard UML diagram with functions as an effective technique to document flow activity (Burd, et al., 2012). Hence, an activity diagram serves as a figure to define user or system activities, the subject who involves and does the activity, and the sequential event flow of the activities performed.
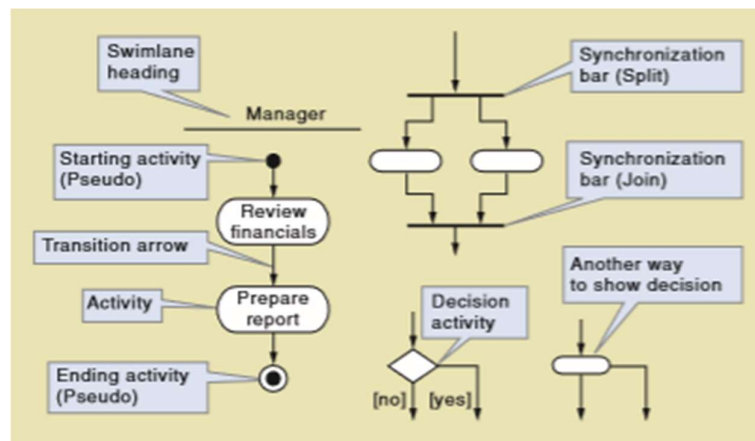

Figure 2.17. Activity Diagram of Order Fulfilment Process with Examples (Burd, Satzinger & Jackson, 2015)

Following figure above (2.18) shows an example of fulfilment process activity documented in activity diagram from start to end. It can be seen from the figure above that process in activity diagram is signified by the symbols, as described below:

1. Swimlane heading is a rectangle item in the activity diagram which shows the activity being completed by an agent. A swimlane always shows who performs and divides the workflow activity into groups. It is common that one workflow may consist of more than one swimlane, i.e., different agents performing separate steps that start after another.

2. Start and end activity (pseudo) is the black circles in the very beginning and end of activity which indicate the start and ending of workflow.

3. Transition arrow or connecting arrow is a direction line that represent the transition or sequence between activities.

4. Activity is usually illustrated by an oval shape; it is a symbol that describes an activity in a workflow.

5. Synchronization bar is a heavy solid line symbol used to control process route, either splits or recombines parallel paths.

6. Decision activity is represented by diamond shape. This symbol is used when there are 2 or more alternatives of process output made by a decision in an activity.

2.1.21 Business Process Modelling Notation (BPMN)

In a business process diagram (BPD), Business Process Modelling Notation (BPMN) is a standard mechanism of a process modelling that provides graphical notation based on traditional flowcharting techniques (Rosing, Scheel, & Scheer, 2014). Moreover, Weske (2019) stated that Business Process Modelling Notation or BPMN is very similar to the flowcharting technique of unified modelling language for object-oriented design and analysis. It has the same intent as the UML version of workflow documentation, activity diagram. Business process modelling notation used to picture logical steps within a business process using its own set of symbols.

BPMN exists with the purpose to identify semantic process sequence in a business, with a different level of perceptions, giving understandable insights for all users, ranging from the business perspective to a more technical level. As Rosing et

al. (2014) point out, the goal of BPMN is to support BPM with understandable notation for all stakeholders, bridging the business analyst who create and refine the processes and technical developer whose responsibility to implement them.

The notation is made out in a standardized documentation expressed in definitive modelling diagrams. The various BPMN elements are shown below (Figure 2.19).
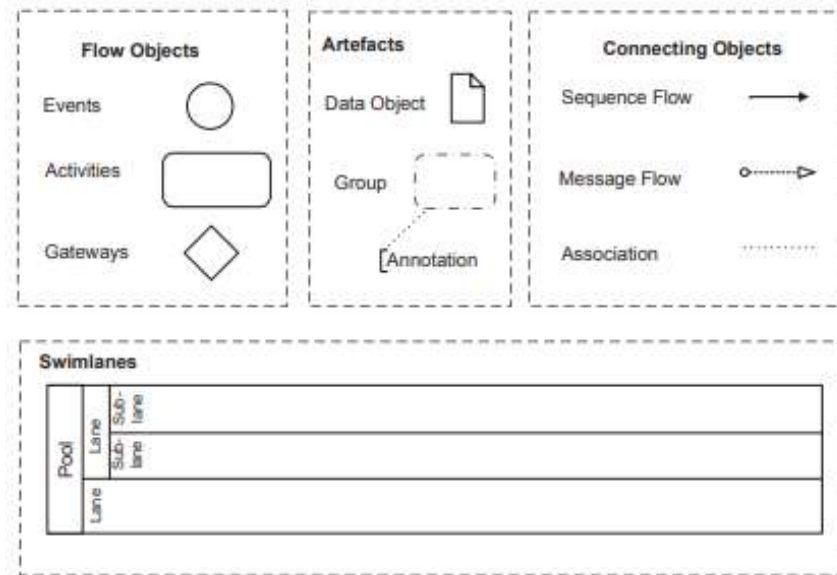

Figure 2.18. Business Process Modelling Notation: categories of elements (Weske, 2019)

As seen in figure 2.19, there are at least 4 element categories of BPMN notations, which are:

1. Flow objects

Weske (2019) in the book asserted that "a flow objects are the building blocks of business processes". Flow objects include:

    a. Events: Indicate trigger of start and end of a process as well as any interaction within the flow.

    b. Activities/Tasks: Represent an action which performed by participants.

    c. Gateways: Represent a pathway of process. It allows modeller to control as well as combine and split the process flow.

2. Connecting Objects

Connecting objects connect the flow of object, swimlanes and artefacts. Connecting objects consists of:

a. Sequence Flow: Represented by a solid line and arrowhead and is used to show the sequence of an activity

b. Message Flow: Similar like a sequence flow but with a dashed line and is used to show the flow message between two separate process business entities/swimlanes.

c. Association: Represented by a dotted line. It connects artefacts.

3. Artefacts

Artefacts aren't directly relevant for the flow of message in the process. It is used to show additional information. Artefact consists of:

a. Data Object: Represents input and output data from activities of a process. It is used to support documentation of the process. Usually connected to represent that data object is used within activities in process.

b. Annotation: A text annotations are used to detail certain attribute and provide additional information in a textual form.

4. Swimlane

a. Pool: Explains whole member of organizations which take part in the interaction of several business processes in containing lanes.

b. Lane: A lane represents department with specific roles. Contained by a pool.

2.1.22 Use Case Diagram

According to Satzinger et al. (2015), a use case is an activity of a system, in which it performs as response to user request. However, most of use case is illustrated in an UML diagram to make it easier to understand how the system and user interacts.

Use case diagram is a UML model that visually depicts various role of users and how they interact with systems (Satzinger et al., 2015). In UML, a user or person is called an actor, and sometimes it represents another system or device. A use case

diagram itself is an oval shape with name of the use case on top. Figure (2.20) shows the component of use case and their position: automation boundary, connecting line and actor.
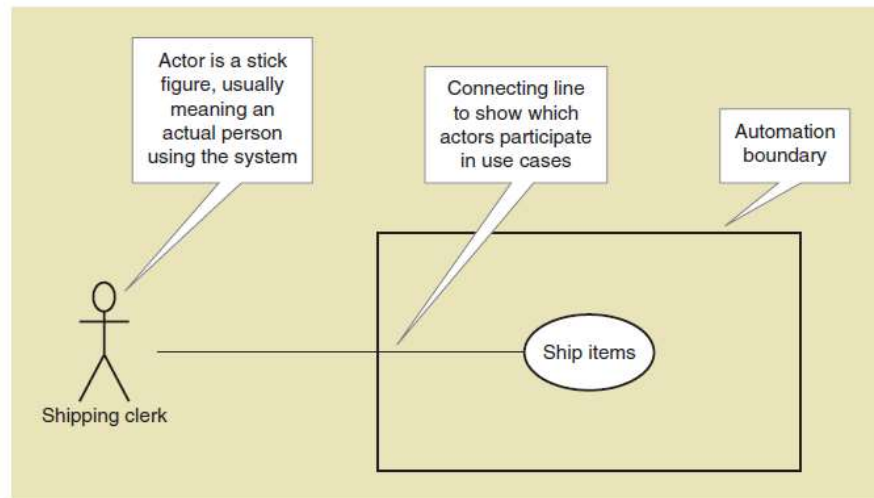
Figure 2.19. Simple Use case with Explanations of Each Components (Burd, Satzinger & Jackson, 2015)

2.1.23 User Interface (UI)

According to Rainer and Prince (2015), a user interface is utterly one of the following deliverables of systems design phase on technical system requirement. The definition of user interface itself is the element of operating systems that allows people to see and interact through presentation layer of computer system (Stair et al., 2018).

An initial design of a user interface is influenced by the system sequence diagram (SSD) and use cases, as they help to identify interactions between actors and systems (Satzinger et al. 2015). A user interface can also be called a view layer, which accepts information request and display results. Moreover, user interface should be designed for ease of use and operational efficiency, with design that varies depending on the target user. Satzinger et al (2015) argued that designing user interface can be sought by using many models such as mock-ups, storyboard, and prototyping tools to produce high-quality UI that leads to user productivity improvement.

2.2 Theoretical Framework

This section will cover up elaboration regarding methodologies that are used in the thesis. The methodology framework used for analysis and design is business process management (BPM) Framework. Furthermore, there will be explanations of using BPM to design the standard of procedure and the creation of inventory and procurement systems design which revolve around supply chain performance throughout the entire company processes. The need of prioritizing process optimization and introduction to new systems, triggers BPM implementation in the company.

The main objective of this thesis is to implement business process reengineering by creating comprehensive design of core processes in the company, this revolves around supply chain environment of the company. While the company is an importer and distributor, applying the BPM discipline can resolve the issues and achieve process improvements in their core business process – such as supply chain. BPM is a bridge between business processes and information technology. It also integrates people across the organization's supply chain. Thus, allows organizations to leverage IT for its supply chain processes to enable real-time information.

The main premise of implementing BPM framework in PT Kusuma Kemindo Sentosa is to improve responsiveness and efficiency through process improvement and IT enablement. Synchronizing supply chain with strategic analysis of end-to-end process (value chain) related to BPM implementation framework will deliver growth and profitability by increasing operating efficiency, minimizing errors in inventory, increase visibility across suppliers and partners, and adding more value to products and services to deliver competitive advantage as well.

1.2.1 Data Collection and Evaluation Methods

The research itself follows qualitative methodology from data analysis which will be collected by conducting interview and field observations. At first, the data gathering of the fieldwork will be conducted on-site delivery. Nonetheless, due to COVID-19 outbreak, the situation in Indonesia now is no longer supportive for on-site meeting. Hence, as a follow-up to government's work-from-home notice, half of the remaining data collection method will be done through online site. Lastly analysis

will be performed, using the framework of thesis adapted from the BPM implementation framework.

1.2.1.1 Interview and Surveys

The interview will be conducted to obtain accurate objective qualitative review given by each lead division based on their own perspective and experiences. The author as the interviewer will ask questions regarding the current running business process and requirements. There is also the distribution of questionnaires for process and people surveys in the organizations. Further interview and survey is half-done by online survey and conducting interviews via conference call.

1.2.1.2 Field Observations

The author will carry out direct observation in the company environment where this research will be conducted. The author will observe business objects, existing documents such as flowchart and procedures, and daily business events happened in PT. Kusuma Kemindo Sentosa.

1.2.2   Research Analysis and Design Method

The author will follow the rules and heuristic method of business process management implementation framework by Jeston to ensure deep understanding of scientific study and applicable to the following company, PT Kusuma Kemindo Sentosa. Three critical aspects to be considered for process improvement are people, process and systems or technology.

There are ten phases of BPM implementation framework. All of them are refined to align critical components with the strategy of the company. The ten phase of BPM implementation framework are as follows: organization strategy, process architecture, launch pad, understand, innovate, develop, people, implement, realize value, sustainable performance. BPM phases can be grouped into what is called 4F's which relates to foundations, findings and solutions, fulfilment, and future. However, only 8 phases until implement phase that will be conducted due to the condition and scope of the research.

Therefore, the adapted framework of this thesis is illustrated by the following research output figure:
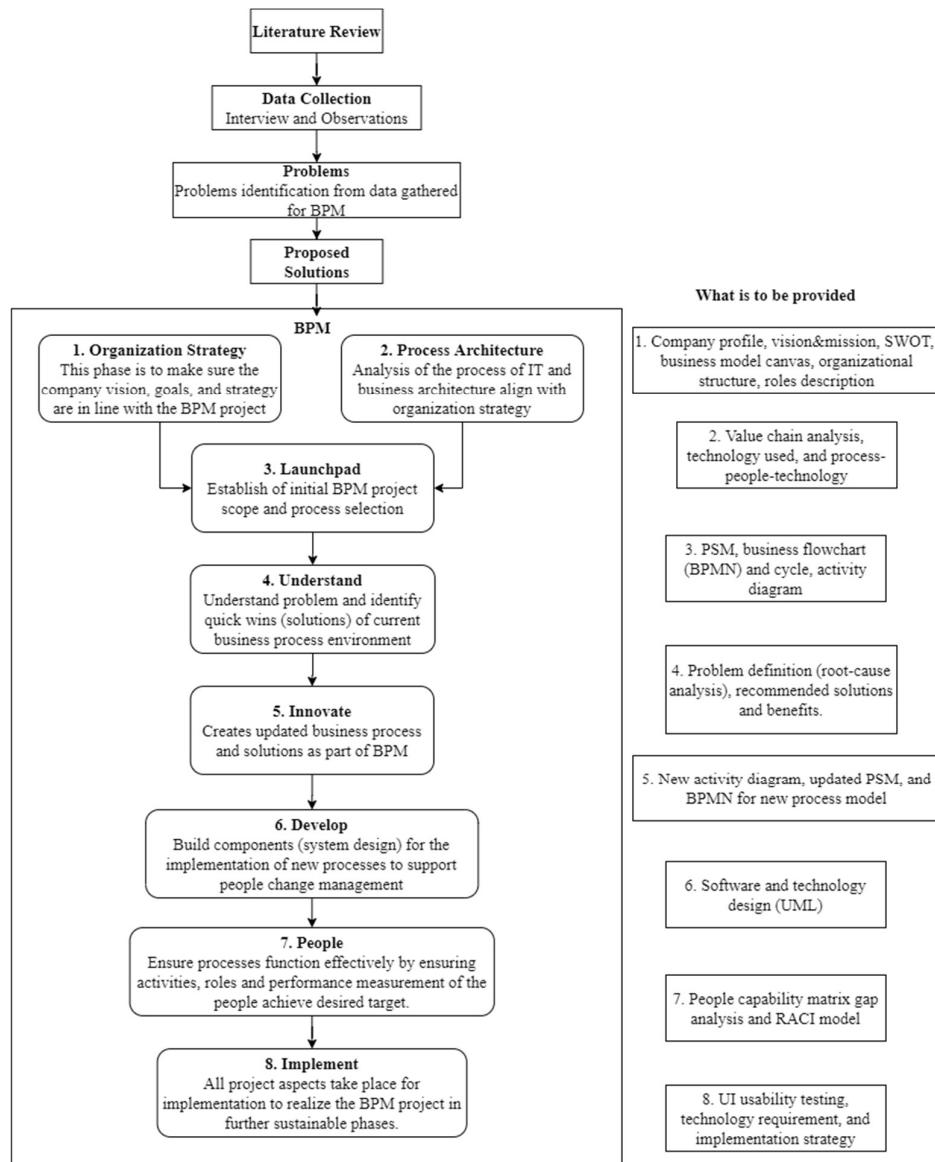
Figure 2.20. Framework of Thinking and Methodology

The approach of this thesis framework for this paper consists of 8 phases embedded within 7 chapters. The first three phases will be initiated with data collection using user-interview and observations of the current processes and systems by the author. The BPM Implementation framework will be conducted in the third until sixth chapter of the thesis. Chapter 3 includes the first until fourth phase of BPM implementation framework. Chapter 4, 5, and 6 will finish rest phases as completion part of solutions, fulfilment and future for PT Kusuma Kemindo Sentosa.

1. First phase – Organization Foundation, several steps will be taken such as analysing all the needed documents of top-level organizational architecture. The organizational strategy ensures that BPM project meet the objective of the organization and add value to it. This phase outcome will explain following outcome:
   a. Organization overview
   b. Vision and mission
   c. Organization strategy using SWOT analysis
   d. Business model canvas
   e. Organizational structure and roles descriptions

2. Second phase - Process foundation phase that connects organization strategy and BPM foundation (launchpad phase). Process architecture is to analyse the alignment of IT and business process is done in the company to achieve organization goals.

   This includes creation of:
   a. Organizational process view using value chain
   b. List of technologies used
   c. A model of current process-people-technology of PT Kusuma Kemindo Sentosa

3. Third phase - Launchpad phase (BPM Foundation) lay the foundation of BPM. This is where the paper will describe all the selected process and areas to be analysed for further implementation of the project within the scope.

   This phase provides the documentation of:
   a. Flowchart using business process modelling notation (BPMN)
   b. Process selection matrix (external and internal)
   c. Activity diagram

4. Fourth phase – Understand Phase. This phase is where the root problems are seen through current business environment. The aim of this chapter is to create list of issues and promising solutions.

5. Fifth phase - Innovate phase. Part of the BPM implementation framework where the creative solutions is designed as a respond to listed issues. The innovate phase yields several documents from analysis tools such as:

    a. Redesigned process models with supporting documentation: new activity diagram, new process model by BPMN; updated process selection matrix,

    b. Simulation model and gap analysis

6. Sixth phase – Develop phase, a next step in chapter 4 has deliverables such as detailed business requirements, and evaluation. The develop phase will include the making UML model of class diagram, use case and a user interface will be provided.

7. Seventh and last phase - People phase where the project 'develops' new roles and people measurement. People phase and develop phase usually can be conducted together according to Jeston's principle of BPM. However, in this thesis, people phase is documented in chapter 5 along with implement phase. Whereas the implement phase is penultimate closing for the thesis, an implementation strategy, software specification and design with technology requirement, usability testing combined with Likert scale survey for the UI mock-ups will be brought together as conclusion of the project deliverables.