

CHAPTER IV

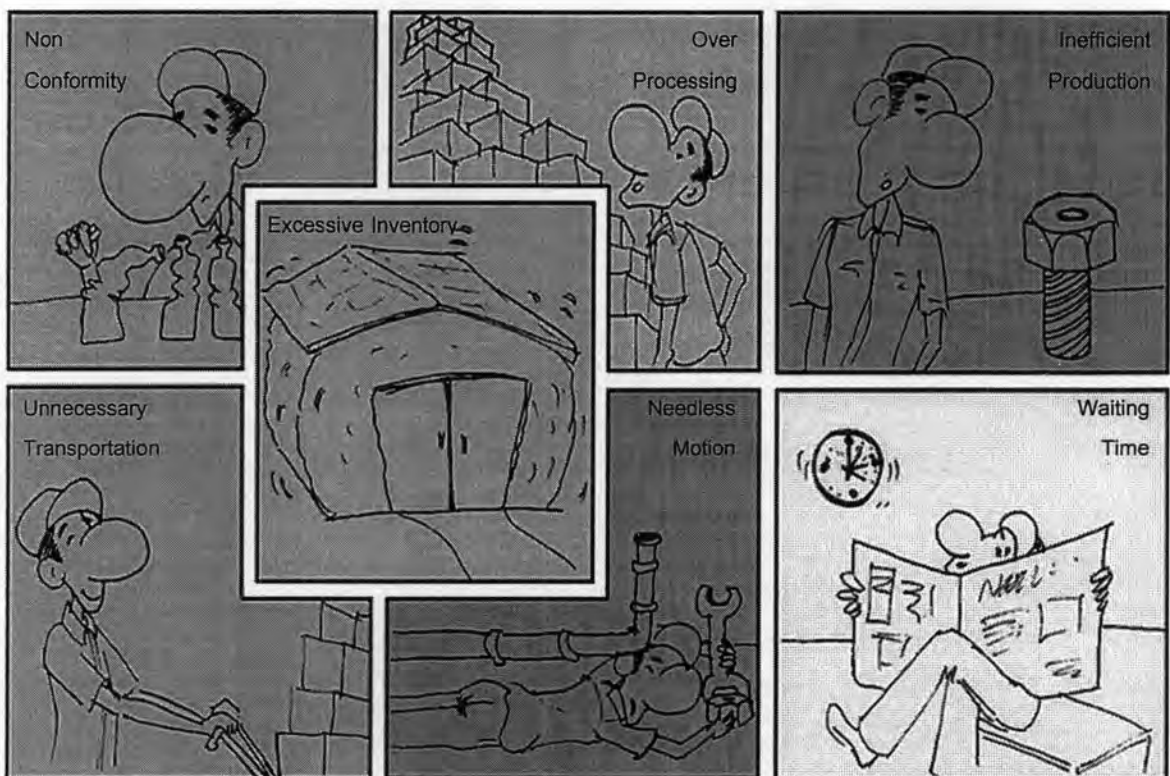
MEASURE PHASE

4.1 Data Collection Plan

As the starting point of Measure Phase, the established team needs to gather information in the medical service core process in order to scan all of potential factors which could directly impact the Service Duration. One of the powerful tools to identify possible weaknesses of any processes is Waste Assessment which had been developed according to Lean principle. Therefore, seven forms of waste (George, 2003); Over Processing, Unnecessary Transportation, Needless Motion, Excessive Inventory, Waiting Time, Non Conformity and Inefficient Production must be considered before start collecting baseline data.

- *Over Processing* – The first kind of waste in healthcare service refers to the organizational activities that tries to add value to the medical service more than what their customers want or would like to pay for. There are two elements within the Over Processing waste. The first one gets involve with the activities that have been exclusively provided by the clinic but the customers do not really needs some of which, while, another one focuses on the activities that allow non value-added work to creep into the core process, for example, there might have some unnecessary levels of approval or handoff during the medications which indirectly cause delay for the service duration.
- *Unnecessary Transportation* – This kind of waste consists of unnecessary movement of related materials, issued forms and information whether it is documentation or electronics format. Excessive transportation in the clinic directly impact to the service duration since every movement form point(s) to point(s) not only takes needless time but also immediately create queue at the receiving area as well. In the clinic, it might possible to have some paperwork loops which a form has been passed through the same point several times. Moreover, every time the form arrives at the incoming tray, it will have to wait in queue repeatedly.

- *Waiting Time* – The gap of time between ending of the prior activity and starting of the latter activity has been crucially considered as one of the most important wastes in healthcare service. It does not only come from the poor capability of the organization to communicate customer information from point to point within the clinic but also the difficulty of service characteristics itself which can not be seen by each other easily. It is highly possible for the customers in many service businesses, also in healthcare, to meet this kind of waste as the majority of what should be critically improved.



Source: Sintara (2006)

Figure 4.1: Seven Forms of Wastes in Lean Principle

- *Excessive Inventory* – Another kind of wastes which consequently occur as the reflection of waiting time points to the Excessive Inventory. Although there is no finished products in the service industry actually but large amount of Work-In-Process (WIP) generally exists in the unbalanced process where sequence of the leading activity upstream could not match with the lagging activity downstream properly. This physical form of waste would refer to the list of pending requests in outlook's inbox, holding lines on in-coming call and queuing patients in front of the doctor's office.


- *Needless Motion* – Different from Unnecessary Transportation which refers to the movement of works, the waste of Needless Motion get involve with the movement of workers. This kind of waste will be found rarely in the service industry than the manufacturing. The sample in Healthcare business could be constantly switching between different computers to complete an issued form or too many keystrokes performing to accomplish a computerized task.
- *Non Conformity* – This kind of waste refers to any matters that do not conform to what customers want called Non Conformity or Defect. Service activities whether they add value to the organization or not could probably cause defects while missing their original functions such as switching patients' information before passing to the doctors or calculating wrong expense before sending to Finance department. Therefore, most of the missing activities will be found by the downstream function as usual.
- *Inefficient Production* – The last form of wastes refers to the Inefficient Production. It could come from both controllable and uncontrollable factors which related to the value-added processes, for examples; slow movement of documents between service functions, delay transportation of medical materials between clinics and missing laboratory results from machine failure. Moreover, as the reflection of this form of waste, it would contribute long lead time, downstream shortages and non conformities as well.

Once thoroughly consider for all of seven kinds, even though there are a number of opportunities to improve Healthcare business for the Over Processing, Unnecessary Transportation, Needless Motion, Excessive Inventory, Non Conformity and Inefficient Production but the most important waste that strongly relates to the overall service duration not only for Healthcare sector such PMC but also many service businesses is the Waiting Time. The data collection worksheet, as shown in Appendix D, has been intentionally designed in order to gather all of data which directly deal with the service duration in multiple functions of the medical service core process. All of information will be certainly summarized in the form of Value Stream Mapping (VSM) to understand possible Key Process Input Variables (KPIVS) in the current state overall.

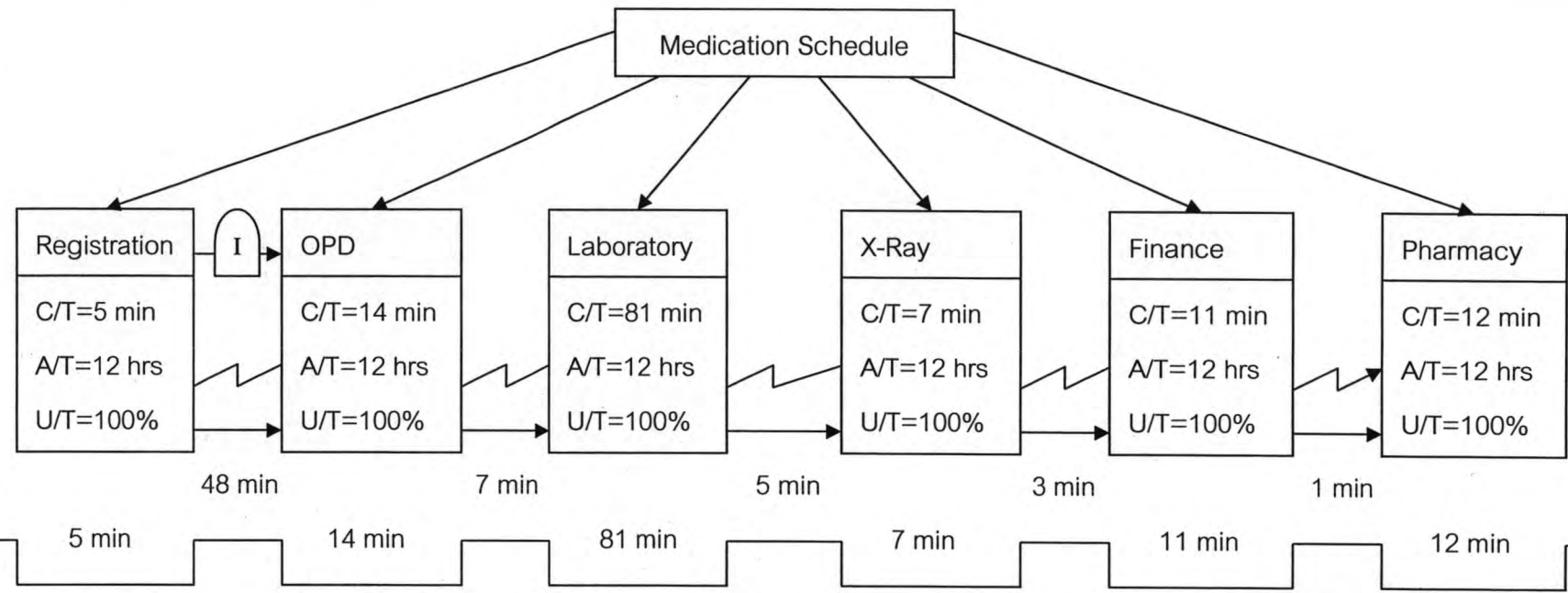
4.2 Value Stream Mapping

Value Stream Mapping (VSM) has been complementarily developed under the Lean principle which refers to a manufacturing paradigm based on the fundamental goal of the Toyota Production System, continuously minimizing waste to maximize flow (Tapping et al., 2002). It could be effectively implemented both for the producing based of manufacturing industries and processing based of service sectors like Healthcare. In addition, It has been widely used for planning and linking lean initiatives through systematic data capture and analysis so that all of essential input variables in the medical service process will be clearly illustrated throughout the process map which states the value creation process from the admitting point, Registration, to discharging point, Pharmacy.

The first step for creating VSM in the Pattana Medical Center starts at the top of the process map, Medication Schedule, which is the central unit of medication process to control activities in every function of the clinic. It completely collects all of data from particular departments, integrates working schedule with the doctor available period, and communicates any changes or updated information back to each of which. Moreover, it generally controls most of the important activities along the medical service core process; Registration, OPD, Laboratory, X-Ray, Finance and Pharmacy to ensure that particular functions are working in-line with the proposed time table and providing quality service to the patients efficiently.

Once the dedicated process box of Medication Schedule and individual functions from Registration to Pharmacy have been set into the VSM, three different kinds of time are needed to be clarified; Cycle Time (C/T), Available Time (A/T) and Up Time (U/T). Cycle Time refers to the service duration to complete medical tasks in particular functions while the Available Time links with the total service duration during the focusing period of 1 day. Another important factor is Up Time which concerns with the portion of operating time comparing with the total service duration. The Inventory sign () between the Registration and OPD box means that there are a group of patients, like an inventory store, in OPD function where provides the medical services on first come fist serve basis.

VSM Status	Value Stream	Project Manager	Team
Current State (Before)	Medical Service	Peerapatana K.	Pattana Medical Center improvement team



Registration		OPD		Laboratory		X-Ray		Finance		Pharmacy		Overall Service Duration		
W/T	C/T	W/T	C/T	W/T	C/T	W/T	C/T	W/T	C/T	W/T	C/T	Total W/T	Total C/T	Overall
1 min	5 min	48 min	14 min	7 min	81 min	5 min	7 min	3 min	11 min	1 min	12 min	65 min	130 min	195 min

Figure 4.2: Value Stream Mapping for Current State

Multiple numbers of arrows between particular functions represent how the information has been orderly communicated across the clinic. In this case, there are two kinds of arrows; Manual Information Flow and Electronics Information Flow. The Manual Information Flow refers to the Medication Document which has been typically issued by Registration function once the patient contacts at the admitting point, then, it will be flown from function to function regarding to the medication necessary. The form will finish at Finance function where all of medical information and expenses will have been finalized for the customers. On the other hand, the Electronics Information Flow has been working as the first one but it will be mainly used for specific requirements and database matter. Both of information flows seem to be redundant because of the incomplete of computer applications.

Under the row of dedicated process boxes of the functional chain, there are two key parameters called Waiting Time (W/T) and Cycle Time (C/T) which need to be put into careful consideration as the output throughout the thesis. The term "Total Waiting Time" refers to the moment when the clinic absolutely does nothing with their customers so that the patients have to wait until the next function will be prepared, whereas, the term "Cycle Time" illustrates the duration when particular functions perform their tasks from the starting point to the ending point completely. At the end of service processes, the summation of these terms will be called "Medical Service Duration" which is the Key Process Output Variables (KPOVs) in this project.

The last step for creating VSM has been illustrated at the bottom of the chart where all of collected information will be carefully summarized to be the key outputs which are related to KPOVs, Medical Service Duration as well. Two key parameters, Waiting Time and Cycle Time, will be typically concluded both for particular functions in the medical service core process to understand how well each of which could provide related services to their customers and for medical service duration overall; Total W/T, Total C/T and Total Time, to recognize how long the customers have to spend time within the clinic whether for value-added or non value-added activities. After all, most of the gathered data from above Value Stream Mapping for Current State will then be used as the baseline information of this project before continuing the process improvement in the Phase of Analysis later on.

4.3 Current State Summary

According to the Value Stream Mapping (VSM) in the previous section, the current state of medical service duration in PMC must be completely summarized to be the baseline information for process improvements in the future state which will be definitely specified in the following phase. The conclusion will be created intentionally for indicating the two key parameters in this project; Waiting Time and Cycle Time, within particular functions throughout the medical service core process which consists of Registration, OPD, Laboratory, X-Ray, Finance and Pharmacy at the end. Functional activities which are related to the medication service will be carefully clarified on how they will be affecting to the dissatisfied overall service duration of the clinic.

Registration – The medical service core process starts with the Registration function where all of incomers must be intentionally contact for different interests, for example; receiving medication service with specified doctors, appointing professionals through the arranged schedule and even asking information for general healthcare. As the first contacting point of customers, there is very little Waiting Time available at this station so that most of the time that patients spent there will be considered as the Cycle Time. 5 minutes of average C/T in this function will be mainly used for gathering necessary database for new patients, matching appropriate doctors for their symptoms, issuing Medication Document for internal processes and, finally, sending the prepared folder for OPD as usual.

OPD – The core competence of PMC is in the OPD function where patients will receive the medication service from a number high efficient doctors and professionals according to their illnesses and specific requirements. From the VSM, Waiting Time in this station has been illustrated 48 minutes as the average time that patients have to wait in front of the clinic without receiving any medical activities. This kind of waste could come from many factors such non delivering documents, long customer queues, missing patients or even delaying doctors so that it should be put into consideration for improvements seriously. Another average number of 14 minutes is the time that doctors generally spend within their rooms to provide medication service for individuals.

Laboratory – In the case that doctors or professionals require increasing information to diagnose specific illnesses, the patients will be consequently passed to laboratory to collect necessary blood or different kinds of liquid for chemical analysis by high technology machines. Average Waiting Time is 7 minutes which illustrates the summation of time spent by customers to move between different functions, while, the average of 81 minutes is the Cycle Time which has reflected the very long duration of analysis. The process generally starts from collecting blood or liquid from patients, labeling tubes or containers, inserting samples in the machines, analyzing specified results and documenting information in the computers so that here is another point within the clinic which should be carefully considered and looks for huge opportunities for improvements

X-Ray – Another case that doctors or professionals might require additional information to specify some special diseases, the patients will then be sent to this station where the medical ray called "X" will be carefully performed to illustrate any abnormalities within the human body. 5 minutes of the average Waiting Time at this function properly represent the time spent by the customers to leave from the OPD function after the doctors have been diagnosed that they would like to include this function within their medication process. Another 7 minutes of the average Cycle Time consequently displays the service duration starting from preparing the X-Ray machine and related equipments, changing the patients' clothes, performing the film operations and completing the report for professionals.

Finance – The only function which does not directly perform any medical service processes but highly create value for the clinic is Finance where all of information both for medication processes and non-medication services in particular functions will be exclusively summarized to calculate the medical service expenses for the patients. The average of 3 minutes is the Waiting Time that customers transport from their ending medical functions to the waiting area in front of the Finance office; whereas, the average of 11 minutes is the Cycle Time that employees in this station complete their tasks such as summarizing all of information, calculating total expense and operating financial services. By the way, the major problems in this area mostly come from mistakes and errors about medical information within other service functions more than the internal faults themselves.

Pharmacy – The last contacting point at the end of medical service core process is Pharmacy function where the collected medicines which have been arranged according to the doctors of professionals' orders will be assigned by the pharmacists, together with, the medical instruction as well. Because the Pharmacy function area is very close to the prior function, Finance, the average Waiting Time to transfer between stations is; therefore, as fast as 1 minutes. The average Cycle Time is as long as 12 minutes which consists of inserting the medicine name lists, printing the attached labels, collecting the tablet and pills, matching the medicines with their labels and explaining the medical instructions. The service duration in this area has been consumed by the very small location which causes difficulties in performing all of activities in the narrow area.

Information – The last topic which should be included in the current state summary is about how each of which could efficiently communicate their patients' information between different functions. There are two kinds of information flow within the clinic. The Manual Information Flow frequently consumes a lot of time to transfer medical related documents from one station to another. The flow will be conducted by nurses or supporters who are available at that moment, thus, the documents are sometimes collected in the waiting tray for a long time. On the other hand, the Electronics Information Flow which has been also used by all of functions often causes long service duration both from the wrong data insertion by the operators and the system redundancies with the manual approach.

Summary – The current state value stream mapping has clearly illustrated the medical service core process from the starting point, Registration, to the ending point, Pharmacy that the average overall service duration of PMC before process improvements is 195 minutes. The Total Waiting Time which has been spent by the customers to transfer from one function to another, together with, by the employees to transport medical related documents between functions is 65 minutes as the average. The Total Cycle Time which has been collectively operated by doctors to provide necessary medications, professionals to analyze laboratory and X-Ray reports and employees to continue medical related tasks in particular functions is 130 minutes as the average. All of summarized information must be analyzed to contribute the opportunities for improvements in the next phase effectively.