

PROCESS FLOW IMPROVEMENT USING VALUE STREAM MAPPING TO
REDUCE WASTE AND LEAD TIME IN MALAYSIA HEALTHCARE

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DEDICATION

I dedicate this thesis to

Almighty ALLAH S.W.T,

**My father (Haron Bin Mohd Saad), my mother (Zainah Binti Buang) and
siblings,**

For your love, care and encouragement.

My supervisor and co-supervisor,

For your help, encouragement and guidance to ensure the success of this thesis.

Friends,

For your help, encouragement, helped me through, make me feel like I am not alone,
may Allah ease their journey and never give up.

**And everyone who involves directly and indirectly in the process of completing
this thesis.**

Thank you.

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ABSTRACT

The implementation of Value Stream Mapping (VSM) method in healthcare institutions has started since the 1990s, mainly to fulfill the current need for an improved quality and efficiency in delivering services. However, the application of VSM in Malaysia healthcare institutions is still at an early stage. These institutions are under pressure to improve service quality and costs. Most of the healthcare institutions are facing an issue regarding long waiting time. Therefore, the intentions of this study are to investigate any process improvement that is currently being practiced by Healthcare Industry within Malaysia and reduce the waste and lead time in the process flow of patient by using VSM. VSM is one of the lean tools that can be used for process improvement in reducing both waste and lead time. Furthermore, VSM strengthens the analysis and provides clearer vision and plans by connecting all improvement methods in one figure. The study implemented a mixed method which includes distribution of questionnaires to explore the current practices on process improvement and observation process in order to reduce waste and also the lead time. The questionnaires were distributed to 141 respondents from the management team of healthcare industry in Malaysia. This study received 34% feedback through the survey of quantitative data. Results from quantitative data analysis shows that currently, 5S is the most applied process improvement practice in Malaysia healthcare industry. The results from the qualitative data showed that the waste and lead time in the process flow of patient are successfully reduced. The findings proposed that the healthcare should combine the process of registration with the blood and urine tests into one process, and also combine the process of check-up with the process of treatment. The number of staff remains the same. This study also suggests for the health centre to relocate the filing shelves to facilitate easier staff access, reorganize the layout of the clinic and relocate the room according to the process. These suggestions will improve the total lead time and reduced the cycle

time and waste in the process flow for patient. The result of this study is significant for other healthcare as well who are looking for further insight to implement VSM in their process flow, and intended to reduce the waste occurred within their healthcare.



ABSTRAK

Perlaksanaan kaedah Peta Aliran Nilai (VSM) di dalam institusi kesihatan telah bermula sejak tahun 1990-an, terutamanya untuk memenuhi keperluan semasa bagi meningkatkan kualiti dan kelancaran dalam menyampaikan servis. Walau bagaimanapun, perlaksanaan VSM di institusi penjagaan kesihatan Malaysia adalah masih di peringkat awal. Institusi-institusi ini menghadapi tekanan untuk memperbaiki kualiti servis dan juga kos. Kebanyakan pusat kesihatan menghadapi isu berkaitan masa menunggu yang lama. Oleh itu, tujuan kajian ini adalah untuk mengkaji proses penambahbaikan semasa yang digunakan di dalam industri penjagaan kesihatan Malaysia serta mengurangkan *waste* dan masa di dalam carta aliran proses untuk pesakit dengan menggunakan VSM. VSM adalah salah satu alatan *lean* yang boleh digunakan untuk proses penambahbaikan dalam mengurangkan kedua-dua *waste* dan masa. Tambahan pula, VSM dapat mengukuhkan analisis dan memberikan gambaran dan rancangan yang lebih jelas dengan menyatukan semua kaedah penambahbaikan dalam satu rajah. Kajian ini dilaksanakan dengan menggunakan kaedah campuran yang merangkumi pengedaran borang soal selidik untuk mengkaji amalan semasa bagi proses penambahbaikan dan proses pemerhatian untuk mengurangkan *waste* dan masa. Borang kaji selidik telah diedarkan kepada 141 responden yang terdiri daripada pasukan pengurusan industri penjagaan kesihatan di Malaysia. Kajian ini menerima 34% maklum balas melalui hasil kajian data kuantitatif. Keputusan daripada analisis data kuantitatif menunjukkan bahawa 5S merupakan proses penambahbaikan yang paling kerap digunakan di dalam industri penjagaan kesihatan Malaysia. Keputusan bagi data kualitatif kajian ini menunjukkan *waste* dan masa dalam aliran proses untuk pesakit telah berjaya dikurangkan. Hasil daripada dapatan kajian mencadangkan supaya pusat kesihatan perlu menggabungkan proses pendaftaran dengan proses ujian darah dan air kencing dalam satu proses, serta menggabungkan proses pemeriksaan dan

proses rawatan. Jumlah kakitangan bagi setiap proses adalah masih sama. Kajian ini turut mencadangkan supaya pusat kesihatan mengubah posisi rak penyimpanan dokumen bagi memudahkan kakitangan mengakses fail/dokumen, mengubah susun atur klinik serta megubah kedudukan bilik mengikut proses. Kesemua cadangan ini akan memperbaiki jumlah masa dan mengurangkan kitaran masa dan *waste* pada proses aliran pesakit. Hasil daripada kajian ini adalah penting bagi pusat kesihatan lain yang mencari gambaran untuk melaksanakan VSM di dalam aliran process mereka, serta ingin mengurangkan bilangan *waste* yang berlaku di dalam pusat kesihatan mereka.



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LIST OF ACRONYMS /ABBREVIATIONS

CQI	-	Continuous Quality Improvement
DES	-	discrete-event simulation
DMAIC	-	Define, Measure, Analyze, Improve, Control
EPU	-	Economic Planning Unit
GDP	-	Gross Domestic Product
LMI	-	Lean Management Initiatives
MHTC	-	Malaysia Healthcare Travel Council
MoH	-	Ministry of Health
RFID	-	Radio frequency identification
SSI	-	Six Sigma Initiatives
VSM	-	Value Stream Mapping
VA	-	Value Added
NVA	-	Non-Value Added
C/T	-	Cycle Time
C/O	-	Change Over Time
SIPOC	-	Suppliers, Inputs, Process, Outputs, Customers

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Table of data collection from observation

Survey Questions



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CHAPTER 1

INTRODUCTION

1.1 Introduction

Malaysia has been listed as one of the developing countries that are successful in various fields. Malaysia is one of the developing countries listed by the World Bank in a group category of upper-middle-income economies with the range of \$4,086 to \$12,615. Malaysia has enjoyed economic growth and underwent major development programmes aiming to be a fully developed nation by 2020. In order to achieve the target as a successful nation, lots of action/programmes had been done in various fields such as economy, technology, social, cultural, spiritual, and more. Malaysian Plan is one of the steps taken to achieve the target for a better Malaysia in the future that includes services, manufacturing, agriculture, mining, construction and others. Health industry is included under the service sector as stated in the first Malaysian Plan.

Since the first Malaysian Plan, the Ministry of Health had introduced various health programmes to improve patient's safety and the population's health. The Health Plan which has been detailed out in 10th Malaysian Plan 2011-2015 aims to improve the country's healthcare system based on the concept of "1 Care for 1 Malaysia". This 1 Care is a structured national health system that is responsive and provides choice in quality healthcare, ensuring universal coverage for the population's healthcare needs based on solidarity and equity. This Health Plan was formulated based on a deep understanding on the needs and challenges, the government's ability to finance it, and

value for money. It was developed to reflect the aspirations in achieving a high-income country status by 2020 (MoH, 2010). Since Malaysia is categorized in a group of upper-middle-income economies with the range of \$4,086 to \$12,615 which is considered high, citizens are experiencing the consequences where it involves the rise in hospitalisation, institutional care and health insurance costs (Malaysia Economic Planning Unit, 2010).

The major issues that have been discussed in Malaysian Health Plan 2011-2015 are regarding the increase in healthcare costs. From the report, it was stated that the rising cost of care is due to several factors which are inefficiency, increasing demand for health services in institutions and also wasted resources (MoH, 2010). Besides, there are five cost drivers that had been mentioned which are wealth, epidemiological transition, facing emerging/re-emerging infectious diseases, demographic transition and lastly, technology (MoH, 2010). Other than the aim to maintain the low cost, the healthcare sector also needs to meet the goals in providing care and enhancing health (Dahlgard, Pettersen, & Dahlgard-Park, 2011). According to the previous reports, it were mentioned that the allocation budget for Malaysian Health increased each year since 2010 until 2016 except 2011 and 2016 where the amount slightly decreased. Figure 1.1 summarise the data for Malaysian health budget allocation from 2010 until 2016.

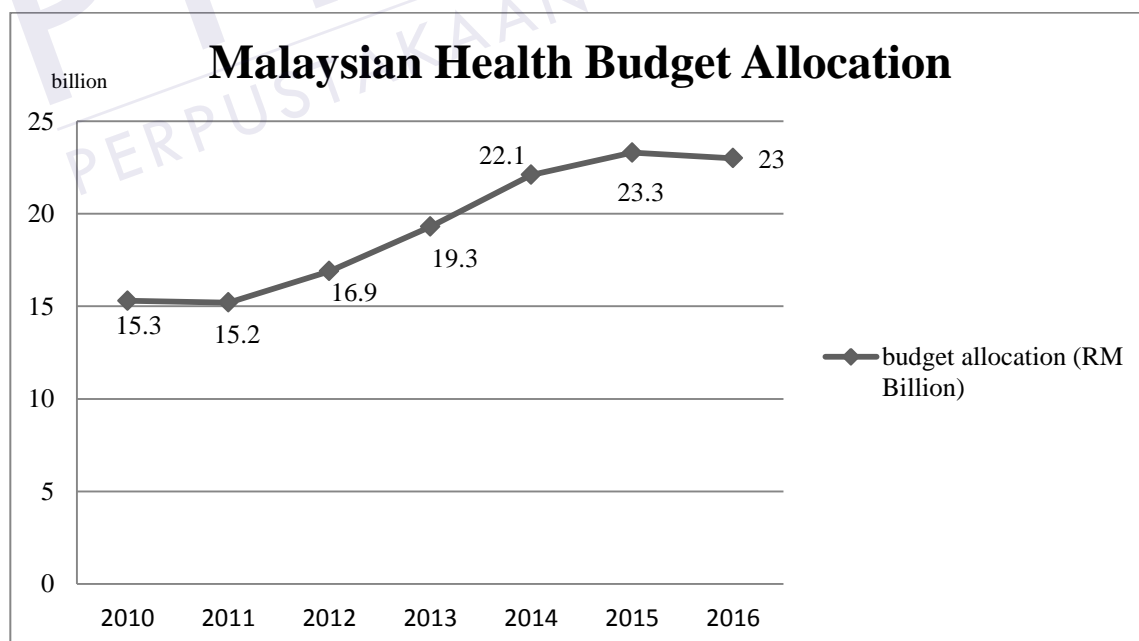


Figure 1.1 Malaysian Health Budget Allocation from 2010-2016.

On the other hand, to complement the continuous growth of Malaysian healthcare, the research organizations are required to study the cost-effectiveness and performance measurement during the implementation of 10th Malaysia Plan. Therefore, it is important for the management to fully utilise available process improvement for healthcare in order to curb the hardship issues from mushrooming. The process improvement methodologies such as Lean and Six Sigma have tremendously improved the quality and efficiency of manufacturing and service sectors for decades (Antony, Krishnan, Cullen, & Kumar, 2012).

Process improvement method has been widely used around the world in improving the operation of an organization (Abdulmalek & Rajgopal, 2007; Mujtaba, Feldt & Petersen, 2010; Shahrabaki & Jackson, 2011). Value Stream Mapping is one of the process improvement tools that has been tremendously used in healthcare (Castle & Harvey, 2009; Nelson-Peterson & Leppa, 2007; Puterman et al., 2012). However, the implementation of Value Stream Mapping (VSM) in Malaysian healthcare industry is still low. In fact, the result obtained from the preliminary study showed that VSM is one of the process improvement tools that has not been used by respondents of the study. Therefore, this research aims to study the current practice of process improvement in Malaysian Healthcare to the extent of implementing the VSM in the process flow of patient in healthcare.

1.2 Research Background

Healthcare industries are experiencing an extremely challenging situation in maintaining a competitive edge. In recent years, the healthcare providers for example in Malaysia are under a great deal of pressure to improve the quality of services as well as costs. This is due to the growing number of population and greater expectation for healthcare services in Malaysia. The Malaysian government has shown its commitment to improve the country's healthcare system as detailed out in The Health Plan under the 10th Malaysian Plan 2011-2015. In fact, the government had introduced various health programmes to improve patients' safety and the population's health since the first Malaysian Plan (1966-1970). In 2014, the Malaysian government had allocated RM22.1

billion, in order to minimise any possible gap in priorities area for the health sector which includes operation and development expenses (MoH, 2013). The budget allocation for health had been increased in 2015, where the Malaysian government had allocated about RM23.3 billion. In Malaysia, the public healthcare sector is heavily subsidised by the Malaysian government which is almost 90 percent of the total cost and the patient pays a minimum amount for treatment.

Healthcare providers in Malaysia has been urged to transform the way they deliver their service to improve the quality in order to meet the Millennium Development Goals and the Malaysian Health Plan which has been set by the Malaysian government. Malaysia needs to restructure the national healthcare financing and healthcare delivery system, for example by using process improvement method in order to achieve the target (MoH, 2010). In October 2011, the Malaysian Healthcare Travel Council (MHTC) was corporatised to develop and promote Malaysia as the main destination for healthcare services in the region. As stated in Health Expenditure Report 1997-2011, Malaysia had recorded 3.9% GDP in health spending which was similar to other countries in Asia such as The Philippines, Thailand, India and Bangladesh. While in 2015, it recorded 4.3% spending in GDP on healthcare. However, these countries have much lower spending capita compared to Malaysia which ranging from USD67 in Bangladesh to USD353 in Thailand, while in Malaysia spending was USD616 per capita. According to Malaysia National Health Account database 2013, Malaysian Healthcare spending continues to grow at about 12% rate on average per year for the past 15 years. As reported in MNHA Health Expenditure Report (2015), the trend for total health expenditure keeps on increasing since 1997 until 2013. Figure 1.2 shows the data of escalating total health expenditure for 1997-2013.

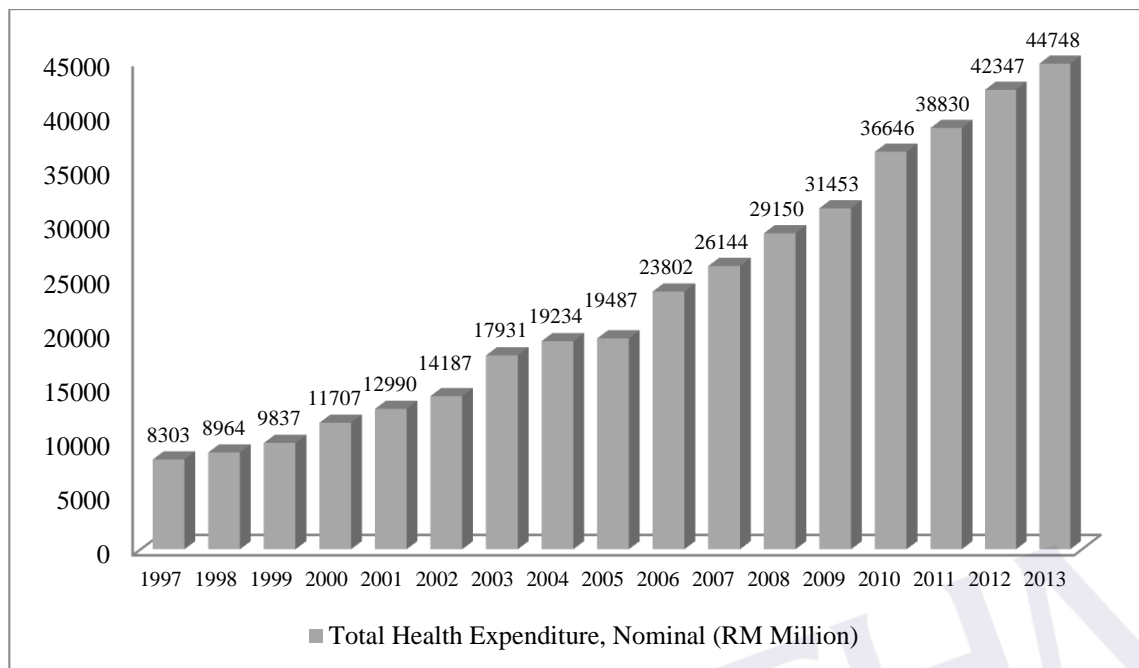


Figure 1.2 Trends for Total Health Expenditure 1997-2013

(Source: Malaysia, & Malaysia National Health Account Unit, 2015)

The implementation of process improvement or change management in healthcare has started for decades. This method manages to save operational costs where available resources were used diligently in delivering continuous healthcare services across the programmes, healthcare settings and also healthcare providers (Gill, 2012). The advantages of applying process improvement method in an organization have also been mentioned in previous studies (Celano, Costa, Fichera & Tringali, 2012; Liberatore, 2013; Southard, Chandra, & Kumar, 2012).

Lean and Six Sigma are tools that have been used and evolved in healthcare for the process and operations efficiency improvement, as well as financial concern in healthcare delivery (Gamal, 2010; Revere, Black & Huq, 2004; Rohini & Mallikarjun, 2011). Six Sigma is a method that helps to identify problems on medical errors, quality and costs improvements (Revere et al., 2004; Taner, Sezen, Antony, 2007). Lean is well-known as the best tool for removing waste and related lead time reduction in process and operations. Previous researchers suggest that lean can be described as a medium to

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