STUDY ON INVENTORY MANAGEMENT PRACTICES AND INVENTORY MANAGEMENT PERFORMANCE AMONG PHARMACIES OF PUBLIC HOSPITALS SETTING IN MALAYSIA

FARIZA AHMAD MAHYADIN@MAHIDIN

DOCTOR OF PHILOSOPHY
UNIVERSITI UTARA MALAYSIA
July 2018

STUDY ON INVENTORY MANAGEMENT PRACTICES AND INVENTORY MANAGEMENT PERFORMANCE AMONG PHARMACIES OF PUBLIC HOSPITALS SETTING IN MALAYSIA

By

FARIZA BINTI AHMAD MAHYADIN@MAHIDIN

Thesis Submitted to
School of Technology, Management & Logistics,
Universiti Utara Malaysia,
In Fulfillment of the Requirement for the Degree of Doctor of Philosophy

Kolej Perniagaan
(College of Business)
Universiti Utara Malaysia

PERAKUAN KERJA TESIS / DISERTASI
(Certification of thesis / dissertation)

Kami, yang bertandatangan, memperakukan bahawa
(We, the undersigned, certify that)

FARIZA AHMAD MAHYADIN @MAHIDIN

calon untuk Ijazah DOCTOR OF PHILOSOPHY
(candidate for the degree of)

telah mengemukakan tesis / disertasi yang bertajuk:
(has presented his/her thesis / dissertation of the following title)

STUDY ON INVENTORY MANAGEMENT PRACTICES AND INVENTORY MANAGEMENT PERFORMANCE AMONG PHARMACIES OF PUBLIC HOSPITALS SETTING IN MALAYSIA.

seperti yang tercatat di muka surat tajuk dan kulit tesis / disertasi.
(as it appears on the title page and front cover of the thesis / dissertation).

Bahawa tesis/disertasi tersebut boleh diterima dari segi bentuk serta kandungan dan meliputi bidang ilmu dengan memuaskan, sebagaimana yang ditunjukkan oleh calon dalam ujian lisan yang diadakan pada:
15 Julai 2018.
(That the said thesis/dissertation is acceptable in form and content and displays a satisfactory knowledge of the field of study as demonstrated by the candidate through an oral examination held on:
15 July 2018

Pengerusi Viva *(Chairman for Viva)*	:	Assoc. Prof. Dr. Zulkifli Mohamed Udin	Tandatangan *(Signature)*
Pemeriksa Luar *(External Examiner)*	:	Prof. Dr. Zaini Abdullah	Tandatangan *(Signature)*
Pemeriksa Dalam *(Internal Examiner)*	:	Dr. Kamaruddin Radzuan	Tandatangan *(Signature)*

Tarikh: **15 Julai 2018**

Nama Pelajar
(Name of Student) : **Fariza Ahmad Mahyadin @ Mahidin**

Tajuk Tesis / Disertasi
(Title of the Thesis / Dissertation) : STUDY ON INVENTORY MANAGEMENT PRACTICES AND INVENTORY MANAGEMENT PERFORMANCE AMONG PHARMACIES OF PUBLIC HOSPITALS SETTING IN MALAYSIA.

Program Pengajian
(Programme of Study) : **Doctor of Philosophy**

Nama Penyelia/Penyelia-penyelia
(Name of Supervisor/Supervisors) : **Dr. Rohaizah Saad**

Tandatangan

Nama Penyelia/Penyelia-penyelia
(Name of Supervisor/Supervisors) : **Dr. Mohd Norhasni Mohd Asaad**

Tandatangan

Nama Penyelia/Penyelia-penyelia
(Name of Supervisor/Supervisors) : **Prof. Dr. Rushami Zien Yusoff**

Tandatangan

PERMISSION TO USE

In presenting this thesis in fulfilment of the requirements for a Post Graduate degree from the Universiti Utara Malaysia (UUM), I agree that the Library of this university may make it freely available for inspection. I further agree that permission for copying this thesis in any manner, in whole or in part, for scholarly purposes may be granted by my supervisor(s) or in their absence, by the Dean of School of Technology Management and Logistics where I did my thesis. It is understood that any copying or publication or use of this thesis or parts of it for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to the UUM in any scholarly use which may be made of any material in my thesis.

Request for permission to copy or to make other use of materials in this thesis in whole or in part should be addressed to:

Dean of School of Technology Management and Logistics
College of Business
Universiti Utara Malaysia
06010 UUM Sintok
Kedah Darul Aman

ABSTRACT

The main purpose of this study was to investigate the relationship between inventory management practices and inventory management performance in Malaysian public hospital pharmacies. Specifically, it aimed at investigating the moderating effect TQM on the relationship between inventory management practices and inventory management performance. The motivation for this study was driven by the inconsistent findings in the literature concerning the relationship between inventory management practices and inventory management performance. Due to these inconsistencies, a new research stream emerged which suggested investigating the effect of possible moderating variables that may better explain such inconsistencies. Accordingly, this study integrated different theories such as the System Theory and the Stakeholder Theory to map and position the possible relationships between the variables in the conceptual framework. The study utilized a survey questionnaire which was randomly distributed to 103 public hospitals in Malaysia, with a 78 percent response rate. The data collected were analyzed by using the Rasch Measurement Model (Winstep3.6 software) and the Partial Least Squared - Structural Equation Modelling (Smart PLS3 software) technique. The results obtained confirmed that the three constructs, namely inventory administration, inventory control and inventory system have to be together to meet the unidimensionality for inventory management practices. Additionally, the results showed that there is a positive relationship, and TQM moderates the relationship between both variables. However, TQM is unable to moderate this relationship in pharmacies at special hospitals. About 49 percent (39 hospitals) had high abilities to perform the items listed in the questionnaire while 51 percent (41 hospitals) were otherwise. These findings have contributed theoretically, practically and methodologically with imperative implications to academicians, policy- makers and pharmacies of public hospitals in Malaysia specifically.

Keywords: inventory management practices, inventory administration, inventory control, inventory system, and pharmacies of public hospitals.

ABSTRAK

Kajian ini bertujuan untuk menyelidik hubungan antara amalan pengurusan inventori dan prestasi pengurusan inventori di farmasi hospital awam di Malaysia. Secara khususnya, kajian ini memfokuskan kepada peranan perantara Pengurusan Kualiti Menyeluruh (PKM) ke atas hubungan antara amalan pengurusan inventori dan prestasi pengurusan inventori. Kajian ini dimotivasikan daripada kajian lepas yang tidak mempunyai sebarang kesimpulan terhadap hubungan di antara amalan pengurusan inventori dan prestasi pengurusan inventori. Berdasarkan ketidaktekalan ini, satu aliran baharu yang mencadangkan pemeriksaan ke atas kesan potensi pemboleh ubah perantara yang boleh menerangkan dengan baik keadaan yang tidak konsisten ini telah dibangunkan. Oleh itu, kajian ini telah menggabungkan teori yang berbeza iaitu Teori Sistem dan Teori Pihak Berkepentingan untuk menyusun dan meletakkan kemungkinan hubungan antara pemboleh ubah dalam kerangka konsep. Kajian ini menggunakan penilaian borang soal selidik yang diedarkan secara rawak kepada 103 buah hospital awam di Malaysia sebagai sampel dengan kadar maklum balas sebanyak 78 peratus. Data yang dikumpulkan telah dianalisis dengan menggunakan Model Pengukuran Rasch (Perisian Winstep 3.6) dan teknik Model PLS-SEM (Perisian Smart PLS3). Keputusan kajian yang diperolehi mengesahkan bahawa ketiga-tiga kontruks iaitu pengurusan inventori, kawalan inventori dan sistem inventori perlu berada secara bersama-sama untuk menuju ekadimensi bagi membentuk amalan pengurusan inventori. Selain itu, keputusan turut menunjukkan bahawa terdapat hubungan yang positif dan PKM didapati mengantarakan hubungan di antara kedua-dua pemboleh ubah. Namun, PKM gagal mengantarakan hubungan di farmasi hospital besar. Kajian mendapati terdapat 49 peratus (39 hospital) berada pada kategori keupayaan tinggi untuk melaksanakan item-item dalam borang soal selidik manakala 51 peratus (41 hospital) lagi adalah sebaliknya. Kajian ini telah menyumbang secara teori, praktikal dan metodologi dengan implikasi penting kepada ahli akademik, penggubal dasar dan farmasi hospital awam di Malaysia secara khususnya.

Kata kunci: amalan pengurusan inventori, pengurusan inventori, kawalan inventori, sistem inventori, dan farmasi hospital awam

LIST OF PUBLICATIONS

Mahyadin, F.A., Saad, R., Mohd Asaad M. N., & Yusoff, R.Z. (2017). Rasch Measurement Model (RMM) of inventory administration practiced by public hospitals in Malaysia. *International Journal of Supply Chain Management,* Vol 6(3).

Mahyadin, F.A., Yusoff, R.Z., Saad, R., & Mohd Asaad M. N. (2016). Do inventory practices correlate with inventory management performance? A cross-sectional study in Malaysian public hospitals. *Asean Entrepreneurship Journal,* Vol 2(1), 67-77.

Mahyadin, F.A., Saad, R., Mohd Asaad M. N., & Yusoff, R.Z. (2015). The influence of inventory management practices towards inventory management performance in Malaysian public hospitals. *International Academic Research Journal of Business and Technology,* Vol 1(2), 142-148.

Mahyadin, F.A., Yusoff, R.Z. & Saad, R. (2014). Inventory management practices: A key success towards supply chain performance among industries in Malaysia. *4th International Conference on Technology and Operations Management (ICTOM 04)*, 98-104.

ACKNOWLEDGEMENTS

In the name of Allah, Most Gracious, Most Merciful, *Selawat* and *Salam* to our Prophet Muhammad s.a.w, his family members, companions and followers.

My uncountable praises to Al-Mighty Allah as it is only by His grace, guidance and consent I am able to reach to the end of this thesis. Alhamdulillah. My sincere appreciation, gratitude and heartfelt thanks go to my supervisors, Dr. Hajjah Rohaizah binti Saad, Dr. Hj. Mohd Norhasni bin Mohd Asaad and Professor Dr. Rushami Zien bin Yusoff for their continuous patience, dedication, guidance, constructive criticisms and assistance throughout this entire challenging PhD journey of mine. Each one of you has given lots of your precious time, energy, and expertise and I am richer for it. I will always appreciate and remember in heart the endless support, encouragement that you all have given me in completing this journey.

The appreciation and gratitude also goes to Prof. Dr. Zaini bin Abdullah, Prof. Madya Dr. Che Azlan bin Taib, Dr. Kamaruddin bin Radzuan, Dr. Abdul Aziz Othman, members of RZY Colloquium, Academic Writing and Research Methodology classmates of PhD Candidates 2014 for their ideas, comments, advised, supports and suggestion in the process of preparing my thesis. My heartfelt appreciation also goes to the Head of Pharmacy Officers of the public hospitals in Malaysia for helping and guiding me in obtaining the needed data for the study. A note of thanks also goes to all my beloved friends at Politeknik Seberang Perai, Universiti Utara Malaysia, and my other friends for their moral support, guidance, encouragement, continuous motivation and friendship. May Allah bless all your kindness and sharing.

Special appreciation and thanks also I extend to Allahyarham Hj. Ahmad Mahyadin@Mahidin, Haji Ahmady@Ahmad Din Abdullah, my beloved husband Mohamad Zaky bin Ahmady, son Muhammad Danish and daughters Rania Suraya and Rasha Shofeeya and all my supportive family members for their continuous doa's, endless love, and encouragement that had culminated in an ending to this long and memorable journey. Their sacrifices, care, assurances, psychological and emotional support, patience and understanding are unforgettable and invaluable. Finally, I am also dedicating this thesis to my late mother Hajjah Zainab Hj. Hussain and late mother in-law Rohani Abdullah who passed away during the course of my studies. May their spirits be showered with mercy forever. I dedicate this thesis to all of you.

Sincerely,
Fariza binti Ahmad Mahyadin@Mahidin

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATION

WHO	World Health Organization
PKRA	Prospects and Key Results Area
SCM	Supply Chain Management
TQM	Total Quality Management
CTT	Classical Test Theory
MTT	Modern Test Theory
GST	General System Theory
IRT	Item Response Theory
LTT	Latent Trait Theory
MOH	Ministry of Health
UUM	University Utara Malaysia
UITM	University of Technology Malaysia
PSP	Polytechnic Seberang Perai
SOP	Standard of Procedure
HPD	Head of Hospital Pharmacy Department
MNSQ	Mean Square
PCA	Principal Component of Analysis
ERP	Enterprise Resource Planning
IPF	International Pharmaceutical Federation
SKUs	Stock Keeping Units

CHAPTER ONE

INTRODUCTION

1.1 Introduction

This chapter discussed on the introduction of the research and cover 9 sections. Section 1.2 is background of the study and followed by the overview of inventory management in Malaysia. Next is the discussion on problem statement in section 1.3 while in section 1.4 and section 1.5, it cover about research question that being develop and research objectives that should be achieved. The significant of the study is explained in section 1.6, while scope and limitation in section 1.7 and 1.8. Furthermore is the operational definition of the key terms being used which in section 1.9 and lastly is organization of the thesis in section 1.10.

1.2 Background of the Study

In the 21st century era, globalization and competitiveness have become the requirements for organizations, either private or in public services, to have to be more effective and efficient in organizing resources and avoiding waste. The service industry is expected to be more aggressive and challenging in this era of globalization. Healthcare sector in Malaysia has developed progressively since the early 1990s and was recognized under the Tenth Malaysia Plan (2011-2015) as one of the National Key Economic Areas, or NKEA (Jamaludin, Habidin, Shazali, Ali, & Khaidir, 2012). In fact, the evolution of the service sector has been considered to be an indicator of a country's economic movement (Boundless, 2016). Moreover, as can be seen in the Tenth Malaysia Plan (2011-2015), the service sector was the major contributor in Malaysia's Gross Domestic Product (GDP), which stood at 53 percent

(Economic Planning Unit, 2015). This remarkable achievement was mostly derived from the wholesale and retail trade, financial services, communication, and other segments including healthcare sector. This is due to the state of change in the business environment, which has become more challenging nowadays (Zainal Abidin, 2014) and therefore the main concern among public hospitals nowadays is allocating the resources on a rational basis without having any waste (Anil K, Aubid, Rashid, Mushtaq A, & AT, 2012).

Due to that, management of the inventory (drugs management) in healthcare sector specifically in hospitals plays an important role in achieving this ideal goal. Unfortunately, pharmacy department facing difficulty in managing the inventory properly after investing it (Ali, 2011). Management of the all activities related to the movement and storage of raw materials require an efficient information flow, which is the asset of each company (Czwajda & Kosacka, 2017). Due to that, it is particularly important for logistics companies and any organizations that handle inventory to take care their assets. Globalization, shorter product life cycle, rapidly changing demand and increase in the expectations and demands of customers, confirm that world is changing dynamically, would affects increasing requirements for supply chains. According to the requirements, supply chain has to deliver the right product in the right amount and in the right time to the final customer.

Drugs, a part of resources in the public hospitals has been identified as the link between the patient and the health service. Consequently, the availability of such drugs will contribute to the positive or negative impact on health because the provision of drugs could face serious issues such as medical errors, adverse impacts and the growing presence of counterfeit products; therefore, pharmacists must necessarily manage the drug optimally and cannot take the impact of inventory mismanagement lightly. Improperly taking care the drugs will have impact on the patients' safety (Romero, 2013 ; Ali, 2011).

At the international level, a period of deep transformation is being faced by healthcare systems around the world (Romero, 2013). The World Health Organization (WHO) and the International Pharmaceutical Federation (IPF) have listed among the eight important roles of pharmacists, of which managing capitals (money, inventory, labor, time and data) is a key indicator to professional performance on the single person level and company level (Wiedenmayer et al., 2006). Studies done by Talafha (2006), revealed that the medication quantification requirements among 25 public hospitals in Jordan were under forecasted by the actual standard procedures of public healthcare wants. Besides that, mismanagement in recording the inventory also been notified among the hospitals.

Meanwhile in Tanzania, studies conducted by Kagashe & Massawe (2012) showed that factors influencing the stock outs of Antiretroviral drugs and overstocking are unclear. The increase in healthcare costs in Australia and many other countries Bhakoo, Singh, & Amrik (2012) like India, Tanzania, Indonesia, Jordan, United States, Canada, Thailand and United Kingdom has imposed important economics issues to each of the countries concerned (Romero, 2013).

Canadian healthcare system provided 32 billion in 2011 on drug costs, thus it represents the third biggest provision costs for the healthcare procedures after hospitals and medicals staffing (Romero, 2013). As healthcare cost are growing rapidly and keeps on increasing, it is becoming a requirement for the public hospitals to provide the high quality of care (Rachmania & Basri, 2013). This has given an opportunity to the public hospitals to harness the value of excellence through inventory management practices (drug management) in order to achieve a steady growth in performance.

While waste, viewed from the Islamic perspective, based on the Quran and Sunnah are very clear that avoiding in producing waste and prodigality is a matter of the highest importance. For example, *Allaah Says (as translated): "Do not be extravagant, for Allaah does not love the wasteful"* [Quran, 6:141], He Says (as translated): *"But waste not by excess, for Allaah loves not the wasters" [Quran, 7:31]* and as stated in the Holy Al-Quran, where Allah said:

"Indeed the spendthrifts are the brothers of the devils (Satan) and the Satan is ever ungrateful to his Lord,'

(Surah Al-Isra 17:27)

Thus, relevant attention towards the improvement of public hospitals in managing resources without any waste based on the Islamic principles is necessary. Research finding by Harhay, Halpern, Harhay, & Olliaro (2009) also point towards avoiding the disposal of pharmaceutical waste, especially drugs.

Purchasing is becoming more strategic and exerts direct impact on cost, quality, time and responsiveness of the buying firms, therefore efficient and effective management of inventory throughout the supply chain significantly improves the ultimate service to the customers (Chen and Paulraj, 2004). Too much inventory and not high enough customer service is very common, but unnecessary. Inventories should neither be excessive nor inadequate, the objective of inventory management is therefore to determine and maintain the optimum level of investment in inventories which help in achieving the required objective (Aarti & Dhawal, 2013). Beamon (1999) identified supply chain practices as; inventory turn, gross margin and profit, average in-stock inventory and ability to measure inventory while Rajwinder et. al. (2010), identified four major primary constructs of competitive advantage as inventory management, customer satisfaction, profitability and customer base identification.

Sahay et.al. (2001), revealed that in their survey across 156 companies in India, surprisingly showed that, inventory management is low on the agenda compared to customer service, order fulfillment and quality. The right approach to inventory management can produce dramatic benefits in customer service with lower inventory, no matter how complex company network is. Therefore, Li et al. (2006) suggested that implementation of Supply Chain Management (SCM) practices have greater impact on achieving competitive advantage as well as improving firm's performance.

According to Chase (2011), every production system must have agreement, within some specific range, between what the records says is in inventory and what actually is in inventory. Therefore, to keep the production system flowing smoothly without parts shortages and efficiently without excess balances, record must be accurate. He added that there are many reasons why records and inventory may not agree;

- The legitimate removal may have been done in a hurry and simply not recorded
- Parts are misplaced, turning up month later

- Parts are often stored in several locations, but records may be lost or the location recorded incorrectly
- Stock replenishment orders are recorded as received, when in fact they never were
- A group of parts is recorded as removed from inventory, but the customer order is cancelled and the parts are replaced in inventory without cancelling the record

Aarti & Dhawal (2013) notified that inventory management consists of everything from accurate record-keeping to shipping and receiving of products on time, therefore, an inventory management that is properly maintained can keep a company's supply chain running smoothly and efficiently. Therefore, organizational leaders should possess and showcase certain leadership style to manage and lead such a difficult task environment, at the same time managing suppliers and customers, ensuring smooth flow of information between organizations and its partners and modifying certain organizational internal process (M.Birasnav, 2013). According to Singh et. al. (2007b), employee involvement are needed for effective inventory management in order to improve the competitiveness of the organization.

In the Malaysian context, several accounts on the mismanagement of public funds among Malaysian public agencies and officials have been under the spotlight of the media (Abu Bakar & Ismail, 2011). In depth, multiple issues threaten the performance and sustainability of Malaysia's health system, against a background of rising health expenditure. Among the current issue that can be highlighted, which is related to waste and theft of inventory, is the National Audit Chief Report 2013 when the following information was revealed to the public:

Table 1.1
Location, types of inventories and estimated cost

Location	Types of inventories	Estimated cost
Kuala Lumpur Hospital (HKL)/Nov 2011	Medicine	RM1.21 million
Kuala Lumpur Hospital (HKL)/Dis 2013	Control Panel model Shimadzu – component to General X-Ray	RM300,000.00
Kuala Lumpur Hospital (HKL)/Dis 2013	Aircond compressor, Syringe Pump, Phycologic System and Pulse Oxymeter	RM610,000.00
Pulau Pinang Hospital (HPP)	Medicine	RM240,000.00
Pulau Pinang Hospital (HPP)/Feb 2013	Medicine	RM242,125.00

Source: National Audit Chief Report, 2013

As shown in Table 1.1, a total of RM1, 692125.00 of the theft involved medicine. It showed that the situation is critical and need proper inventory management practices to control it. Waste means costs incurred to the pharmacy department, therefore the supplies of medicine need to be managed efficiently in order to prevent all types of wastage including theft, overstocking, pilferage and expiration. This wastage will lead to the reduction in the quantity of drugs available to patients and due to that, the quality of healthcare would be negatively affected (Kagashe & Massawe, 2012).

Malaysian healthcare system has been put under pressure as healthcare expenditures are expected to rise significantly in the coming years, mainly due to an increase in overall healthcare consumption (Lee, Ramayah, & Zakaria, 2012). Besides, the Malaysian government faces an imposing pressure to enhance the healthcare quality (Lee et al., 2012). Because of the above mentioned issues, several reformations have been started in Malaysian for promoting and maintaining the population's health. Public sector financial management is crucial to Malaysia, as one of the developing countries. Issues such as extravagance, waste, embezzlement, and corrupt practices will affect the development of a country (National Audit Office, 2008).

Spending on the healthcare of Malaysia government has been increasing every year. In the year 2005, Malaysia healthcare spending was RM22 billion (as shown in Fig.1.1), the amount of spending rose each year and was RM30 billion in year 2009, an increment of 36.4% over the 5 years. The amount is projected to reach RM42 billion in the year 2014, almost 91% increment in 10 years times. Therefore, the government is facing great pressure to reduce the healthcare cost while continuing to improve the healthcare quality (Lee et al., 2012).

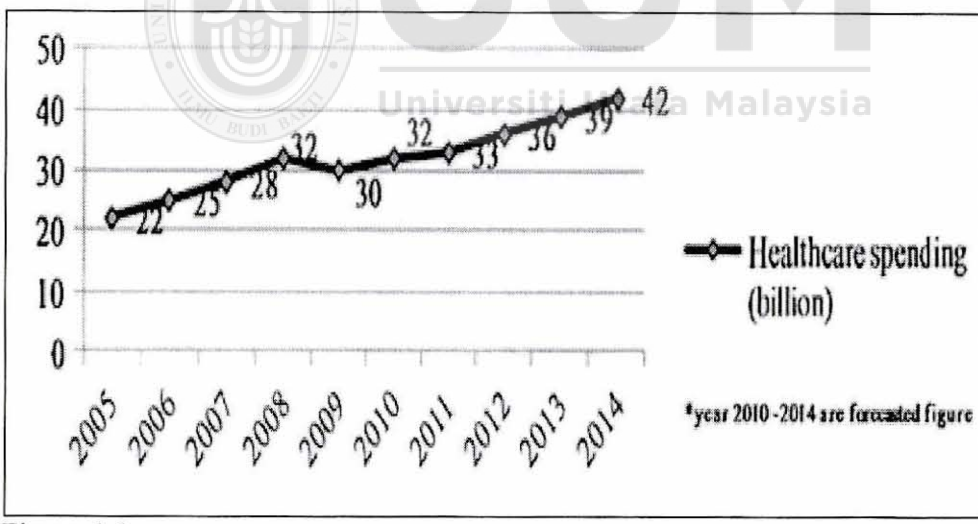

Figure 1.1
Malaysia Healthcare Spending 2005–2014
Source: Ministry of Health Malaysia, Health Facts 2005-2009

An example is a study done by Chen (2014), which used medical error as an example of error wastage that appears often within the United States (US) healthcare sector, and resulted in great losses across the country, amounting to USD17.1 billion in 2008 alone (Chen, 2014). Approximately 5 million patients were severely affected because of medical errors annually (Woodward-Hagg et al., 2013). All these issues have brought practitioners, professionals, and staff who work in healthcare to find a possible solution in ensuring the sustainability of healthcare sector's performance. If the issues continue, it can have an adverse effect on patient's health and well-being, the environment, as well as public safety (Department of Environment, 2009).

The above scenario depicted the important role of inventory management (drugs management) and it is noticed that this has indirectly indicates the relation between inventory management and performance, which is crucial for continuing economic growth. Hence, avoiding waste provides an impact to the public hospitals to find an effective and efficient solution in managing inventory. The focus of this study is on public hospitals in Malaysia, where there are several areas and issues having main indicator for excellence but with limited studied done, and due to that the extend of study in these topics related to the inventory management practices of drugs towards inventory management performance.

1.2.1 Overview of Public Hospitals Service Industry in Malaysia

Malaysian healthcare sector similarly to the German system, constitutes two types of system; private and public sector (Market Watch, 2012). Both sectors have contributed differently to the Malaysian economy based on the assessment criteria (Rani, 2010). In fact, the demand of public sector seeing a steady rise due to the cost in the private sector is escalating (Rani, 2010). Malaysia National Health Account (MNHA) reported in 2012, public health spending was RM22,461 million, and private was RM19,795 (MNHA, 2014). This figure indicates the upward trend by both sectors, but public health spending remained higher compared to counterpart.

An inventory control practice in pharmacy is the process of managing inventory in order to meet customer demand at the lowest possible cost and with a minimum investment. The pharmacy department is most often charged with responsibility for managing drug and delivery system costs. The pharmacy management team should focus on developing effective strategies to maximize leverage of drug and human resource cost (Manhas Anil K, 2012). The existing Malaysian hospitals services coordination has been not fully competent and lead to the remarkable excess of resources among the general and private hospital. Previous studies showed that among the main factors for surplus are less of medical value, less of skills staff, low patient turnover, inefficient of logistics wise and incompatible of facilities. Those issues pointers to excess, surplus and cost-effective incompetence (*Country Health Plan -10th Malaysia Plan*, 2015).

Malaysia is classified by the World Bank as the country with upper middle-income and Malaysia has declared a mission of getting upper-income country status by 2020, has a centrally-administered healthcare provider by the MOH over its head quarter, district and state offices (Jaafar, Noh, Muttalib, Othman, & Healy, 2013). In addition, Malaysia has administratively centralized its general hospitals system through a limited budgeting, managed by standard financial provisions and connected to the objectives and performance benchmarking. The Ministry of Health reasoned is based to standard procedures provides standard practices throughout Malaysia and will promote in achieving country aims (Jaafar et al., 2013).

There are approximately 139 public and 210 private sector hospitals in Malaysia which are Non-Governmental Organisations (NGOs), public and private (*Country Health Plan - 10th Malaysia Plan*, 2015). Therefore, more problems are faced by the

Malaysian hospitals in terms of credibility measurements. In Malaysia, pharmaceutical costs itself growth from RM 891 million in the year of 2005 to RM 1.5 billion in 2009, which justified operating expenditure for almost 18%. Deloitte (2014) did mention that total global health spending was expected to rise by 2.6% in 2013 before accelerating to an average of 5.3% a year over the next four years, 2014 – 2017, and it is expecting to increase on average of 5.3% in 2014 – 2017. This situations will provide impact to the Ministry of Health, public hospitals, insurance company, and customers in the markets, to handle with problems of imbalanced access to healthcare due to work-force shortages.

In order to face the challenge and strengthen the services, the government of Malaysia has allocated an amount of RM23.3 billion for the initiatives to improve public health services and facilities. Government also allocated RM45.4 million to provide medications to patients undergoing chronic hemodialysis and acute illnesses treatment in the 2015 budget (Utusan Malaysia,10 October 2014). Prospects and Key Result Areas (PKRA) of the health sector is primarily through the governance and provision of services that will lead to improved health outcomes and ultimately to better health status, befitting that of an advanced nation.

Towards that, the health sector must transform to be a more efficient and effective healthcare providing system in ensuring universal access to healthcare and must speedily react to the changes in products and services in order to be at the forefront on the advent of new technologies, and applying new processes while replacing old processes (*Country Health Plan - 10th Malaysia Plan*, 2015). Among the specific areas to look into are where governments, hospitals and doctors are seen as having the greatest opportunity to eliminate wasteful spending in healthcare (*Economic*

Transformation Programme - A Roadmap for Malaysia, 2010). One of the area to take care in eliminating wasteful spending is by having a proper inventory management, which in this study focusing on drugs management.

Based on the above discussions, it is noted that public hospitals, as the general healthcare provider, are important contributors to the Malaysian economic growth and in relation to their inventory management practices, it is vital for public hospitals to move up their service standards to a higher value chain. To do so, this service needs a systematic approach of inventory management practices that would accelerate service (drugs inventory management) performance, thus can lead to excellence in healthcare. As highlighted by Puan Eisah binti A. Rahman, Pharmaceutical Service Senior Director of the Malaysian Health Ministry, the staff concerned must properly manage the inventory through accountability, integrity, obey to the current act and rules in order to avoid misconduct, misuse of power and wastage (Pharmaceutical Service Division, 2009).

1.2.2 Issues and Challenges in Public Hospitals

Ministry of Health - Country Health Plan under 10th Malaysia Plan 2011-2015 had discussed the issues and challenges faced in health. Financial burden and constraints facing by the government right now has gradually shifted more patients to the public healthcare system. The existing healthcare delivery system has been far from efficient and that there has been tremendous wastage of resources within the public and private sector. The existence of the dual system of care contributes to the misdistributions of resources. This has led to duplication of services and to a certain extent, underutilization of high end expensive technology. All this leads to waste and economic inefficiency. There were reports stating that some hospitals in the public sector had low bed occupancy ratio. There were also reports of underutilized and unused high end equipment when skilled specialists resigned from the public sector. Research has shown that the primary drivers for waste are lack of clinical quality, inadequate and incompetent workforce, poor patient flow, poor supply chain and the presence of mismatched services.

Hospitals today are complex organisations, which are technologically driven and manned by various professionals from various subgroups and subcultures (Manaf & Hazilah, 2009). Public hospitals product line items includes of high cost and low cost item as well as perishable and durable goods that are consumed in large and small (Rachmania & Basri, 2013). The increasing demand for healthcare services coupled with rising cost of medical care leads to a necessity of an efficient utilization of medical resources (Stranger, 2013). Vipul (2013), business economy and efficiency can be enhanced due to effective and frequent inventory control. His studied also highlights the significance of inventory management in building successful and sustaining inter-firm relationships in industrially backward area and proper inventory management even results in enhancing competitive ability and market share of small manufacturing units.

The existing healthcare delivery system has been far from efficient and that there has been tremendous wastage of resources within the public and private sector. The existence of the dual system of care contributes to the misdistributions of resources. This has led to duplication of services and to a certain extent, underutilization of high end expensive technology. All this leads to waste and economic inefficiency. There were reports stating that some hospitals in the public sector had low bed occupancy ratio. There were also reports of underutilized and unused high end equipment when skilled specialists resigned from the public sector.

Importantly, supply chain management in the healthcare context is not simply a financial issue; its reliability and speed also has a direct effect on clinical outcomes (Iannone et. al., 2013). Heck et al. (2010) through their case study conducted in 2 hospital, found that in general, in the hospital with Enterprise Resource Planning (ERP), far less people were concerned with inventory management. For this reason, the ERP hospital has to operate in any case more efficiently. The reasons for choosing health care sector are obvious; currently, the Dutch government demands hospital to work effectively and efficiently, meaning that they have to be competitive against predefined fares and other hospitals. For this reason, budgets are under pressure and hospitals are seeking for means to offer excellent care against the lowest costs. Kumar Ordamar, Zhang, 2008, did mentioned that inventory levels have been seen as one of the more interesting area for improvement in healthcare materials management and academics have also given attention to replenishment processes in healthcare organizations.

Typically several different inventories exist: raw materials, finished products and work in process. Storage of raw materials and finished goods take place at the beginning and the end of the manufacturing. During the production, semi-finished products have to be stored occasionally as well, those are call work in process inventories (Heck, 2009). This research focuses only on drugs management. Therefore pursuing this study is deemed appropriate and informative as it will expand the knowledge on inventory management practices, inventory management performance as well as total quality management practices and public hospitals study in Malaysia.

There are reported that public hospital didn't supply enough drug or medicines to the people (The Star, 7 December 2011). The health ministry at Putrajaya has detected a maternity hospital that provides expired medicines to patients (Berita Harian, 24 Oct 2014). This statement is shows us the inefficient inventory control management of hospital. Thus, inventory control techniques must be optimized to ensure the availability of essential medicines and essential drugs list at healthcare facilities.

Heck, 2010 had stated that the reason to select the sub-domain of inventory management is due to three (3) main reason; 1) biggest costs hidden in business are usually found in the inventory, consequently the biggest potential benefits can thus be gained here too (Harrington, 1996), 2) stock form a source for risk (Fawcett et. al., 2007), and (Visser, 2004): for example, stock may catch fire, can be stolen, damaged etc. If stock level are lowered, the related risks are reduced too, and 3) inventory costs are relatively easy to identify and reduce (Johnson et. al., 2001). Improved inventory management in the public sector in terms of financial management and internal control can lead to increases in investment revenue or freeing up of resources to be used elsewhere due to reduction in stock held in inventory and a reduction in losses due to theft, wastage, damage, spoilage or misuse.

The health care in modern days has become more complex, sophisticated and more expensive in terms of cost of drugs, surgical equipment and hospital stay. The management of inventory pares, the avenues for optimizing the costs of medicare services besides making available materials to the patients which increase the quality of health care services (Manhas, 2012). The hospital management has to ensure the availability of various drugs as these are essential and vital for patient care.

Pharmaceutical department is one of the important department supply medicine to patient and due to that, becoming one of department using high expenditure to purchase of stock (Anil K, Aubid, Rashid, Mushtaq, & Syed, 2012). An inventory control practice in pharmacy is the process of managing inventory in order to meet customer demand at the lowest possible cost and with a minimum investment. The pharmacy department is most often charged with responsibility for managing drug and delivery system costs. Therefore, the pharmacy management team should focus on developing effective strategies to maximize leverage of drug and human resource cost (Manhas, 2012). As such, the researcher will look deeply into the implementation level of inventory management practices towards inventory management performance in the Malaysian public hospitals by taking into account the moderating effect of total quality management.

Realizing the effect of inventory on the functioning of any healthcare organization, all areas (stores, purchase, pharmacy) connected with receiving, buying, stocking, issue of materials are being brought under the name of " inventory management" as one function in the organization. Even though various findings had highlighted on the importance of inventory management at manufacturing or public service, limited research had been done on inventory management practices among public hospitals specifically in Malaysia. Since drug expenditure is the main component of the hospital's spending, drug inventory management practices is an interesting area to investigate (Theptong, 2010). Therefore public hospitals in Malaysia will be the scope of this study.

1.2.3 Need for Inventory Management (Drugs Management) in Malaysian Public Hospitals

Hospitals are complex organisations providing large number of services of patients, physicians and staff, where one of the services is pharmacy. According to Burns (2002), although the amounts and dollar values of the inventories carried by different types of health care providers vary widely, as average of supply costs, 15 to 23 percent goes for pharmacy. A typical hospitals spends 25-30% of its budget on medical supplies and their handling. Similarly, a recent survey on health care providers found that each year the providers spent more than $100 million on supply chain activities, which was "nearly one-third their annual operating budget (WHO, 2010). In the current scenario of increasing health care costs, inventory management system must be optimised without sacrificing the level of service provided. In spite of recent improvement in supply process, drug stores still face a difficulty in providing effective drug delivery and flexible access methods to patients during critical times.

Drugs & Medicine being expensive and resources limited, it becomes imperative to improve their supply, increase the use, and minimize the cost through a pharmaceutical management system to be effectively put in place. There are some 3000-4000 drugs at any point in time, registered in any country; of which almost 70% are non-essential (WHO, 2010). Ideally, a National list of essential drugs should have 300-400 drugs; a district hospital needs some 150 to 200, while a health centre can manage with 40-50 drugs. Besides the big number of drugs to manage, aspect of Therefore, there is a need for inventory especially for drugs management in hospitals due to drug supply and delivery play a very important role in developing a quality health care system.

The research to date has tended to focus the performance of drugs management on public hospitals pharmacists rather than private hospitals. Public hospitals is running under government budget, due the increasing cost of medicine in couple of years, efficient drug management is the key strategy in reducing the cost of drugs and ensuring their availability in the healthcare facilities (Malik, Hassali, Shafie & Hussain, 2013). Meanwhile, private hospitals operating and stand on individual budget. They are operating their business under pressure to minimize cost and maximize profit. Therefore the mismanagement of drug was very limited and closed highlighting to the public compare to incident related to waste and theft of inventory in Hospital Kuala Lumpur and Hospital Pulau Pinang in the National Audit Chief Report 2013. Therefore, another motivation for this study is to study the ability of pharmacy department among Malaysia public hospitals in managing drugs.

Table 1.2
Study in Hospital and Pharmacy Unit

Author's name	**Objective of Study**	**Design of Study**
H.W.Stranger et al. (2012)	To identify what drives good management of perishable within the supply chain (blood inventory management)	Qualitative method (case studies) method at hospital transfusion laboratories
Alijani et al. (2010)	To investigate drug supply, delivery and access in greater New Orleans area during normal and critical periods	Quantitative and qualitative method on dispension of drugs at drugstores
Alejandra Romero (2013)	To gain better understanding on main logistics inefficiencies executed	Quantitative method (case study) at hospital pharmacy
Khurana et al.2013	To identify the categories of drugs which need stringent management control	Quantitative method at tertiary care neuropsychiatry hospital

Table 1.2 (Continued)

Bhakoo & Singh (2011)	To develop an understanding of the nature of collaborative arrangements that partners in hospital supply chains use to manage inventories	Case study at healthcare organisations (pharmaceutical manufacturers, wholesalers/distributors and public hospitals)
Anil K et al. (2012)	To study the drugs stored in pharmacy department according to cost and criticality	Quantitative method at drugs store of pharmacy department
Sarda & Gharpure (2013)	To identify the various issues, developments and suggestion for improvement in drug inventory management in hospitals	Qualitative method at health care sector – hospitals
Kagashe & Massawe (2012)	To access inventory management and logistics skills level of personnel working at health facilities	Quantitative method at public hospitals

Table 1.2 above summarized a previous study on public hospitasl and pharmacy units. Current inventory management studies focusing on healthcare services, since 2010 until 2013, have so far been equally studied by qualitative, quantitative and mixed method research approaches, drawn heavily by in-depth interviews, case studies and surveys that are descriptive in nature (Callender, 2007; Hamza, 2006; Heck, Berg, & Davarynejad, 2010; Stig-arne, 2006; Woosley, 2009); Bhakoo & Singh, 2012;(Anil K, Aubid, Rashid, Mushtaq A, et al., 2012; Hani, Basri, & Winarso, 2013; Kagashe & Massawe, 2012; Khurana, Chhillar, Kumar, & Gautam, 2013; Rachmania & Basri, 2013; Romero, 2013; Saraste, 2013; Stanger, Wilding, Yates, & Cotton, 2012). Although it is well-acknowledged that a qualitative approach could provide accurate and thorough findings regarding the specific issue, the main limitation of this approach is that the findings gathered are unable to be

generalized to the identified population. In light of this, the researcher will further examine this study using quantitative study.

1.3 Problem Statement

In the era of intense competition and globalization, the survival of individual firms depends on their ability to enhance and augment their competitive advantage in the global market. The health care in modern days has become more complex, sophisticated and more expensive in term of cost of drugs. It required Pharmaceutical department, one of department using high expenditure to purchase inventory such as drug, making available medicine to the patients. Thus inventory management techniques must be optimized to ensure the availibity of essential medicines and essential drugs list at healthcare facilities. Among the inventory management practices that can be highlighted based to previous studies are as tabulated in the following Table 1.3:

Table 1.3
Proposed Inventory Management Practices

Singh (2013)	**Singh & Singh (2014)**	**Heck et. al.(2010)**
Support by highest management	Current stock counting	Improved production process
Involvement from staff	Managing employees	Less faults of master data by single registration
Investment in information technology	Cyclical counting	Improved inventory turnover visibility
Vendor development	Stock controlling	Real-time and advance control of budget
Process automation	Keeping accurate records	Improved 'three-way-matching" of purchase order
The effectiveness of marketing process	Controlling supply and demand	Invoice and packing note
Production planning & control	Managing small items	Reliability monitoring of better supplier
Supply chain integration		Automatic restriction of approved supplier

Table 1.3 (Continued)

Efficient material plan	Improved dead inventory visibility
Product cost reduction	Less waste
Delivery on time	Rush orders planning
Performance improvement of supply chain	Better supplier-contracts registration

Table 1.3 above shows the proposed inventory management practices by Singh (2013), Singh & Singh (2014) and Hect et. al. (2010) for effective inventory management that can enhance the business process performance. However, all these thirty (30) practices are derived from a framework and not empirically tested. After critically reviewing the thirty (30) practices, the current study will take all the practices to be tested by clustering them into three different groups. The descriptions of dimensions fell into: (1) Inventory Administration, (2) Inventory Control and (3) Inventory System. Previous studies on dimension of inventory administration, inventory control and inventory system were discussed separately, resulting in inconsistent results.

This study will review these three dimensions by gathered together in confirming the constructs of inventory management practices and tested it in order to get the result of unidimensionality as a main contribution to the study as Ziegler & Hagemann (2015) noted that without testing for unidimensionality, an interpretation of the test score as representing one dimension is potentially risky. Therefore, unidimensionality is tremendously important. According to Mueller (2006) which revealed that, Rasch analysis should not be employed if the assumption of unidimensionality is not met. In addition, another studied stressed that each item in the instrument should be a meaningful measure of the unidimensional construct (Bond & Fox, 2007).

The drug supply and delivery play a very important role in developing a quality health care system. In spite of recent improvement in supply process, drug stores still face a difficulty in providing effective drug delivery. The increasing demand for healthcare services coupled with rising cost of medical care leads to a necessity of having an efficient utilisation of medical resources. Health care management has always been and still remains one of today's top issues of concern worldwide. Emergency preparedness is critical for all businesses, especially to drugstores that deal with the dispensation of drugs, an important aspect of healthcare (Alijani, Mancuso, Kwun & Barika, 2010).

From the point of view of healthcare sector, medicine management is the ability of healthcare and pharmaceutical organizations to optimize the pharmaceuticals use (Boulet, 2001). Due to that, the hospital pharmacy plays a vital role in patient care (Romero, 2013). However, pharmacy logistics processes are related to several issues that impact negatively the cost and quality of the medication services. Several studies show different inefficiencies, namely out-of-stock (Dongsoo, 2005), high costs (West, 2002), excessive manual labour (Dreyer, Strandhagen, Romsdal & Hoff, 2010), shrinkage (Vila-Parrish, Ivy & King, 2008), high frequency of reorders (Rosseti, Marek, Prabhu, Bhonse, Sharp & Liu, 2008), counterfeit products (Lefebvre, Romero, Lefebvre & Krissi, 2011) and product recalls (Schuster, Allen & Brock, 2007). The result of this inefficiencies show that an inappropriate inventory management can produce over- and under-procurement, out-of-stock, medicine shortage and multiple and unnecessary storage locations such as storage in care units or in the physicians' and nurses' offices which will lead to affect rigorously the sustainability of healthcare system in general and the patient security in particular. (Romero, 2013).

In Malaysia scenario, among the current issue that can be highlighted, which is related to waste and theft of inventory, is the National Audit Chief Report 2013. A total of RM1, 692125.00 of the theft involved medicine. This issue have confirm that poor drug inventory management particurly in public sector is a critical issue (Sarda &Gharpure, 2013). This theft will lead to the reduction in the quantity of drugs available to patients and due to that, the quality of healthcare would be negatively affected (Kagashe & Massawe, 2012). The aim of the hospitals is to make medical services available timely, continuously and importantly, the regular availability of drugs is the highest priority for any hospitals (Khurana et. al., 2013). Hence, the control of the inventory is essential for efficient and effective supply management, which is vital to the patient care function.

Khurana et. al., 2013, raised important concerns and highlight the need of application of scientific inventory management tools for effective and efficient management of the medical stores and close supervision on items belonging to important categories. Therefore, this study aims to experimentally investigate the ability of public hospitals in implementing the items of inventory management (drug management) practices comprises dimension of inventory administration, inventory control and inventory system in relation to inventory management performance and determine the most influential dimension (inventory administration, inventory control or inventory system) that effect inventory management performance.

Inventory management is part of the supply chain practices and it has always been discussed in previous literature (Rajwinder, Sandhu, Metri, & Kaur, 2010). Numerous research were conducted to determine the influence of supply chain towards organization performance, such as in the area of manufacturing (Chalotra, 2013), automobile (Othman, 2012), service logistics (Shams-ur & Tritos, 2008), motor industry (Hussain & Waveren, 2009), retailing (Rajwinder et al., 2010) and integrated operations strategy (Kannan & Choon, 2005). Othman (2012) studied on the strategy and practices of supply chain towards performance of supply chain in the automobile industry while Rajwinder et al. (2010) examined the relationship between practices in managing supply chain towards achieving competitive advantage and organizational performance of retailing.

Another researcher looked deeper, Jonsson & Mattsson (2010) studied on the inventory management practices and its implications on perceived planning performance, while Heck, Berg, Davarynejad, Duin, & Roskott (2010) discussed in more detailed in the proposed framework with regard to improving the performance of inventory management with a process-oriented measurement framework. The research done in Malaysia by Agus & Hajinoor (2012) looked to the direction of practices on inventory and supply chain management towards the level of performance in the industry. However, there is limited research focusing on inventory management practices towards inventory management performance (Kagashe & Massawe, 2012).

There is no doubt that inventory needs proper control due to it being the largest asset of a business Singh & Singh (2014) and the balancing of strategy in supply chain, management of inventory and characteristics of the product are highly urgent for the performance operations of an organization (Srinivas, 2013). This issues are in line with the research conducted by Chalotra (2013), where a greater degree of inventory control is important in hourly basis, as it contributes the organizations performance as the challenge is strong, and which requires daily growth. There is a need for future research in inventory management to look into the performance measurement and its effects on inventory management (Eckert, 2007; Hsu-Hua Lee & & Kleiner, 2001).

In the context of business services, particurlarly towards public hospitals in Malaysia, Rossetti (2008) had proposed inventory management implimentation in the hospital as the future research areas. Performance measurement in healthcare and public service is not easy to measure, due to the wide range of stakeholders. Its requires a high standard of performance on a wide range of factors, including clinical care, patient satisfaction, short waiting times, cost control and learning from best practice elsewhere (Moullin, 2004). Therefore, the performance measurement that would be addressed in this research is by focusing on three key measures of performance, which are operational performance by Heck (2009), problem-solving performance and decision-making performance by Basaran (2013) under non-financial performance.

There were numerous studies undertaken, where the major concerned is about the implementation of inventory management and its impact on performance (Ann I et al., 2014; Romero, 2013; Azzi and Persona, 2013; Ruankaew and Williams, 2013; Lwiki et al., 2013; Deveshwar and Modi, 2013; Mogereet al., 2013; Mitraet al., 2013; Khurana et al., 2013; Namagembe et al., 2012; Ali et al., 2012; Stranger et al., 2012; K Anil, 2012; Kagashe and Massawe, 2012; Bhakoo and Singh, 2011; Theptong, 2010; Rossetti, 2008; Callender, 2007; Talafha, 2006). Previous studies in inventory management performance have indicated that there is an inconsistency in the results of the analysis. However, empirical research covering inventory management practices towards inventory management performance is surprisingly small in number. Thus, there is still lack of study in examining these frequently studied area in one study and in addition, studies which have examined such relationship are still limited particularly in Malaysia. Besides, there are still gaps highlighted from such conflicting findings which involved the inventory management practices and inventory management performance (Chen and Paulraj, 2004). Therefore, the current study will look different inventory management practices (which comprised of the dimension of inventory administration, inventory control and inventory system) together to test their relationship with inventory management performance among the public hospitals in Malaysian context.

Total Quality Management (TQM) is being applied either in public service or industries for the sake of competitive advantage. Thus, nowadays TQM is well-recognised and proven that have positive impact for the entire performance in the service industry and the practically of TQM in public industries acknowledge with the participation of overall business organisations (Talib, Rahman, & Qureshi, 2011). A commitment to quality in the long-term period would be the main constant factor towards performance of the business, having direct significant, except for the return on assets with all performance measures (Kannan & Choon, 2005). Quality is referring to the capability of an organization, and a procedure, to produce with consistent a service or product according to the level that are required as acceptable to either the producer or client, or together (Saraste, 2013). Most of the previous researches had only examined the relationship between supply chain practices, inventory management and inventory practices towards organizational performance, without considering the influencing factor of total quality management (Heck, 2009; Saraste, 2013).

Besides, in another previous research, Kannan & Choon (2005) also focused on the direction of overall practices of TQM towards performance but unfortunately, not in the context of inventory management practices towards inventory management performance. Although total quality management practices was portrayed as a moderating variable between the strategy, practices and performance of the supply chain in the studies conducted by Othman (2012), there has been limited use in the context of inventory management practices towards inventory management performance. Patel (2009) believes that total quality management, which places importance on improved customer satisfaction, is the tool that offers better quality services in the public health.

Even though the usage of TQM is increasing, TQM implementation still has gaps in delivering the services in the public health sector. TQM presents a basic challenge to hospitals administrators and offers a unique chances to the hospitals to apply a great techniques towards enhancing management (Kaluzny, Mclaughlin, & Simpson, 1992). The increasing use of TQM is an exciting development, but TQM application lags in the process of providing health services in the public sector, specifically public health agencies. TQM offers public health organizations a unique opportunity to adopt a powerful tool for strengthening management and presents a fundamental challenge to public health administrators.

This study will propose the potential of TQM as a major managerial innovation, compared with the current management of many public health agencies and offer guidelines to help users realize its full potential in public health applications. Besides, it also shows that the implementation of TQM also eliminating waste in all processes (Irfan, Ijaz, Kee, & Awan, 2012). Therefore, there is a pressing need that leads this study to postulate total quality management practices as the possible moderator between inventory management practices and inventory management performance among public hospitals in Malaysia.

After critically reviewing all the literature and having discussions with experts and academicians in the quality area and keeping the service sector in focus, therefore the present study attempts to examine the moderating influence of TQM practices, which may play a positive role in the correlation between practices and performance of inventory management. An analysis on practice of quality management between district, state and national level hospitals has never been conducted in Malaysian public hospitals before (Manaf & Hazilah, 2009). The study concluded that, despite the fact that all the public health institutions are practicing some form of TQM elements, none has matched the international best practices (Noreen, Kudakwashe, & Kudzanayi, 2016). Empirical studies on the effect of organisational structure on practice of quality management among employees of Malaysian public hospitals have never been conducted before and thus, this contributes to the body of knowledge in this discipline of research (Manaf & Hazilah, 2009).

Various measures taken by the Malaysian government from the 1980s onwards were aimed at increasing the efficiency of the public service by strengthening the importance of quality management in the public sector (Karim, 1994). Empirical studies on practice of quality management in health care have been found to be wanting, and the emphasisis still very much not necessarily true or reliable (Bigelow and Arndt, 1995). It is thus anticipated that this study will fill the gap (Manaf & Hazilah, 2009). Rising health care costs and its associated wastes have often been cited as one of the reasons for quality management to saturate the health care sector.

Costs associated with waste and errors in healthcare are estimated to be between 20 to 40 per cent of the total costs of the industry (McLaughlin and Kaluzny, 1999).

With these inconsistent results, it is apparent that total quality management needs to perform as a moderator. Previous studies have also been unable to clearly highlight the relationship between inventory management practices, total quality management, and inventory management performance. In light of this, this study will explore total quality management at the organizational level as a moderating effect, so as to observe the relationship between inventory management practices and inventory management performance among Malaysian public hospitals.

From the above discussion, it can be concluded that it is important to develop a comprehensive study on inventory management practices and inventory management performance in the context of the public hospitals. Thus, this study will focus on unidimensionality of inventory management practices which comprised of dimension of inventory administration, inventory control and inventory system, the ability of public hospitals in implementing the practices, the most influential dimension that contributes to the performance of inventory management, and relationship of inventory management practices towards inventory management performance, moderated by total quality management among the public hospitals in Malaysia. This study therefore sought to answer the following research question. Thus, Table 1.4 below summarized the gaps in the problem statement.

Table 1.4
Summary of Gaps

<table>
<tr><th>Problem Statements</th><th>Gaps</th></tr>
<tr><td>
<table>
<tr><th>Singh (2013)</th><th>Singh & Singh (2014)</th><th>Heck et. al.(2010)</th></tr>
<tr><td>1. Support by highest management</td><td>13. Current stock counting</td><td>20. Improved production process</td></tr>
<tr><td>2. Involvement from staff</td><td>14. Managing employees</td><td>21. Less faults of master data by single registration</td></tr>
<tr><td>3. Investment in information technology</td><td>15. Cyclical counting</td><td>22. Improved inventory turnover visibility</td></tr>
<tr><td>4. Vendor development</td><td>16. Stock controlling</td><td>23. Real-time and advance control of budget</td></tr>
<tr><td>5. Process automation</td><td>17. Keeping accurate records</td><td>24. Improved 'three-way-matching" of purchase order</td></tr>
<tr><td>6. The effectiveness of marketing process</td><td>18. Controlling supply and demand</td><td>25. Invoice and packing note</td></tr>
<tr><td>7. Production planning & control</td><td>19. Managing small items</td><td>26. Reliability monitoring of better supplier</td></tr>
<tr><td>8. Supply chain integration</td><td></td><td>27. Automatic restriction of approved supplier</td></tr>
<tr><td>9. Efficient material plan</td><td></td><td>28. Improved dead inventory visibility</td></tr>
<tr><td>10. Product cost reduction</td><td></td><td>29. Less waste</td></tr>
<tr><td>11. Delivery on time</td><td></td><td>30. Rush orders planning</td></tr>
<tr><td>12. Performance improvement of supply chain</td><td></td><td>31. Better supplier-contracts registration</td></tr>
</table>
Singh (2013), Singh & Singh (2014) and Hect et. al. (2010) proposed inventory management practices however, all these thirty one (31) practices are derived from a framework and not empirically tested.

After critically reviewing the thirty one (31) practices, the current study will take all the practices to be tested by grouping them into three different groups; inventory administration, inventory control and inventory system

Previous study looked on single dimension, current study grouped into 3 dimension which are, therefore re-visit the unidimensionality issues.</td>
<td>GAP 1: The need to test on unidimensionality, to examine the ability of public hospitals in implementing the items and to determine the most influential dimension which includes, dimension of inventory administration, inventory control and inventory system in relation to inventory management performance.</td></tr>
<tr><td>The research done in Malaysia by Agus & Hajinoor (2012) looked to the direction of practices on inventory and supply chain management towards the level of performance in the industry. Othman (2012) studied on the strategy and practices of supply chain towards performance of supply chain in the automobile industry while Rajwinder et al. (2010) examined the relationship between practices in managing supply chain towards achieving competitive advantage and organizational performance of retailing.

One of the main knowledge gaps that would be addressed in this research is till now, most of the research did not go in depth by zooming it into inventory management practices towards inventory management performance.</td>
<td>GAP 2: Therefore, there is a necessary for the researcher to see does inventory management practices will lead to inventory management performance in the public hospitals in Malaysia.</td></tr>
</table>

Thus, there is still lack of study in examining these frequently studied area in one study and in addition, studies which have examined such relationship are still limited particularly in Malaysia There is a need for future research in inventory management to look into the performance measurement and its effects on inventory management (Eckert, 2007; Hsu-Hua Lee & & Kleiner, 2001). In the context of business services, particularly towards public hospitals in Malaysia, Rossetti (2008) had proposed inventory management implementation in the hospital as the future research areas. There is limited research focusing on inventory management practices towards inventory management performance (Kagashe & Massawe, 2012).	
Even though the usage of TQM is increasing, TQM implementation still has gaps in delivering the services in the public health sector (Kaluzny, Mclaughlin, & Simpson, 1992). Patel (2009) believes that total quality management, which places importance on improved customer satisfaction, is the tool that offers better quality services in the public health. The implementation of TQM also eliminating waste in all processes (Irfan, Ijaz, Kee, & Awan, 2012). An analysis on practice of quality management between district, state and national level hospitals has never been conducted in Malaysian public hospitals before (Manaf & Hazilah, 2009). The study concluded that, despite the fact that all the public health institutions are practicing some form of TQM elements, none has matched the international best practices (Noreen, Kudakwashe, & Kudzanayi, 2016). Empirical studies on practice of quality management in health care have been found to be wanting, and the emphasisis still very much not necessarily true or reliable (Bigelow and Arndt, 1995). It is thus anticipated that this study will fill the gap (Manaf & Hazilah, 2009).	**GAP 3**: Therefore, this study attempt to investigate whether Total Quality Management (TQM) moderate inventory management practices and inventory management performance.

Although TQM practices was portrayed as a moderating variable between the strategy, practices and performance of the supply chain in the studies conducted by Othman (2012), there has been limited use in the context of inventory management practices towards inventory management performance. Therefore, there is a pressing need that leads this study to postulate TQM practices as the possible moderator between both variables.	

1.4 Research Questions

Research questions were derived from the gaps identified in the problem statement above. To ensure the research objectives will be achieved, this study intends to answer the following research questions:

RQ1: Do inventory management practices comprises dimension of inventory administration, inventory control and inventory system are moving towards unidimensionality?

RQ2: What is the ability of the public hospitals in implementing the items of inventory management practices comprises dimension of inventory administration, inventory control and inventory system in relation to inventory management performance?

RQ3: Which is the most influential dimension of inventory management practices comprises dimension of inventory administration, inventory control and inventory system that affect inventory management performance?

RQ4: What is the relationship between inventory management practices and inventory management performance in Malaysian public hospitals?

RQ5: Do total quality management practice moderate the relationship between inventory management practices and inventory management performance among public hospitals in Malaysia?

1.5 Research Objectives

The main objective of this research is to examine the implementation level of inventory management practices comprises dimension of inventory administration, inventory control and inventory system towards inventory management performance. Moreover, this research will investigate the moderating effect of total quality management on the relationship of inventory management practices and inventory management performance. From previous studies, it is apparent that not many empirical researches have been conducted that pertain to the relationship between inventory management practices and inventory management practices. Therefore, this research will underline several research objectives based on the problem statement. In detail, the research aim to fulfill the following objectives as follows:

RO1: To investigate inventory management practices comprises dimension of inventory administration, inventory control and inventory system are moving towards unidimensionality.

RO2: To investigate the ability of the public hospitals in implementing the items of inventory management practices comprises dimension of inventory administration, inventory control and inventory system in relation to inventory management performance.

RO3: To investigate the most influential dimension of inventory management practices comprises dimension of inventory administration, inventory control and inventory system that affect inventory management performance.

RO4: To examine the relationship between inventory management practices and inventory management performance in Malaysian public hospitals.

RO5: To test the moderating role of total quality management practice in enhancing the relationship between inventory management practices and inventory management performance among public hospitals in Malaysia.

1.6 Significance of Study

In general, this study will provide explanation of the inventory management practices comprises of inventory administration, inventory control and inventory system among public hospitals in Malaysia towards inventory management performance moderated by total quality management. As such, through a systematic research methodology, significance of this study is expected to contribute into three (3) knowledge which are theoretical, methodological and practical. Detail explanation regards to significance from this study are as follow:

1.6.1 Theoretical significance

Generally, this study could contribute to successful implementation of inventory management practices in Malaysian public health sector. Public health sector is a significant contributor to Malaysian healthcare service system where it have tremendously improved the health of the population and transforming the country into one of the healthiest countries in the tropics based to the indicator of increase in life expectancy from 63.1 years (male) and 66.0 years (female) to 72.6 and 77.2, respectively (Tahir et. al., 2015). However, the public healthcare sector facing similar challenges like other countries in sustaining and providing more equitable and efficient services. Thus, Malaysian public health sector need to improve their performance to growth continuously. Malaysian public hospital must ensure inventory management practices programme is successfully implemented.

Although there are numerous studies available with regard to inventory management practices, and its relation to performance of inventory management, research that is related to measuring the level of drugs management as part of the inventory in the public hospitals seems limited. Due to that, this study intends to investigate the ability of Malaysian public hospitals in implementing the inventory management practices. This study needs to test empirically on the relationship between inventory management practices, total quality management practices as the moderator and inventory management performance. Most studies attempted to establish a link between these two variables but evidences are insufficient. Thus, the motivation of this study is to influence by the role of inventory management practices particularly on the implementation process (how) and outcome (what) of the performance.

The concept of unidimensionality which referring to the focus on one attribute or dimension at a time (Bond & Fox, 2015) was introduced in this study. This concept referring to each and every question contributes to the measure of a single underlying attribute. In addition, the principles of unidimensionality require that our analytical procedures must incorporate indicators of the extent to which the persons and items fit our concept of the ideal unidimensional line. It is expected that the originality of this study will be judged through its contribution in extending the body of literature in the area of inventory management performance related to the specialized area of inventory management practices. The contribution will not only benefit public hospitals but all organizations either public or private will gain the benefit from the proposed framework as holding the inventory plays an important role in manufacturing or services.

This study also significant to enrich the Theory of Item Response as one of the underpinning theories, beside System Theory and Stakeholder Theory based on the research framework proposed. The Theory of Item Response is one of the IRT families used in analyzing the data collected from the field through the assistance of Winstep computer software. The results of the findings are discussed according to the Rasch analysis, which has hardly been found previous studies therefore, this study will derive a new paradigm of analysis in the context of inventory management. Furthermore, this study is able to measure the ability of the organization in performance the inventory management practices and its relationship to inventory management performance. Besides, this analysis will provide guidelines for the top management in planning for continuous improvement of the organizations.

This study utilizes System Theory to describe the interrelated subsystems in an organization to formulate an inventory management practices and inventory management performance. The other theory supporting this study is Stakeholder Theory as it covers organizational performance. Therefore, the variables of inventory management practices (combining dimension of inventory administration, inventory control and inventory system), Total Quality Management elements as moderator, and inventory management performance are considered as a contribution to the general theory of System Theory and Stakeholder Theory.

The study will be beneficial to various stakeholders; it will be a source of information for the large manufacturing firms that will help in understanding inventory management practices, their mode of application and the practical relevance in the firm. The study will also provide a framework for sound decision making as far as inventory management is concerned.The study will enable policy makers obtain knowledge of manufacturing industry dynamics and the appropriate inventory management practices to be implemented. It will also provide guidelines for policy makers for designing appropriate policies that will regulate the industry. To the academicians, the study will form a basis for further studies in the field of inventory management practices in an organizations, especially in the service and manufacturing sector. This will probably generate and develop new knowledge and ideas to narrow the gap in the area of inventory management practices.

1.6.2 Methodological Significance

Analysis in Rasch Measurement Model affords characteristic of the measurement in the natural sciences. Data collected from the field will be analyzed through the assistance of the Winsteps computer software. The results of the findings are discussed according to the Rasch analysis, which has hardly been found in previous studies. Therefore, this study will derive a new paradigm of analysis in the context of inventory management practices. Among the advantages of the Rasch Model are: (1) able to provide indications concerning their ability in performing the inventory management practices, (2) results of the study will also indicate the most difficult items or constructs to perform by each of the public hospitals and (3) each of the public hospitals can have access to the information on the probability of success in performing the mentioned items.

Rasch measurement, which demonstrates the role of modern measurement, can facilitate the production of results which are more efficient, reliable, having validity in assessment and providing more convenince to users (Abdul Aziz, 2010). Due to that, the analysis will provide guidelines and ideas to the Heads of Pharmacists and hospital directors in planning for continuous improvement of a particular department related to drugs management. This analysis studied is able to measure the ability of the public hospitals in performing the inventory management practices construct. With Rasch model, the respondents from participating organisations (public hospitals) who performed inventory management practices were measured according to their ability level and the difficulty of items under study. Item Respond Theory is the most suitable as it will be able to explain the ability of the respondents (public hospitals) in achieving the variance in item difficulties for the construct of inventory management practices and inventory management performance.

The responded public hospitals were also divided into two levels; high achiever (high, very high and extremely high) and low achiever (low, very low and extremely low) of abilities in performing inventory management practices. In line with the framework of the study, the level of performing inventory management practices has affected the inventory management performance. Those public hospitals which at the upper level abilities have improved inventory management performance while public hospitals with low abilities were less performed.

The Rasch analysis contributed to attend the measurement issues particularly the rating scale applied in measuring the instruments. According to Tatum (1998), the common rating scales used in research did not have uniform structure or equal interval because measuring such items that involved attitudes, confidence or ability are not all the same point on the scale. Therefore, the Rasch model operates through Winsteps software able to alter the rated data into the logistic model in the logit form. Output from the model was calibrated into common unit so that the measures taken on inventory management practices comprises dimension of inventory administration, inventory control and inventory system are measured in objective, stable and precise across sample of study (Tatum, 1998).

1.6.3 Practical Significance

In the real situation, this study will provide positive benefit to drugs management practices in the government service sector, in particular the public hospitals of Malaysia. Today, more and more organizations have acknowledged the importance of ensuring proper inventory management. This proactive approach to develop inventory management practices is lacking and research studies need to promote it actively. The value of this research stand up from giving a detailed analysis of a healthcare inventory management (drugs management) framework in the rising world. There has been only a minimum number of other studies published in the literature.

Many public hospitals in the world including Malaysia have limited knowledge or ignore the importance of inventory management in the organization. This lack of knowledge has led to mismanagement and waste of inventory in the public hospitals. This study may shed light on the organizations and also industries to find a solution with regard to inventory management. The information from this study will give an overall benefit to all parties in the organizations and industries to understand the impact and suitable practices in order to reduce or to apply better measures to prevent inventory problem.

On the part of the students, graduates and researcher, they will get a broad opportunity to expand for future researches in the area of inventory management in Malaysia public and private sector. This study is undertaken to enhance the frontiers of knowledge by adding up to literature on inventory management practices, inventory administration, inventory control, inventory system, total quality management and inventory management performance in service industries (health sector) and other private industries.

From an institutional perspective, this study will benefit them in terms of assessing their curriculum as to whether it meets the public services or industries expectation and requirements. The study will also beneficial to the general public and the entire population because it will come up with appropriate suggestions on how timely and the right quantities that inventory would be managed in healthcare delivery so as to be able to satisfy their requirement. Furthermore, this study will serve as management policy guide for the stakeholders in the health sector since the study will reveal the hospital's inventory management practices.

1.7 Scope of Study

The study focuses on the medical warehouse of Pharmacy Department as part of the services of public hospitals in Malaysia. Inventory management practices in this study refer and specifically focus on drug management practices. The selection of this service is due to the consideration of drug expenditure being the main component of a hospital's spending and the medical store is one of the most extensively used facilities in the hospital. The participating respondents in this study are Head of Pharmacy Officers from 139 public hospitals under Ministry of Health Malaysia (MOH). Further explanation will be given in Chapter Four.

This scope has assisted the researcher to focus on discussions related to the level implementation of inventory management practices in the sense of inventory administration, inventory system and inventory control, moderated by Total Quality Management (TQM) practices that affect the performance of inventory management among public hospitals. The underpinning of the study is based on The System Theory by Von Bertalanffy (1940) and Stakeholder Theory by Freeman (1984) while Item Response Theory by Tucker (1946) and Frederick M.Lord (1952) relates to the Rasch model.

The Rasch Measurement Model and Partial Least Squared (PLS) Method, a covariance based Structural Equation Modelling (SEM) was scope as method of data analysis and the data were collected from the survey through online questionnaires. Five categories of hospitals are merged and used for data analysis under Rasch Measurement Model in order to answer research objective one, two and three. Meanwhile, for data analysis under Partial Least Squared (PLS) Method, five categories of hospitals were then split into special hospitals and non-special hospitals in order to answer research objective related to direct relationship and moderating effect. Further explanation will be given in Chapter Three.

1.8 Limitation of Study

Since this study focuses on the level implementation of the inventory management practices towards inventory management performance (for non-financial performance) among public hospitals in Malaysia, it is limited on the several elements such as dimensions, research framework, research instruments, ethical approval, data collection and analysis method. The study uses the survey method and the population only focuses on Main Medical Store of Pharmacy Department among public hospitals in Malaysia. The questionnaire instrument was used as the primary tool for gathering data and was sent to the Head of Pharmacy Officers as target respondents. Besides, this study is limited to the application to conduct the research and ethical approval from Medical Research & Ethics Committee (MREC), Ministry of Health Malaysia through the National Medical Research Register (NMRR). Therefore, it was time consuming and length of time is usually occured for respondents to return the questionnaire when dealing with the managerial level.

1.9 Operational Definition of Key Terms

This section describes briefly some important key terms of the study. The key terms indicate the operational definitions of the variables and assist in understanding the concept within the context of study. Summers (2001) had claimed that the conceptual descriptions of the construct warrant special attraction to the readers and are the back bonds of theory. The definitions are further explained in Chapter 2. The operational definitions of relevant construct variables are as follows:

1.9.1 Inventory

This study refer inventory as medical consumables in hospital which represent the drugs which having the critical roles in hospital activities, ready to be served to sub-store and patients in the public hospitals in order to achieve goals of the organization. It is stored at a Main Medical Store (MMS) of the public hospitals in order to ensure that the operation process can be carried out smoothly by Pharmacy Department.

1.9.2 Inventory Administration (IA)

In this study, the inventory administration is referred to as those involved in managing planning, managing employees and managing suppliers towards drug management practices in order to ensure that the drugs are properly administered. In other word, it means securing the business drugs stock, flow of drugs and services as per their demand in the hospital by the Pharmacy Department.

1.9.3 Inventory Control (IC)

In this study, inventory control is referred to as practices by the public hospitals in controlling the drugs before and after receiving them from suppliers that made medical services available timely and continuously for efficient patient-care functions. It covers qualitative indicator description, pharmacy records and documents and supply process.

1.9.4 Inventory System (IS)

In this study, an inventory system is referred to as a computerized system used in the Main Medical Store (MMS) of public hospitals in improving informed decisions, saves time, saves cost, minimize error and information gather by using a proper computer system towards drugs allocation in order to avoid instances when drugs are out of stock. An effective inventory system can quickly provide the information to the Head of Pharmacy Officer, who make more perfect and on time judgments in managing the operation of medical store.

1.9.5 Inventory Management Practices

Inventory management practices for this study is defined as new or meaningfully improved by combining the three dimensions, which are inventory administration, inventory control and inventory system under one practices to be implemented rather than worked under single dimension. Inventory management practices are proposed in this study to work as input in the drugs management of Pharmacy Department towards inventory management performance as output by reduce healthcare cost without sacrificing the quality of the service to the patient by improving efficiency and productivity of the healthcare system.

1.9.6 Inventory Management Performance

In this study, inventory management performance refer to the operational perspective of non-financial performance, consists of operation performance, problem solving performance and decision making process performance which will affect the extent of drugs management performance for non-financial performance. The inventory management performance was measured based on the ability of public hospitals to achieve the mentioned items regards to operation performance, problem solving performance and decision making process performance, related to drugs management performance.

1.9.7 Public Hospitals

According to National Healthcare Establishment & Workforce Statistics Hospitals 2012-2013, public hospitals is defined as an institution that primarily provides inpatient services (diagnostic and therapeutic); catering for a variety of medical conditions (surgical and non surgical) and the establishment of the hospitals was approved by Ministry of Health Malaysia (Medical Practice Division-CKAPS).

1.10 Organization of Thesis

The thesis is divided into six chapters and organized according to the research process employed in this study:

Chapter One: Introduction.

This chapter outlines the various important contents that are relevant to this research topic. The specific contents are: background of the study, problem statement, research questions, research objectives, significance of the study, scope of study, operational definition of key terms, organization of the thesis and summary of the chapter.

Chapter Two: Review Of The Literature.

The second chapter will explain the literature review based on the research objectives that discuss the relationship between all variables, the implementation of Rasch Measurement Model and PLS-SEM, and the theoretical perspectives. The underpinning theories are The System Theory by Von Bertalanffy (1940) and Stakeholder Theory by Freeman (1984) while Item Response Theory by Tucker (1946) and Frederick M.Lord (1952) relates to the Rasch Measurement Model.

Chapter Three: Conceptual Framework And Development Of Hypothesis

The third chapter includes the description of the conceptual framework and the development of hypothesis.

Chapter Four : Research Methodology

The fourth chapter will further describe on the ethical approval, research design, the justification of population, sampling method, data collection, measurement of variables, pre-testing of research instrument, analysis of instrument validity and method of data analysis.

Chapter Five: Analysis and Findings

Chapter five presents the analysis of data assembled and the result obtained from this research by using Rasch Measurement Model and PLS-SEM.

Chapter Six: Discussions, Conclusions and Recommendations

This chapter provides the discussions on the study's findings, its implications for practitioners in industry, policy makers and regulatory authorities, and researchers. Subsequently, it deliberates the study's conclusions, limitations and recommendations for future research.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter explained comprehensive understanding of literature review regarding the variables involved in this study. The review is based on previous researches and explorations on this subject matter. Its included discussion related to inventory management practices comprises dimensions of inventory administration, inventory system and inventory control, total quality management practices and inventory management performance. Discussion on underpinning theory that supported the research framework also included in this chapter. This chapter contained nine (9) sections which provides critical literature review and arguments related to this study.

Firstly, section 2.2, will gives understanding of inventory management practices. Section 2.3 will then discuss about inventory management performance and section 2.4, will continue with previous studies on inventory management practices and inventory management performance. Section 2.5 discussed on relationship between inventory management practices relatedness to inventory management performance studies with the moderating effect of total quality management. In section 2.6, the concept of Rasch Measurement Model will be elaborated in the context of inventory management, while Section 2.7 will deliberate the implementation of Partial Least Square (PLS-SEM) imputed in Rasch Analysis Procedures. Section 2.8 will gives explanation on related underpinning theories proposed for the study and finally, section 2.9 will provides the summary for Chapter 2.

2.2 Inventory Management Practices

It is a method of maintaining stock of drugs at a level of lowest purchasing and stocking cost. The effective and efficient management of medical stores entails close supervision of important drugs, prevention of the pilferage and priority in purchase and distribution of drugs. An efficient inventory control system would help the optimize use of resources and eventually help to improve patient care, by ensuring the availability of essential stocks and preventing stock-outs (Santhi & Karthikeyan, 2016).

The purpose of inventory management is to determine the amount of inventory to keep in stock, how much to order and when to replenish, or order (Russell & Taylor, 2010). Inventory control in the activity which organizes the availability of items to customers. Inventory enables a company support the customer service, logistic, or manufacturing activities in situations where purchase or manufacture of the items s not able to satisfy the demands.The purpose of the inventory control function in supporting the business activities is to optimize the three targets which is customer service, inventory costs and operating cost (Tony Wild, 2002).

Laeiddee (2010) refers inventory as the stock in the warehouse for uncertainty demand, purchase in large order, reduces waiting time, increases transportation usage and as contingency against seasonal. It simply mean the quantity of goods held in a specific location at specific time in an unproductive state, waiting to be used or sold (Yahya, 2016). Some scholars refer inventory as materials or a detailed list of assets held by an organization or institution which consist of company's raw materials, work in processed goods, supplies used in operations, finished goods, goods in stock, drugs and equipment (Santhi & Karthikeyan, 2016; Muller, 2011). In the pharmacy store of public hospitals, there are approximately 730 items of inventory being managed (Theptong, 2010).

2.2.1 Definition of Inventory Administration

Inventory administration as one of the practices refers to those activities which consist of precise recordkeeping on shipment and acceptance of items at the right time. Recent developments in the field of inventory administration have led to a renewed interest where the trade-off between customer service levels and inventory investment is addressed in practice by formal quantitative inventory management solutions (Kholidasari, 2013). The research study by Singh & Singh (2014) indicated that proper management of inventory can enhance an organization's supply chain to run efficiently. Drug administration from the point of view of the healthcare sector is referring to the ability of healthcare and pharmaceutical organizations to optimize the pharmaceuticals being used (Romero, 2013).

Inventory management does not make decisions or manage operations but provides the information to managers who make more accurate and timely decisions to manage their operations. (Deveshwar & Modi, 2013). Singh & Singh (2014) defined inventory administration as those activities which consist of precise record-keeping to shipment and acceptance of items at the right time. Proper management of inventory can enhance an organization's supply chain running efficiently.

Inventories play a major role in enhancing the service level and reducing the operation cost of logistic systems. Inventory administration as one of the practices are referring to those activities which consist of precise record-keeping to shipment and acceptance of items at the right time. Recent developments in the field of inventory administration have led to a renewed interest where the trade-off between customer service levels and inventory investment is addressed in practice by formal quantitative inventory management solutions (Kholidasari, 2013). The research study by (Singh & Singh, 2014) indicated that proper management of inventory can enhance an organization's supply chain running efficiently. Due to that, authors added that companies should strive to ensure high customer satisfaction, and off-the-shelf availability is almost a necessity under current supply chain arrangements.

Inventory is kept by an organization for the aim of internal or external customer demand, known as largest item in the category of current assets, must be accurately calculated and must be valued to determine profit or loss of the company. Inventory items have to record if changes occur in the stock. The objective of proper managing the inventory is to control the total number of inventory to stock, ordering number and when to replace, or order (Russell & Taylor, 2010).

2.2.2 Definition of Inventory Control

Mitra, Pattanayak, & Bhowmik (2013) defined inventory control as the proper detection of all materials in the company's inventory after these items were purchased from the suppliers. Inventory control system is the level of inventory to know the order quantity and the time to order. Inventory control is the supply of goods and services at the right time with the right quality and quantity. It is a reliable means in which businesses are been managed to ensure customers are satisfied and organization remains in operations via minimization of losses (Wilfred I.Ukpere, Jun 2014). According to Muninarayanaapa (2013), the ordering cost and carrying cost have a reverse relationship. The ordering costs go up with the increase in number of orders placed. On the other hand, carrying cost goes down per unit with the increase in number of units purchased and stored. There have a lot of type of medicine and different ordering time, so it will give complicated work to continuously monitor the stock.

Inventory control is the most important function of inventory management and it forms the nerve point in any organization. Inventory control is the supply of goods and services at the right time with the right quality and quantity. It is a reliable means in which businesses are been managed to ensure customers are satisfied and organization remains in operations via minimization of losses (Ukpere, 2014). According to Muninarayanaapa (2013), the ordering cost and carrying cost have a reverse relationship. The ordering costs go up with the increase in number of orders placed. On the other hand, carrying cost goes down per unit with the increase in number of units purchased and stored.

Inventory control in the activity which organizes the availability of items to customers. Inventory enables a company support the customer service, logistic, or manufacturing activities in situations where purchase or manufacture of the items is not able to satisfy the demands. The purpose of the inventory control function in supporting the business activities is to optimize the three targets which is customer service, inventory costs and operating cost (Tony Wild, 2002). Good inventory control means that everyone time to fulfill and orders stays low (Ali et al., 2012). Thus, material managers are suggest to be more focus and putting attention to the areas of inventory control, process of procurement and relationship towards vendors and physicians.

Inventory control is the activity which organizes the availability of items to the customers. Inventory control system refers to the way organizations manage and determine their inventory to be distributed efficiently and effectively. Inventory control involves the procurement, care and disposition of materials. Inventory control is natural occupation that everyone undertakes, some more successfully than others. As with any profession, inventory control has a body of technique and knowledge, which differentiates the professional from do-it-yourself enthusiast.

There are still colleagues who believe that inventory can be managed using a clear brain and common sense. With the techniques described, many people have been able to manage their stock inventory so their customers are happier and so are the accountants. Improved inventory management has been shown to halve stocks and improve service at the same time. If manager effectively controls the inventory, can release the capital that tie up in unnecessary inventory, production control can be improved and can protect against obsolescence, deterioration and or theft.

Inventory control in the activity which organizes the availability of items to customers. Inventory enables a company support the customer service, logistic, or manufacturing activities in situations where purchase or manufacture of the items is not able to satisfy the demands. The purpose of the inventory control function in supporting the business activities is to optimize the three targets which is customer service, inventory costs and operating cost (Tony Wild, 2002). Good inventory control means that time to fulfill orders stays low (Ali, Asif, *et. al.*, 2012). At the same time, a good inventory control means improving managerial efficiency in all functional areas of management (Lwiki *et. al.*, 2013).

The advantages of using inventory control system can avoid redundancy and out of inventory stock, missing stock and expired stock of medicine. The issue is a very sensitive in Malaysia because oversupply of stock can be detrimental hospital cost. It is because for each medicine supplied has an expiry date but may have an impact on inventory holdings increased by storing the excess stock supply. Inventory control system also helps to avoid the inventory of medicine out of stock. When applied inventory control system in pharmacy management stock, we can detected the stock has reached minimum level immediately. So, easy for pharmacy purchase the stock from supplier again before the inventory out of stock.

Every transaction for medicine stock has to record for avoiding missing stock of medicine. As we know, the cost of purchases medicine very expensive and important for patient. So, if we manage the stock very well and follow the instruction of inventory control system can avoiding this case from happen. It is also same happen for the expired stock of medicine. Pharmaceutical department is one of the important department supply medicine to patient. Pharmacy department also one of department using high expenses in the purchase of stock. An inventory control practice in pharmacy is the process of managing inventory in order to meet customer demand at the lowest possible cost and with a minimum investment (Anil K, Aubid, Rashid, Mushtaq A, et al., 2012). The pharmacy department is most often charged with responsibility for managing drug and delivery system costs. The pharmacy management team should focus on developing effective strategies to maximize leverage of drug and human resource cost (Anil K, Aubid, Rashid, Mushtaq A, et al., 2012).

2.2.3 Definition of Inventory System

The inventory system has important role in inventory management system due to it can minimize errors, accelarate accumulated data, and simplified the process of inventory management (Hani et al., 2013). While, M. Ali et al. (2012) defined the inventory system as uses of strong applications of good forecasting techniques with effective incoming and outing inventories, therefore inventory management facilitates the process to be more effective and efficient.

Visibility of the inventories, supply and demand in the supply chain is at the top of the most relevant initiatives in recent times. In order to support them, there have been used information technologies. Distortion and information errors may cause lack of visibility and problems with the control of ordered stocks. It results in hidding the true state of information and lack of possibility of taking corrective actions for unpredictable events in the consequence. Lack of coordination and visibility among partners significantly influence the efficiency of the supply chain and the increase of the management costs. Consequently, uncertainty in the supply chain is increasing. Many researchers in their work have paid their attention to inventory control at various levels. In order to increase the stability of inventories, there have been proposed initiatives directed to increase the efficiency of the inventory level control process achieved by: activities which increase the coordination, expand access to local and global information and improve the forecasting process (Czwajda & Kosacka, 2017).

Material and supplies are part of inventories that organizations carries for the purpose of sale or as inputs to production process. Therefore, having a good inventory system enable the company to keep track on their inventory level as low as possible at minimum cost. Choosing the right method and appropriate system enable the company to be more efficient (Mohd Lair *et al.*, 2014). A successful business depend on many reasons, one of the factor is a consistent system of inventory management which offers into smoothly manage the materials, fully utilize people and equipment, communicate with customers and coordinate internal activities. Furthermore, an appropriate system will reflect to the firm's short and long-term profitability (Vaisakh, 2013). A successful business relies on many factors, one of which is a reliable inventory management system.Inventory management system provides information to efficiently manage the flow of materials, effectively utilize people and equipment, coordinate internal activities and communicate with customers.

Inventory system is used to analyze product sales, detect popular item in stock and ready to instantly fulfill any customer's order. It also helps us know which special orders sell on occasion and have those products available in a limited quantity to keep inventory costs down and to develop a positive reputation for quickly filling special orders (Ali et al., 2012). A good inventory system means that organization have an up to date inventory count at all times, giving good customer service, giving accurate information to customer and improve image of the organizations (Ali, 2011).

These initiatives all share the common goal of striving to improve the efficiency of inventory and demand management in the supply chain (Schary& Skjott-Larsen, 1998; Waller et.al., 1999). A good inventory system means that organization have an up to date inventory count at all times, giving good customer service, giving accurate information to customer and improve image of the organizations (Ali,2013). It is a vital that inventory management system allows managers to receive real time information on inventory. This will assist management to accurately made informed decisions, anywhere, anytime and save time and cost used for labor and thus working on inventory management properly (Mathaba, Dlodlo, Smith, & Adigun, 2011). A properly managed inventory system can considerably improve the firm's performance (Koumanakos, 2008). Without doubt, the upgrade of technology change will increase the expenditure of health care but the best parts and among the benefits from its are technologies become cheaper, faster, mobile and more featured (Medical Development Division, 2011).

Inevitably, the progress of technology will raise the cost of health care. However, the benefits will increase exponentially as technologies become cheaper, faster, mobile and more featured. The medical fraternity is apprehensive of the tendency by medical providers to be inappropriately technologically-driven rather than patient-centered (Health, 2011a).

2.3 Inventory Management Performance

Good inventory management performance for perishables entails carrying enough stock to guarantee high on-shelf availability while at the same time minimizing time expiry (Steven Nahmias, 1982). Due to that, if many organisations incorrectly manage the inventory, it will lead to increased costs and increased wastage (Stanger et al., 2012).

2.3.1 Introduction of Inventory Management Performance

Mentzer et.al. (2008), stressed that performance objective for inventory management are focused on providing the desired level of inventory availability and timeliness to immediate downstream customers while minimizing the costs associated with personnel, equipment, and inventory required to achieved established service level, given the constraints imposed by factors outside the purview of logistics. Therefore, the aim of this research is to focus on the performance of a small part in Supply Chain Management (SCM) which is inventory management as a specific domain.

To be successful in the long run, every organizations needs a clear and explicit vision which is formulated by top-management (Waal, 2002). The objective of good inventory management are twofold; namely 1. Offering a good service level and 2. At the lowest possible costs. Measuring reliable and adequate performance is critical for steering, business success and achieving the goals (Fawcett et. al., 2007). The measurement for performances can be divided into two: financial and non-financial performance.

Previous research conducted by Othman (2012) highlighted non financial performance of supply chain. Saad (2012) studied organizational performance in the context of financial performance and operational performance while Zainal Abidin (2013) measure innovative performance. In the area of this study, measuring performance indicator for pharmaceutical inventory department will looked at unwanted and expired drug rate. Therefore, in allowing the department to achieved its objective of cost-effective product utilization, minimizing waste is one the primary goals.

There is no doubt that inventory needs proper control due to, it is the largest assets of a business (Aarti & Dhawal, 2013) and the alignment of supply chain strategy, inventory management and product characteristics are extremely important for successful operations of a company (Srinivas, 2013). Samir (2006) highlighted future research direction as research should also focus in establishing actual performance improvements in logistics and supply chain practices leading to cost-savings and customer satisfaction.

This issues are in line with the researched conducted by Vipul (2013), where a greater degree of controlling inventory is need of the hour as it formulates the business success/failure as competition is intense, growing day by day. Furthermore, inventory management problems can interfere with a company's profit and customer service. They can cost a business more money and can lead to an excess of inventory overstock that is difficult to move. Most of these problems are usually due to poor inventory processes and out-of-date systems.

Besides that, Singh et.al. (2007) have also felt the need for employee involvement for effective management for improving the competitiveness of the organization. Rossetti (2008), had proposed inventory management practices within the walls of a hospital as the future research areas. Therefore, the measurement that would be addressed in this research is by focusing on three key measures of performance which are operational, problem solving and decision making under non-financial performance. Improving the performance of inventory management (drug management) in the Malaysian public hospitals require a good indicator to measure and to support a reduction in wastage. This study will look into the following performance indicators:

2.3.2 Definition of Operational Performance

Saraste (2013) refers operational performance as the strength and swiftness of the logistic chain. One of the characteristics in the operational performance as mentioned by Bowersox, Closs, & Cooper (2002) is speed and the consistency of the supply chain. Handling inventory especially drug in medical store is very crucial due to drug can save lives of many if it is used in a good way, right time, right quantities, right quality and at affordable cost. Studied done by Kagashe & Massawe (2012) in public hospitals in Tanzania showed that problems of maintaining stocks of drug at the level needs exist in Dar Es Salaam Region hospitals. Among the factors contributing to under stock of drug are lacks of funds, changing treatment guidelines, medicines not commonly used, unexpected increase of patients, small size of warehouse, bureaucracy, not paying supplier on time and procurement procedure too long (Kagashe & Massawe, 2012).

This idea was supported by Heck (2009) in his framework to assess operational performance of inventory management which revealed that there is room left to develop a performance measurement tool that explains the coherence between activities within inventory management. The alignment of supply chain strategy, inventory management and product characteristics are extremely important for the successful operations of a company (Srivinas, 2013)

2.3.3 Definition of Problem Solving Performance

Basaran, 2013 states that if the inventory problems can faster be detected, the actions plan for the solution also can quicker be taken. Among the problem solving performance indicators of overcoming the problems as stated by Basaran (2013) are faster determination of the problems, acceptance of it, no hidden agenda, and solving without harm. Thus, ability to solve problems faster in effective and efficient ways is recognized as a performance benchmark before the problems get more and extent all over the whole productions.

From the healthcare perspective, due to the hospital pharmacy plays a vital role in patients care, the problem solving performance may become a good indicator for hospitals in general and hospitals pharmacies in reducing operations costs and patient security through inventory management practices towards inventory management performance.

2.3.4 Definition of Decision Making Performance

Decision making related to management of inventory either in public or industries are complicated. Inventory managers are always facing with these situations in their daily operations. As deciders, there are numerous categories of mutually involved systems that need link one another before deciding any decisions and it is behind intuitive power of inventory managers (Basaran, 2013). Among the indicators under decision making performances are faster, logic, scientific, and compliant when the inventory related decisions are being made. More than that, using of computer support, not conflict with other decisions in the organization and the decisions making have to be inform simultaneously to all departments can more contribute to better decision making (Basaran, 2013).

Since medicine represents a critical component of healthcare, been notified as not well managed in hospitals pharmacies (Basaran, 2013) and inventory management has an impact on wastage (Stanger et al., 2012), these study intended allows better decisions making to be made in leading to an improved practices of inventory management towards inventory management performance.

2.4 Inventory Management Practices and Inventory Management Performance

Lee and Kleiner (2001) stated that in order to manage inventory management successfully, "retailers should understand customer needs, vendor partnerships, technology, data integrity, and performance measurements". This statement was in line with study done by (Ali, 2012), that the efficient and effective management of inventories leads towards higher satisfaction level in customers. Ali (2012) stated that the efficient and effective management of inventories will lead to higher satisfaction level in customers. Thus, the use of proper practices in inventory management especially at hospital pharmacies can enhance inventory management performance of drug management. Study done by Anil et al. (2012) proposed necessary effective and efficient management of drug stores in order to make sure the performance of medicines is high. Among the ideas are efficient priority setting, purchase decision making, specific drug distribution, higher supervision of drugs, and avoiding of pilferage drug.

2.5 Inventory Management Practices, Total Quality Management Practices and Inventory Management Performance

Total quality management stage is comprised of all the ideas from the quality scholars molded into a model to form a strategic implementation. This quality implementation involves internal environmental factors as well as external factors. The aim of the quality management concept is the totality of features and characteristics of products or service that bears on its ability to satisfy the given needs to the satisfaction of the customers (Singels, Ruel, & Water, 2001).

2.5.1 Previous Research on Total Quality Management (TQM) Practices in Hospitals Services

Since 1992, the practices of TQM in public sector especially in public hospitals are very rare compare to manufacturing organizations which have successfully incorporated TQM as strategic choice Irfan, Ijaz, Kee, & Awan, (2012) even TQM practices is well accepted and means for continuous improvement processes and enhance performance of organizations included publics hospitals for internal operations (Kaluzny et al., 1992). Pass studied revealed that in order for the public health achieved ultimate success of TQM, the entire components of organizations must integrate one another for the outcomes.

Kaluzny et al. (1992) listed ten (10) challenges for public healthcare to meet in order to success in TQM practices. As a conclusion, studied mentioned that public health organization need public health practice face continual challenges that required a new look of organizing and managing the services especially drug management practices towards drug management performance.

The next phase, which began around 2009 till 2012, discussed and addressed of the TQM implementation in public health care. Patel (2009) point out the importance of TQM implementation and practices as a paradigm shift in the quality of healthcare delivery, to monitor and sustain it. While Al-Zu'bi & Judeh (2011) stated that hospital worldwide are undergoing dramatic changes in establishing health care systems and one of the system re trying to implement is TQM practices.

The importance of TQM practices has conceptualization highlighted as a technique for constant improvement taking into account that the patients in healthcare sectors reside in the core of these improvement for better service (AlHarbi, 2012). Ali (2012) revealed the result of his studied that customer needs quality has a strong link with inventory management while performance measurement has poor or no link with inventory management.

The research can be extended to different categories based on the industry such as hospitals, hotels and higher education or based on the ownership such as private, government or NGO. This will enable to compare the results across different sectors (Yapa, 2015). This study may serve as a foundation for future studies in different countries. So, it is recommended that this study be repeated in different countries and contexts. The results of such studies can be very fruitful for developing a model of TQM that can be implemented easily, effectively, efficiently and successfully in a cross-cultural context (Rad, 2005).

Quality management was actively pursued by the Malaysian public sector and this was formalised with the release of Development Administration Circular No. 1/1992 entitled ''Guidelines for Total Quality Management in the Public Sector''; and Development Administration Circular No. 4/1991, entitled ''Guidelines on Strategies for Quality Improvement in the Public Sector''. With the release of these two government circulars, implementation of quality management became obligatory for the public sector. Under the Ninth Malaysia Plan, quality management will continue to be reinforced as one of the policy thrusts towards service excellence in the public sector (Economic Planning Unit (EPU), 2006). Apart from government directive, the implementation of quality management in Malaysian public hospitals has also been fuelled by the rising concern for quality in order to control excessive waste and inefficiency in health care services the world over.

2.5.2 Inventory Management Practices, Total Quality Management and Inventory Performance

The study concluded that despite the fact that all the public health institutions are practicing some form of TQM elements, none has matched the international best practices. TQM has not been fully adopted and applied in the health sector. The major factors that have hindered the successful adoption of TQM in the PMTCT programme are lack of employee involvement, lack of training, lack of financial resources and lack of senior management involvement in all issues to do with TQM.

Service industries play an essential role in a developing nation's survival and growth. In almost every type of service industry, total quality management is being applied to gain competitive advantage. Therefore, it is a well recognised nowadays that quality and its management issues strongly impact the overall performance in service industri and the implementation of TQM in service industries requires the involvement of entire organization (Faisal,Zillur & M.N.Qureshi, 2011). A strategic commitment to quality appears to be the most consistent driver of business performance, correlating significantly with all performance measure except return on assets (Kannan & Tan, 2005). Quality is a broad term, often referring to a product's or service's capacity to meet or rise above expectations, in relation to the minimal requirements of consumers as well as competing products.

However, quality also refers to the ability of a business unit, or a process, to consistently produce a product or service that conforms to standards that are predetermined as acceptable to either the client or the producer, or both (Saraste, 2013). Most of the previous researched had only examined the relationship between supply chain practices, inventory management and inventory practices towards organizations performance without considering the influenced factor of total quality management (Saraste, 2013; Heck, 2009; Noori, 2004; Zhang et al.. 2006; Mohamed et al..2008; Lin et al..2005). Besides that, previous research also focused on relationship between the overall implementation of total quality management towards performance (Hendrick & Singhal, 2001; Goerge & Richard, 2002; Vijay & Keah, 2004; Prajogo & Sohal, 2004;) unfortunately not in the contact of inventory management practices towards inventory management performance.

Although total quality management practices was portrayed as moderating variable between the supply chain strategy, supply chain practices and supply chain performance in the studies conducted by Othman (2012), there has been limited used in the contact of inventory management practices towards inventory management performance. Patel (2009) believes that total quality management, which places on improved customer satisfaction, is the tool that offers better quality services and in turn prospect of great market share and profitability. Thus it is important that institution working in the healthcare sector, particularly government healthcare institutions work on their TQM practices.

Therefore, there is pressing need that lead this study attempt to postulate total quality management practices as possible moderator between inventory management practices and inventory management performance among public hospitals in Malaysia. Further researches and challenges in this field will be oriented to empower the quality performance indicators within the pharmaceutical organisation to be able to monitor the health outcomes, rather than customer satisfaction (Marinkovic et al., 2016). Othman (2012) who conducted a study that attempted to investigate the relationship supply chain strategy and supply chain performance in automative industry in Malaysia. Result showed that TQM practices at high level can improved the performance of supply chain. After critically reviewing the literature and discussion with experts and academicians in the quality area keeping service sector in focus, therefore present attempts to examine the moderating influence that TQM practices may play in the relationship between inventory management practices and inventory management performance.

Although the country has already reached a reasonable level of healthcare provision, there is a need to ensure that the standard of practice of medicine is maintained and at par with international standards. The importance of quality and standard of care will remain unchanged whatever the choices of mechanisms in health policy. Quality and innovation will attract inward investment and generate income to the nation through many opportunities in the health sector and industry e.g. health tourism, but pose challenges in marketing and branding. Meanwhile, Vipul (2013), stressed that inventory management can be done by taking into account dimensions like quality management.

This is particularly interesting as many firms are focused on tools and practices instead of creating a quality management infrastructure that will lead to long term positive result. Due to that, Focker et.al. (2010) strongly encourage companies to keep and improve their quality departments due to each TQM practices are positively correlated with performance. (Ali, 2012) claimed that customer needs quality has a strong link with inventory management while performance measurement has poor or no link with inventory management according to the results of study conducted.

Suggestions and public opinions should be taken to improve the quality of the services rendered by the public and integrated hospitals (Sheikha Mohammed Ali Al-Balushi & M. Firdouse Rahman Khan, 2017).

2.6 Rasch Measurement Model and Inventory Management Performance

Rasch emphasises a basic scientific measurement that one attribute of an object be measured at a time. Thus, it requires a single construct to be the underlying the items that form a hierarchical continuum (Bond & Fox, 2007). Nevertheless, there are also several studies which took the quantitative approach; for instance, two researches which looked into the practices of lean healthcare which paid attention to healthcare performances in Scotland and in Malaysia, respectively (Shazali et al., 2013; & Antony & Kumar, 2012) but only measured the state of their financial performance, customer satisfaction, and employee performance (Shazali et al., 2013). In using this approach, scholars have utilized several methods to collect their data namely questionnaires and online surveys, and analyzed it using several methods; Structural Equation Modelling (SEM) and SPSS. However, not many research, particularly in the area of lean healthcare and sustainability, applied the partial least square-structural equation modelling (PLS-SEM). In light of this, the researcher will further examine the influence of lean healthcare practices towards operational performance in achieving sustainability and safety climate as moderating effect among private hospitals in Malaysia by using PLS-SEM.

Thus, Babbie (1990) and Fowley (2009) suggested the quantitative approach through a survey as the best choice in generalizing the findings. The statistical method has been widely used in previous studies in analyzing the data collected through survey techniques. According to Salzberger (1999), the significance and quality of the empirical finding of thereon based would rely on properties and quality of the measurement theory. Most of the common analysis techniques are using either statistical modelling to estimate the relationship between variables, or descriptive analysis by adopting dimensionality reduction methods like Factor Analysis (FA), or Principal Component Analysis (Battisti, Nicolini, & Salin,2008) which is similar to the Classical Test Theory (CTT).

CTT has become a main paradigm of measurement in research relating to the social sciences. CTT has the underlying assumption which is, an individual must have a *true score* (T); therefore it gained with no errors in measurement. CTT also looks at the relationship between *error* (E), *observed score* (X), and *true score* (T) in the population (Salzberger, 1999). The relations between these scores will explain the quality of the test score and would contribute to the formalization of dependability, which are inner steadiness plus instructions of unidimensionality (Tor, 2009).

Conversely, as mentioned by Wright (1997), based to the outline in CTT, the difficult part of linearizing raw scores is that they are hidden and it is test-dependent. In the context where the Likert Scale data is analyzed, it has been argued that CTT methods are inappropriate due to the fact that it assumes the interval or even the ratio measurement (Thorpe, 2012). As explained by Bond & Fox (2007), "the increases of the unit across the level scale are of similar value and all items are treated as being the same under the relative value of each response across the category."

In addition, Likert scales, to some researchers, may be seen as representing at best nominal or categorical measurement, but Linacre (2012), argued that it should not be treated as continuous as they do not have the origins or units of measurement, even though they are viewed as involving ordinal measurements. Due to that, a Modern Test Theory (MTT) was introduced based on the work of (Thurstone, 1927). MTT is represented through the Item Response Theory (IRT) and Rasch measurement (Wright, 1997). In IRT, the items and respondents' attributes can be presented on the same scale (common scale), known as logit (Yu, 2013). The underlying philosophy between IRT and Rasch are different, in the sense that IRT is said to be descriptive in nature, as it aims to fit the model to the data; and Rasch, on the other hand, is vice-versa, where it is prescriptive in nature and fits the data to the model, but, both are still being seen as having advantages over CTT (Yu, 2013). The test under this theory is dependent on a multiple set of questions, and the assessment of the tested subject's ability depends on two factors: (1) the subject's relative ability; and (2) the item's intrinsic difficulty (Saad, 2012).

Rasch measurement is a mathematical modelling under a unique approach which is dependent upon an accomplished additive conjoint measurement and a latent trait, where the word *conjoint* refers to the probabilistic analysis of respondents, persons and the same scale of questions (Granger, 2008). Rasch measurement is prescriptive in nature and it is able to eliminate errors associated with CTT when it perfectly fits the data to the model (Yu, 2013). Furthermore, Rasch develops the forecast of a person's ability and true intervals of item difficulty by emerging linear measures (Granger, 2008).

Since this research aims to evaluate the relative influence of practices in inventory management and their effect on the performance, the level of inventory administration, inventory control and inventory system implemented by the inventory management practices may lead to a different level of inventory management performance. Therefore, it is crucial to measure the level of performance in inventory management and the implementation practices of inventory management. Thus, a correlation analysis is necessary, which requires interval formed data. Most of the study especially in the management aspect, uses ordinal scores while nominal and ordinal data can only be analyzed using non-parametric analysis (Sekaran, 2003).

Conversely, Rasch analysis is able to solve this limitation since it is able to perform a correlation analysis by transforming the data available into an interval form. Thus, the data collected from this study will be analyzed based on the Item Response Theory (IRT), due to the well-developed capability for limitation-solving, calibrating the instrument and clarification of IRT level, with regard to the analysis procedure and respondents' ability in adopting the items proposed. Commonly practiced in social science research, this is where ordinal data have been analyzed using CTT, which is contradictory to the basic principal of statistics (Abdul Aziz, 2010). Therefore, the Rasch Measurement Model (RMM), using Winsteps Software Linacre (2012), as part of the modern test, can solve the issue of measurement and CTT. Correlational studies are the most popular approach among previous researchers, but are limited in looking at the ability of the organization to practice in order to enhance the performance.

Almost all of the research which have been done are analyzed by SPSS, SEM and PLS, but none are using the Rasch Measurement Model as a tool for analyzing. The Rasch Measurement Model uses the Item Respond Theory can measure the ability of the organizations towards performance. Therefore, for the purpose of this study, as it intends to look at the ability of public hospitals in practicing inventory management (drug management) through the level of inventory administration, inventory control and inventory system (difficulties), as well as to look at the moderating contribution to the dissimilar level of TQM practices (difficulties) with the level of inventory management performance, the Rasch Model of measurement will be used to analyze the data.

2.6.1 The Review of Measurement Issues in Social Sciences

The objective of this part is to clarify the application of Rasch dimension standard, context also simulations for the capacity of Malaysian public hospitals ability in performing the inventory management practices and its relation to inventory management performance specifically in drug management by reviewing the measurement issues in social science. Stevens (1946) proposed a latest meaning for dimension of social science by determining the numbers to activities based to some regulation.

The main structure on how to measure in social behavioral science is assumed by straight relation on interpretations in the method of amounts, ranks, marks and the underlying focus of objective. These categories are also known Likert scale items (Nunally & Bernstein, 1994).

According to Wright (1997), ordinal and categorical scales are not in lines. Berenson, Levine, & Krehbiel (2011) mentioned that the ordinal scaling is a relatively weak form of measurement because the scale does not account for the amount of the differences between the categories. It implies only which category is greater, better,or more preferred rather than by how much. Preece (2002) stated that, analyses of variance and covariance under parametric statistical tools are based on productmoment correlations such as multiple regression and factor analysis, are not practical for ordinal data. It can be summarized that continuing with analysis of parametric statistical and bearing in mind that raw data from Likert-type response scales as interval scales are risks invalid and misleading inferences.

2.6.2 Traditional Test Theory

According to Saad (2012), Traditional Test Theory will takes the total score of assessment, an attitude or opinion and believed it as a benchmark of an individual assessed on the variable through the questions. This theory has added to the formalization of dependability in relations of inner stability and unidimensionality matters (Tor, 2009).

However, the problem of linearising raw scores is not addressed Andrich (2004) under the context of Traditional Test Theory and in the form of test-dependent (Hambleton & Jones, 1993).

2.6.3 Modern Test Theory

Modern Test Theory traces its origin in the work of Thurstone (1927) on both achievement and attitude measurement in his article named A Law of Comparative Judgement. Thurstone (1927) formalized a probabilistic model for the relationship between a responses of a person to an item. It was a precursor to two branches of Modern Test Theory Andrich (2004) one called Item Response Theory (IRT), the second called Rasch Measurement (Wright, 1997a). Initially, the theory was built on dichotomous responses, and then generalized to response in more than two ordered categories. (Thurstone (1927) generally considered populations rather than individuals, but for efficiency, the concern here is immediately with the parameterization of individuals (Andrich, 1978).

2.7 Implementation of Partial Least Square (PLS) imputed in Rasch Analysis Procedures

Second part of this study is a Rasch Measures for Structural Equation Modelling (PLS-SEM) Analysis for path coefficient, hypothesis testing of the direct relationship and testing the moderating effect. Due to the limitation in Rasch measurement, Bond & Fox (2015) proposed the solution for it. The solution involved the process of taking the interval-level person Rasch measures and their standard errors for each latent variable that derive from previously Rasch analysed data on each of those data collection instruments to be imputed into the SEM software for further analysis. Its further explain in the study done by Boon et al. (2012) where the limitation were solved when the Rasch computed measures for each construct were used to investigate the path coefficient and hypothesis testing of the direct relationship between those variable measures.

This study took the proposed idea by Bond & Fox (2015) and Boon et al. (2012) as a guideline for analysis and current studied realized it is relevant in analysing the relationship. Furthermore, this second part of result from SEM-PLS is important to support the result of this study. The main analysis used in the Rasch measurement model are item polarity, right person-item distribution map, person measure order, item measure order, ability and difficult pattern parameters, rating scale, reliability analysis and principal component analysis. As suggested by Hair et al. (2014), one of the main reasons to include second order construct in research is to reduce the number of relationships in the structural model, making the PLS path model more parsimonious and easier to grasp.

2.8 Underpinning Theories of the Study

Theory is important to understand what is the concept embedded in the phenomena under investigation. Generally, a theory is specifically designed to assist in understanding the notion behind the phenomenon under investigation. In fact, a theory provides a picture of the logical linkage between various concepts/constructs, allowing us to better understand the relationship among them, and how they affect one another (Zikmund, 2003). Therefore, theory presents a systematic set of relationship which provides a consistent and comprehensive explanation of phenomena (Hair, Black, Babin, & Anderson, 2010). In other words, theory permits researcher to understand, specify the entire relationship among constructs and explain on how the contracts affected one another.

Three types of dimension (inventory administration, inventory system and inventory control) in the study contribute an important role towards inventory management performance. Hence, based on the literature review, the researcher finds three related theories are used to describe the conceptual framework of the study. The related theories are System Theory, Stakeholder Theory and Item Response Theory that will explain the ability level of implementing inventory practices in the organization towards inventory management performance.

2.8.1 System Theory

System Theory was introduced by Ludwig von Bertanlanffy, a biologist in 1940, who initially presented it through the General System Theory (GST). System Theory is a theory that asserts the system is a set of two or more elements of the behavior of individual elements which affect the behavior of other elements and the overall system in which each of these elements are dependent of each other Skyttner (1996) extracted from (Amagoh, 2008). This theory received a lot of attention around the 1960s.

In 1960s, System Theory was accepted and used in business organization. According Johnson, Kast, & Rosenweig (1964), the main objective of using this System Theory in the business organization was to develop a systematic and theoretical framework for describing general relationships of the empirical world. The business organization is a man-made system that has a dynamic interplay with its environment such as customers, competitors, labor organizations, suppliers, government, and many other agencies, in other words, interested parties or so called stakeholder.

Furthermore, the business organization is a system of interrelated parts working in conjunction with each other in order to accomplish a number of goals, both those of the organization and those of individual participants (Johnson et al., 1964). Among the key concepts of system theory as mentioned by Fremont & James (1972) are as follows:-

1. **System theory as subsystems or components** : They are interrelated parts or elements or systems and subsystems. Every system has at least two elements, and these elements are interconnected.
2. **Holism, synergism, organicism and gestalt** : The system can only be explained as a whole, not partially.

3. **Open systems view** : Open systems exchange information, energy, or materials with their environments.
4. **Input-transformation-output model** : The system can be viewed as a transformation model. It receives various inputs, transforms these inputs in some ways, and exports output.
5. **Feedback** : The concept of feedback is important in understanding how a system maintains a steady state. Information concerning the outputs or the process of the system is feedback as an input into the system. Feedback can be both positive and negative feedback. Negative feedback is informational input that indicated that the system is deviating and corrections need to be done.

System Theory also suggests that organization is a social system where interactions between departments occur, within the existence of mechanism of rules, levels and hierarchy, and with no rigid boundaries (Norlin & Chess, 1997). Public service organizations like public hospitals are very much involved in the concept of System Theory. Each public hospitals needs input such as materials, human resources, finances and technology to assist in transforming the input into output. It involves many sub-systems or departments to support the smooth process of meeting the targets or objectives. The role of each section or department is to ensure the output produces are consistent according to specification specified by customer, and this indirectly will affect the performance of the organization, especially the financial and non-financial status. It is important to note that the purpose of organization existence is to create wealth and the theory of the firm cannot be ignored.

In order to ensure that the services are served according to customer requirements, organizations must be sure to serve consistent services in terms of quality. Total Quality Management (TQM) practices are able to assist organizations in ensuring the services that is served met customer satisfaction through controlling its input and process (Patel, 2009 ; Kaluzny, Mclaughlin, & Simpson, 1992). The concepts of continual improvement practice in TQM practices encourages the organization to continually review the problems that occur in any part of the sub-system by identifying the root of the problems and underlining the corrective and preventive activity. It can be referred to as feedback in System Theory.

2.8.2 Stakeholder Theory

Customer is referred to as internal customer and external customer or interested parties. The interested parties are individuals and other entities that add value to the organization, or are otherwise interested in, or affected by, the activities of the organization (ISO, 2009). The needs and expectations of individual interested parties are different. The Table 2.1 below illustrates the needs and expectation of different types of interested party.

Table 2.1
Examples of Interested Parties and Their Needs and Expectations

Interested party	**Needs and expectations**
Customers	Quality, price and delivery performance of products
Owners/shareholders	Sustained profitability, transparency
People in the organization	Good working environment, job security, recognition and reward
Suppliers and partners	Mutual benefits and continuity
Society	Environmental protection, ethnical behavior and compliance with statutory and regulatory requirements

The interested parties are referred to as stakeholders according to Stakeholder Theory. Freeman (1984) is the father of the Stakeholder Theory defined stakeholder as a group or individual who can affect or is affected by the achievement of the organization's objectives. However this initial idea was redefine when Freeman (2004) come out with new definition of stakeholders as those groups who are vital to the survival and success of the corporation.

Therefore managers in the organization are responsible for ensuring the needs of interested parties are fullfilled not only ensuring the profitability of organization. Today's business environment is characterized by the increasing importance and strength of various stakeholder groups. It has become quite obvious that all stakeholders need to be taken into account when assessing modern company's performance. This is the main idea of Freeman's Stakeholder Theory (R.E. Freeman, 1984, 2004).

One important notion revealed in many studies is that building better relations with primary stakeholders like employees, customers and suppliers could lead to increased shareholder's wealth. A sustainable organizational advantage may be built with tacit assets that derive from developing relationships with key stakeholders (Hillman & Keim, 2001). Berman, Wicks, Kotha, & Jones (1999) studied the relationship between stakeholder management and a firm's financial performance and found that key stakeholders who are customers and employees can help a firm's profitability. However due to significance of various stakeholders, organizational performance should not be solely assessed by financial indicators but also by non-financial indicators.

There are several approaches Tangen (2004) of organizational performance measurement that encompass different stakeholder's perspectives. The most established and commonly used is the balanced scorecard (BSC) introduced by (Kaplan & Norton, 1992, 2007). In addition, there are others such as the Multi-Model Performance Framework (MMPF) model by Weerakoon (1996) which introduced four-dimensions including employee motivation, market performance, productivity performance, and societal impact, and covers the satisfaction of various stakeholders such as customers, investors, employees, suppliers, and society. While Tangen (2004) developed the conceptual framework of the performance prism which suggests that a performance measurement system should be organized around five distinct but linked perspectives of performance.

Based on the general concepts of stakeholder theory, it is in line with this study to measure the performance of the organization from non-financial perspective of performance such as operation, problem solving and decision making performance.

As suggested by the Stakeholder Theory, the organization is required to understand the needs and expectation of various interested parties, which is the concept adopted in TQM practices further explains the so-called interested parties.

The term of stakeholder was first introduced by the Stanford Research Institute in 1963, overviewed as stokeholer (Freeman, 1984). This term has been extensively used in many fields, especially in public administration and business (Zsolnai, 2006). In the 1970s, Russell L. Ackoff and C. West Churchman who stand as system theorist rediscovered stakeholder analysis (Freeman, 1984). Ackoff proposed, many societal problems would be solved by strengthening the central institutions with the positive cooperation among the stakeholders in the organization. Consequently, during 1980s, the acceptance of stakeholder approach has won in strategic management, corporate social responsibility and organization theory (Zsolnai, 2006). Now, with the evolution of this theory, many scholars attempt to explain and define explicitly this stakeholder theory based on their related field.

According to Freeman, Wicks, & Parmar (2004), stakeholder theory refers to managerial state that reflects and leads on how managers operates the organization. It is proven, numerous companies have shown their successful in running a business with stakeholder theory. Albatayneh (2014) reinforced, stakeholder theory emphasizes survival as the prominent goal of any organization by accentuating the relationship among people who accountable internally and externally in the organization. Freeman et al. (2004) advocates, the trusted person to ensure the relationship continuously connected among shareholders is manager. Despite, to inspire stakeholders and creating the environment more lively within the communities where everyone endeavor to deliver the best value for the organization

(Freeman et al., 2004). Moreover, in order to look the organization will be more productive and effective, the requirements of stakeholder groups have to give full consideration (Albatayneh, 2014) without against any procedural and policies of the organization. This is to guide the organization in accomplishing the company's goal.

However, Mainardes, Alves, & Raposo (2011) have debated academically, issues of stakeholder theory where they found controversies ongoing among academicians. Further, they identifying shortcomings of stakeholder theory, elevated by some respected scholars that require to resolve. For instance, there are some disagreement and contradictory evidence emerged among scholars about the nature and purpose of stakeholder theory (Donaldson & Preston, 1995). They argued, the adoption of stakeholder theory, the concept stakeholder, the stakeholder model and stakeholder management that explained by various authors has evolved and unfortunately, has led to the confusion. Correspondingly, Mainardes et al. (2011) claims the terms that stated above, were defined and applied in diverse ways and in different methods. Likewise, Freeman et al. (2004) have critically elucidated the mischaracterization of stakeholder theory. They are critiquing one of the ideas of stakeholder theory written by Sundaram and Inkpen, 2004 whereby they summarized shareholders is not equivalent to stakeholders.

Despite, Zsolnai (2006) has presented the implications of extended stakeholder theory and he has put much concerned on business transformation. It is argued, the business should consider sustainability as to preserve and restore of the world nature towards the human capabilities and future generations. Considering about sustainability, Bulgacov, Ometto, & May (2015) have upraised a question whether the relationship between stakeholder interests and firm affect the firm business. This is quite challenging to achieve sustainability in the organization, due to meet the responds and expectations of the entire stakeholders (employees, customers, investors, governments, etc.) that may lead to less profit. Thus, a much wider observation should be made to see the interest of the stakeholders in order to meet their expectations (Bulgacov et al., 2015).

Consistently, Shim (2014) had debated the organization or corporation can perform better in the long-run sustainability if they deliberate the stakeholder view which not dependently focused on the short-term profits. It is suggested the corporation should emphasis to produce a product without any harmful to the society and strive to strengthen a corporate image. Besides, employee well-being, focus on the customer as well as corporate social responsibility also needs to take into account. By doing so, it is believed; a long-run sustainability will be magnificently achieved and can gain more profitability in the organization.

Throughout the analysis, it was found stakeholder theory has dripped over into different areas. Stakeholder theory adhered and holds relevance to marketing, human resource management, financial management, production, organizational ethics, and others including healthcare management (Mainardes et al., 2011). Indeed, numerous studies on the healthcare sector, have been adopted stakeholder theory since 1990s and has turned this sector into 'hyper turbulent' environment like any other sector (Rohini & Mahadevappa, 2010). Research conducted by Murdock (2004), investigates NHS in UK and Scotland applying stakeholder theory has resulted some implications. The interference of political climate has made the environment of stakeholder changed vividly due to the devolution of power and the creation of new relationships and bodies. While, Jackson & Barber (2014) highlighted customers as one of the imperative person in stakeholder group as well as the lifeblood of the sector, manage to ensure the healthcare tourism sustain economically in the long term by treating them in ethical manner.

Besides, communication is crucial in the stakeholder group due to Virtue, Chaussalet, & Kelly (2013) have reviewed some papers related to stakeholder in healthcare where communication appears to be problematic area in the stakeholder issues. Subsequently, Kakabadse & Rozuel (2006) in their case study at public hospital in France have discovered, the involvement of stakeholder, especially senior manager as a backbone of the organization, enable to improve social performance of the hospital. Undeniably, it is critically important to all managers understands the key elements of CSR and the assessment of social performance. Similarly, study by Rohini & Mahadevappa (2010) reveals, the participations of top management and other stakeholder have an obligation to carry out the social responsibilities of the hospital.

Fundamentally, this theory will help to support the conceptual framework of this research which include both internal and external stakeholder. Kakabadse & Rozuel (2006) have divided stakeholders into three categories in the context of healthcare, which manifested in Table 2.2. Indeed, problems may occur in the organization where Kakabadse & Rozuel (2006) states, internal stakeholder may found least supportive compared to external stakeholder shows non-supportive.

Table 2.2
Categories of Stakeholders

Categories	Sub categories	Descriptions
Internal		Management, professional, and non-professional
External	Provide inputs	Suppliers, fund providers, and patients
	Competitors	Other hospitals or any other related to healthcare organization
	Special interest	Government, professional associations, the media, community, labour unions

Source: Kakabadse & Rozuel (2006)

2.8.3 Item Response Theory

Item Response Theory (IRT) or Latent Trait Theory (LTT) is an important theory that becomes the basis in undertaking this study. This is a modern theory, used to indicate the alternative way of conceptualising and analysing measurement in social science (Andrich, 1988). IRT highlights that individual's response to particular test item is influenced by qualities of the individual and by the quality of the item. In other words, it describes the test performance which related to the abilities of the item measured (Saad, 2012). According to Bond & Fox (2007) and Andrich (1988), two basic form would affect the psychological measures are individual trait's level and the item's difficulty and hence the following would be the fundamental for the theory to be applied in the social science research :

a) Respondent trait level as determinant of item responses

Individual with high ability level will be more likely to response correctly to the item as compared to the individual with low ability level.

b) Item difficulty as determinant of item responses

A more difficult item level indicate higher trait level for participants to have 50/50 chance of answering those items correct. While the easy items indicate only relatively low trait managed to have 50/50 chance of answering the item correctly.

c) Item discrimination as determinant of responses

Item on test can differentiate individuals who have high ability level from those who low ability levels. Although there are various models from the IRT perspective, this study utilised the Rasch Model, the simplest form of IRT (Andrich, 1988). Rasch model is usable in the psychological investigation as it makes sense to measure the relationship between what is happening between human and their observable action (Azrilah, 1996). Beside its simplicity, this model is relevant to contemporary measurement practice and embracing potential for solving measurement problems (Wright, 1977). Hence this model would addresses five principles of measurement model which are able for linear equal scale, overcome the missing data, estimates precisions, detecting outliers and replicability (Abdul Aziz, 2010).

2.9 Summary of Chapter

The review of literature in inventory management practices, performance and measurement issues in the preceding sections has led to the necessity of integrating a theory of management, measurement and model in the research design, instrument development and data analysis. In addition, the essential characteristic of invariance of comparisons in measurement has also been highlighted. The Rasch model, paradigm and framework serve as a bridge between data collected and statistical exploration of the relationship between variables.

This chapter tries to draw the connection between the issues surroundings the concept in general, its relation to the management of drugs in Malaysian public hospitals in particular, along with the view of some measurement concerns. Total Quality Management (TQM) practices, which forms as moderating factors in this study, is also discussed in the lights of relationship between inventory management practices and performance. Previous research has led to validate the importance of putting together all the related theories, measurement and model in the research design, instrument development and data analysis. The fundamental underpinning theories relating to the development of the conceptual framework are also discussed.

CHAPTER THREE

CONCEPTUAL FRAMEWORK AND DEVELOPMENT OF HYPOTHESIS

3.1 Introduction

This chapter discussed about the concept of conceptual framework and provides an explanation of the previous studies on the relationship between variables. Thus, this chapter presents four sections starting with section 3.1, introduction, followed by section 3.2, framework of study. Section 3.3 are the testable hypothesis that proposed to examine the theory which includes preceding studies on inventory management practices, inventory management performance, and total quality management practices. Then, the following section 3.4 ends this chapter, which summarizes the whole chapter.

3.2 Framework of Study

In conjunction to the problem statement, research questions, research objectives and literature review, this section presents conceptual framework. The conceptual framework provides foundation and also hypotheses for the study. (Sekaran, 2003) mentioned that conceptual framework elucidates the relationship between the variables in the study. It provides foundation and also hypotheses for this study. The conceptual framework stems from the theoretical framework indicates the relationship between variables that become the basis of the research problem (Kumar, 2011). The development of this framework is done after reviews of literature on empirical researches related to inventory management practices, inventory management performance, total quality management practices, Rasch model, and empirical researches related to inventory management, total quality management, performances and measurement theories. Based on the literature review discussed in Chapter Two, one independent variables, one moderating variables, one dependent variable are identified for the study. The independent variables and sub-variables or dimensions are based on articles reviewed.

Figure 3.1, illustrates the theoretical relationship of the inventory management practices represented by inventory administration, inventory system, and inventory control, total quality management practices quantified as moderating variable , and inventory management performance as the dependent variable. Thus, the understanding of inventory management practices as a whole is crucial as to ensure the organization manage to identify what are the right tools or practices can be applied and finally enable to fulfill inventory management performance.

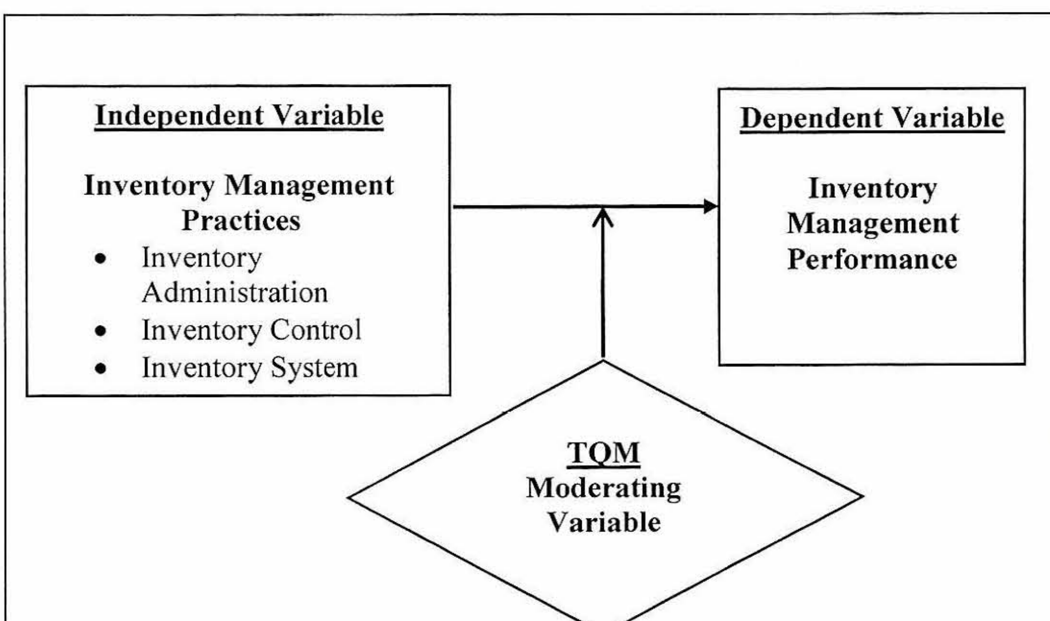

Figure 3.1
Conceptual Framework of the Study
Source: Researcher's Own Construct, 2018

The above of the conceptual framework as illustrated in Figure 3.1 is underpinned by three theories; containing System Theory, Stakeholder Theory and Item Response Theory. Consequently, this study empirically investigates the influence inventory management practices and total quality management practices on inventory management performance. There are four associations have been pointed out which are listed as follows:

i. There is a relationship between inventory management practices and inventory management performance for Special Hospitals in Malaysia.
ii. There is a relationship between inventory management practices and inventory management performance for Non-Special Hospitals in Malaysia.
iii. Total Quality Management moderates the relationship between Inventory Management Practices and Inventory Management Performance for Special Hospitals in Malaysia.
iv. Total Quality Management moderates the relationship between Inventory Management Practices and Inventory Management Performance for Non-Special Hospitals in Malaysia.

From the discussion in Chapter Two, previous studies showed that inventory management performance is influenced by inventory management practices (Anil et al., 2012; Ali, 2012; Chalotra, 2013; & Ngumi, 2015). This study proposes total quality management as moderating variable that helps to hypothesize and understand how inventory management practices bring about inventory management performance. Correspondingly, total quality management has taken into account that acts as a moderating variable which feasibly will moderate the relationship between inventory management practices and inventory management performance. According to Sekaran & Bougie (2013) moderating variable will exist, whenever the relationship between the independent variable and the dependent variable becomes contingent on another variable. Another variable refers to moderating variable that modifies the original relationship between these two variables.

While, Baron & Kenny (1986) have defined moderator as qualitative or quantitative variable that affects the relation between two variables; independent (predictor) variable and dependent (criterion) variable. Thus, this study suggests total quality management as a moderating variable has a contingent effect on the relationship between inventory management practices and inventory management performance. This linkage of these variables derived from the preceding results studied by Othman (2012). Although total quality management practices was portrayed as moderating variable between the supply chain strategy, supply chain practices and supply chain performance in the studies conducted by Othman (2012), there has been limited used in the contact of inventory management practices towards inventory management performance. Patel (2009) believes that total quality management is important that institution working in the healthcare sector, particularly government healthcare institutions work on their TQM practices.

3.3 Development of Hypothesis

A hypothesis is a testable statement that predicts the expectations of the researcher from a relational basis between two or more variables (Sekaran & Bougie, 2013). Hypothesis refers to assumptions or an idea about phenomenon, relationship or situation which become basis of an inquiry (D. Kumar, 2011). While, according to (Sekaran, 2003), a hypothesis can be defined as a logical conjectured relationship between two or more variable expressed in the form of a testable statement. Relationships are conjectured on the basis of the network of associations established in the theoretical framework formulated for the research study. While Joseph F. Hair, Money, Samouel, & Page, 2007 stated that researchers use hypothesis to explain and test proposed facts or phenomena.

Consistently, this section explains the hypothesis development that needs to be tested between, the relationship among independent variable and dependent variable, and moderating variable. The moderating variable is created when it affects the direction or strength of the relationship between an independent variable and a dependent variable (Reuben M Baron & Kenny, 1986). These testable statements will be constructed based on the theoretical framework, theoretical perspectives, discussions, findings, arguments from the preceding studies. On the basis of in-depth analysis of existing review of literature and its meaningful conclusions, the following hypotheses as shown in Figure 3.2 had been emerged in order to make the study more reliable and responsive.

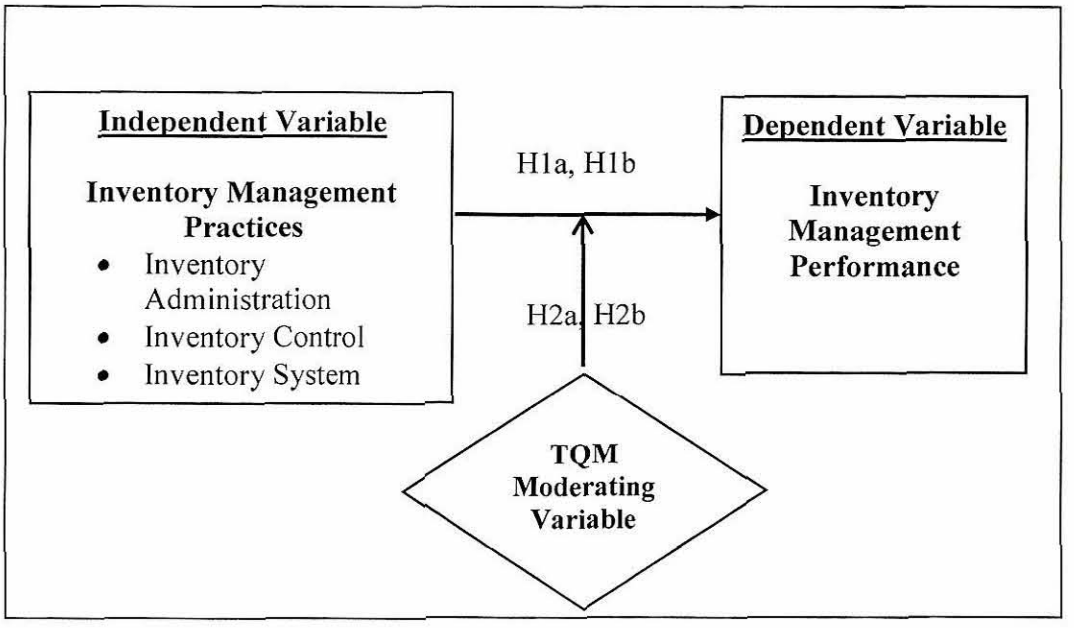

Figure 3.2
The Development of Hypothesis

3.3.1 The Relationship between Inventory Management Practices and Inventory Management Performance

Hospitals are composite organizations given that large number of services to the patients, physicians and staff. One of the foremost services is pharmacy whereby its needs specific and unique of inventory management practices to button it. In pharmacy operations, inventory is referred to the standard of pharmaceutical products retained to encounter future demand. Efficient inventory management plays a great role in pharmacy practice by reducing the cost of procured pharmaceutical products and associated operational expenses from both financial and operational perspective (Ali, 2011).

Improved inventory management in the public sector in terms of financial management and internal control can lead to increases in investment revenue or freeing up of resources to be used elsewhere due to reduction in stock held in inventory and a reduction in losses due to theft, wastage, damage, spoilage or misuse. An inappropriate inventory management can produce over and under procurement, out of stock, medicine shortage and multiple unnecessary storage locations such as storage in care units or in the physicians' and nurses' offices (Romero, 2013).

Studied done by Kagashe & Massawe (2012) revealed that inventories of drugs in the three district hospitals of Tanzania were not well managed. The study declared that skills level of personnel involved in managing medicine in the hospital was poor. Therefore, medicines needs to be managed efficiently in order to prevent all types of wastage including overstocking, pilferage and expiry due to wastage may influence the quality of health care provided to patients.

It is a crucial part in evaluating how well a pharmacists organized the great deal of resources especially drug invested in inventory management (Ali, 2011). In the context of inventory management, DeHoratius & A. Raman (2008) stated that high levels of inventory and a high volume of transactions increase the environmental pressure for employees who work in a crowded space and can't detect stockout and thus inaccuracies in data. Therefore, pharmacists should consider few factors such as product type, inventory size, returned product policies, unclaimed prescription, inventory shrinkage and use of formularies (Ali, 2011).

Pharmacists cannot take the impact of inventory mismanagement simple and lightly. Improper management of pharmacy inventory (drug management) may impacts on patient life and safety. The value of information technology can be recognized in pharmacy inventory management, where computerized systems are broadly available in virtually all pharmacy practice settings in industrialized countries. Ali (2011) had stated that technology help methods of evaluating inventory management more efficient, more precise and more accurate. Therefore, pharmacists should employ the benefit of newer technologies in inventory management practices for better management of their pharmacy inventory especially related to drug.

Smith & Flanegin (2004) highlighted the importance of e-procurement, and claimed that there is a great potential for significant savings in the healthcare sector. It means that system and tools for the management of inventory and supplies within healthcare sector can aspire to realize efficiencies. Rachmania & Basri (2013), suggested several action could be done in order to deal with the lack of information technology in hospital such as implementing a new software tool in order to record and monitor drufs distribution flow in the hospital, building integrated software that linkage between the hospital inventory system and the inventory management. Due to that, the use of inventory management system can be considered as best practice in inventory management (Callender, 2007).

Inventory control as mentioned by Anil et al. (2012) is referring to the tool of management which is used to maintain an economic minimum investment in materials and products for the purpose of obtaining a maximum financial return. While, Wagner extracted from Callender (2007) in his study discussed some benefits from inventory control point of view by increased efficiency in the medical store. Among the actions can be taken are improved ordering methods by reducing active Stock Keeping Units (SKU) in the item master file and increased opportunies for better pricing.

Poor inventory control may cause to misplaced medicines and to theft. Looses normally occur mainly due to the fact that " medicine could become obsolete before its utilization because they were expired or they were not stored under the proper conditons, such as, for example, in amber, air-tight and moisture-resistant containers" (Romero, 2013). The use of inventory management control can be considered as best practice in inventory management (Callender, 2007).

Today's healthcare organizations have evolved into highly complex organizations. The importance of effectively managing the pharmaceutical flow in internal chain has been emphasized by many practitioners and academicians. Alverson (2003) discussed the importance of a disciplined inventory management for hospitals and redesigning inventory management processes for better significant measurable benefits.

Many challenges come up in handling hospital pharmacy. As stated by Rachmania & Basri (2013), among the challenges are drug industry is influenced by regulatory pressures, secondly hospitals are limited to forecast about the patients and consumption of drug and thirdly, hospital pharmacy holds a large amount of safety stock to cope with uncertainty demand, which resulting in a high operational cost and have to deal with expiry problems of drug. Therefore, hospital inventory management must improve efficiency and productivity of healthcare system without sacrificing the quality of service to the patient (Rachmania & Basri, 2013). Studied conducted by Rachmania & Basri (2013) in one of the public hospital in Indonesia, identified three main issues regarding pharmaceutical supply chain management that affect patient service performance. The three issues are overstock, unjustified demand forecasting technique and lack of information technology support.

Since this study intend to investigate the relationship of inventory management practices towards inventory management performance, the hypothesis one were developed as follows in order to answer the research objective four:

H1a There is a relationship between inventory management practices and inventory management performance for Special Hospitals in Malaysia.

H1b There is a relationship between inventory management practices and inventory management performance for Non-Special Hospitals in Malaysia.

3.3.2 The Moderating Effect of Total Quality Management on the relationship between Inventory Management Practices and Inventory Management Performance

The increasing use of TQM is an exciting development, but TQM application still lags in the process of providing health services in the public, specifically public health agencies. TQM offers public health organizations a unique opportunity to adopt a powerful tool for strengthening management and presents a fundamental challenge to public health administrators (Kaluzny et al., 1992). In the past, healthcare providers were generally focus on providing high quality of care regardless of cost. However, with the increasing cost of materials and the intense competition among healthcare providers, the role of inventory management (drug management) has gained great importance for hospitals and healthcare providers.

Today, healthcare managers understand that the efficient management of inventory not only reduce operating cost but increase the quality of care (Callender, 2007). Chalotra (2013) stressed that inventory management can be done by taking into account dimensions like quality management. This is particularly interesting as many firms are focused on tools and practices instead of creating a quality management infrastructure that will lead to long term positive result. This is in contra with Flood (1993) who argues that TQM is a company-wide effort and hence involves everyone's effort in the organization in order to improve performance. In other words, TQM can be achieved through an integrated effort among personnel at all levels, to increase customer satisfaction by continuously improving performance (Noreen et al., 2016).

Other studies, however, have raised the question of the capability of smaller hospitals to effectively carry out quality management. Chow-Chua and Goh (2000) suggested that smaller hospitals tend to lag behind the larger hospitals in implementing quality management because they have limited resources to do so. The implementation of quality management requires serious commitment, not only in terms of leadership commitment, but also in terms of time and financial resources. Thus, the smaller hospitals may lack the resources to sustain and endure the quality improvement efforts over time. The finding from this study seems to suggest that although smaller hospitals may lack the resources, they nevertheless have the right structure and culture for successful implementation of quality management (Manaf & Hazilah, 2009).

The finding also suggests that although the state level hospitals are smaller than the national referral centre, however, the structure of these hospitals are more similar to HKL than the district hospitals. The environment of the state hospitals however, do not differ much from HKL, as observed from the level of activity and crowd (Manaf

& Hazilah, 2009). Therefore, the size difference do not seem to make much impact on practice of quality management between the two levels of hospitals.

Since this study intend to investigate the effect of total quality management on the relationship of inventory management practices towards inventory management performance, the second hypothesis were developed as follows in order to answer the research objective five:

H2a **Total Quality Management moderates the relationship between Inventory Management Practices and Inventory Management Performance for Special Hospitals in Malaysia.**

H2b **Total Quality Management moderates the relationship between Inventory Management Practices and Inventory Management Performance for Non-Special Hospitals in Malaysia.**

Table 3.1
Literary Support for the Framework

Hypothesis	**Literature supports**
H1a & H1b	Ali(2011); Romero(2013); Kagashe & Massawe (2012); DeHoratius & A. Raman (2008); Smith & Flanegin (2004); Rachmania & Basri (2013); Callender (2007); Alverson (2003)
H2a & H2b	Kaluzny et al., (1992); Callender (2007); Chalotra (2013); Flood (1993); Noreen et al., (2016); Chow-Chua and Goh (2000); Manaf & Hazilah (2009);

3.4 Chapter Summary

This chapter presented the theoretical research framework of the study. From the above discussion, this research intends to examine the relationship between inventory management practices, total quality management practices and inventory management performance in Malaysia's public hospitals. This chapter has looked the proposed of theoretical research framework and hypothesis development consistent with the research objectives and research questions which has been underlined in the Chapter One. Further, research methodology will explain in the next chapter that contains important sub headlines such as research design, population and sampling, data collection, measurement of validation, instruments validation and data collection process.

CHAPTER FOUR

RESEARCH METHODOLOGY

4.1 Introduction

The purpose of this study is to examine inventory management practices which comprise of inventory administration, inventory control and inventory system towards inventory management performance, moderated by total quality management among public hospitals in Malaysia. This chapter will show the flow of how this study was conducted using quantitative methodology. Thus, it starts with introduction in section 4.1 and section 4.2 will discuss on research design. Then, section 4.3 touches on population and sampling, followed by 4.4 which would look at sources of data collection. The explanation of validity of the instruments, measurement scale and measurement of variables (questionnaire design) were included in section 4.5, 4.6 and 4.7. Next, section 4.8 and 4.9 discussed on the method of data analysis and ethical approval of the study. Finally, section 4.10 would summarize of this chapter.

4.2 Research Design

Research design will discover matters relating to the purpose of the research, time dimension of the study, research strategy, and unit of analysis. Sekaran & Bougie (2013) described research design as a framework and a blueprint for the researchers with the purpose of measuring, analyzing, and collecting the data to meet the research questions and research objectives of the study. Current research adopts the quantitative method as research design. Thus, descriptive analysis are used for frequency value purposes, and correlational study were adopted in order to determine the relationship between variables involved and measuring the ability and difficulties of the Logistics Pharmacy Department among public hospitals in implementing the research items. Survey research design was used which involves gathering of primary data via a questionnaire. Furthermore, a cross-sectional survey was used to gather the data at one point in time because it is cheaper and reliable (Bryman & Bell, 2007).

4.2.1 Purpose of Research

This is an empirical study by using a quantitative analysis which examines and analyse the independent variables, moderation variable and outcome of dependant variable. There are 2 purposes derived from this study. The first purpose of this study is to examine the ability of the Logistics Pharmacy Department among public hospitals in the implementation of item difficulties in relation to inventory management practices (comprising the dimension of inventory administration, inventory control and inventory system) towards inventory management performance. As for second purpose, this study attempts to investigate the relationship between inventory management practices and inventory management performance with moderating effect of total quality management through quantitative research. Study will discover considerable information on the present status of inventory management practices (drugs management) within Malaysian public hospitals towards inventory management performance moderated by total quality management.

4.2.2 Time Dimension of Study

Descriptive research using quantitative approach is distinguished by longitudinal or cross-sectional studies under time factor. Data collection for longitudinal study has been taken of the same sample over two or more periods of time whereas it's the opposite for the cross-sectional study collected data from the sample understudy, which was done just once throughout purpose of time (Hair *et al.*, 2007). However, this study is adopting the cross-sectional studies. As suggested by Namagembe, J.C.Munene, Muhwezi, & Eyaa (2012), cross-sectional studies allow the researcher to collect the data sufficiently at one point in time to seek for answers to the research questions. Besides, the application of cross-sectional studies are commonly used in the context of inventory management (Anil K, Aubid, Rashid, Mushtaq A, et al., 2012; Kagashe & Massawe, 2012; Khurana et al., 2013; Romero, 2013; Stanger et al., 2012).

4.2.3 Research Design Strategy

Research strategy guided the researcher for a reliable and valid survey measurement, determination of population, selection of respondents, distribution of measurement to the sample, collection of data and analyzing survey data. Quantitative approach was used for this study, while the listed research provided guidance for the purpose of gathering as well as examining the data implemented. In order to achieve the research objectives and research questions, this study will employ the primary method of data collection by using survey method. This method is following the suggestion by Sekaran & Bougie (2013), which stated that survey method is comprehensively applied in business and management research for data collecting through the quantitative approach.

As for this study, three levels of analyses were undertaken. First of all, it is a descriptive study to obtain the frequency and percentage value for the public hospitals according to the state, category of hospital, respondents' working experience in pharmacy area, length of time the Main Medical Store (MMS) has been in operation in the hospital and the number of administrative staff involved in the medical store management. Secondly, the study will involve measuring the ability and difficulty of the Logistics Pharmacy Unit among the public hospitals in implementing inventory management practices according to the Rasch Measurement Model (RMM) analysis. Lastly, the researcher has applied causal relationship study among the independent, moderating, and dependent variables for the purpose of correlation and moderating affect analysis. The application of this analysis was done by imputing the logit value of converted raw data using Rasch Measurement techniques through Winstep software into the PLS-SEM software.

4.2.4 Unit of Analysis

The setting for this study is service industry in Malaysia. Therefore, this study will use the organisation of public hospitals as the unit of analysis. However, for data collection purposes, questionnaires will be sent to the person in charge from the managerial positions who having the knowledge, skills and experience in the public hospitals in Malaysia, in implementing and maintaining the inventory management practices (drug management).

4.3 Population and Sampling

The target population of this study is the Logistics Pharmacy Unit among public hospitals in Malaysia. According to the latest report by Ministry of Health, Malaysia

(MOH) in 31st December 2016, approximately about 143 public hospitals currently operate progressively in this country (*Health Facts 2016*, 2016). As for this study, the population of the public hospitals in operation public hospitals was obtained from the Health Ministry of Malaysia (MOH) directory, according to the number of specialist based to hospitals by types for 10th Malaysia Plan (2011-2015). As a result it appears that there are about 143 public hospitals in Malaysia, which is a combination of five types as tabulated in Table 4.1. Thus, a proportionately stratified according to the types and simple random sampling techniques was used as sampling method in order to select the representative sample from the sampling frame. Since the population size is 143, the determination of total sample size for the required sampling frame is 103 according to table produced by Krejcie & Morgan (1970).

As suggested by Hair et al., (2007), the procedure for taking a proportionately stratified and simple random sampling can be implemented by organising the public hospitals into 5 strata based to MOH Hospitals by Types for 10th Malaysia Plan (2011-2015) as the sampling frame to participate in this research. The next step was to conduct a probability simple random sampling from each of the strata by determining the overall total allocated sample size using Research Randomizer.

Table 4.1
Participated Public Hospitals According to Types

Types of Public Hospitals	**No. of Hospitals (Total 100%)**
Hospital Kuala Lumpur and State Hospitals	10
Specialist Hospitals	18
Minor Specialist Hospitals	19
Special hospitals/instituions	8
Non-specialist hospitals	48
Total	**103**

Table 4.1 shows the 103 participating public hospitals in this study as the respondents according to types. They are 10 hospitals from Hospital Kuala Lumpur and state hospitals, 18 hospitals from major specialist hospitals, 19 hospitals from minor specialists hospitals, 8 from special hospitals/instituions and 48 hospitals from non-specialist hospitals. Appendix I outlined the sampling frame of public hospitals in Malaysia and which was taken based from all the regions in Malaysia.

4.4 Sources of Data Collection

Electronic mail (e-mail) survey method by using Google Doc application was adopted in this study as the means of data collection. Google Doc application has the best method of eliminating missing data because the respondents are required to fill in all the questions and respondents are only allowed to re-submit if all the questions have been completed. In addition, online questionnaires can minimize human errors because this data can be transferred directly to the analysis software (Mohd Asaad, 2012). In this regard, questionnaires were emailed personally to the respondents using Google Doc application, which are the Head of Pharmacists Officers at the Logistics Pharmacy Unit within the public hospitals in Malaysia. The questions were answered by Heads of Pharmacists Officers, for they are more knowledgeable on the day to day operations of the pharmacy. As a result, the total number of return feedback were 80 responses and this represented a valid respond rate of 77.7%@78%.

4.5 Validity of the Instruments

Validity refers to how well the study measures the right concept through an instrument development. Thus, content validity have been conducted in this study, as content validity can ensure the items are suitable towards the concept (Saad, 2013). In the context of this study, the validation of content are important to confirm the adapted question in the instruments are reliable and can measure all the variables involved. Due to that, the items in the survey form should obtain the contribution of experts from academia and industry to validate and approve the content (DeVellis, 2003).

Thus, this study has approached an appropriate person who were directly involved in the managing of inventory (drugs) to seek their expert opinion which is practioner cum potential respondent to the item of the questionnaires. Hence, as displayed in Table 4.2 below, three practioner in the area of drug management were selected from Hospital Kulim, Kedah; Hospital Seberang Jaya, Pulau Pinang and the General Hospital of Pulau Pinang to assist in improving the adapted items of the questionnaires. Meanwhile, lecturers at Universiti Utara Malaysia (UUM), Sintok, Kedah; MARA University of Technology (UiTM), Bertam Campus and Polytechnic Seberang Perai (PSP), Pulau Pinang are also involved toshare their expertise towards determining the appropriateness of the constructs, format and structure of the sentences for the questions.

During the meeting, they were asked to answer the prepared questionnaires. Any ambiguity and irrelevant questions were pointed out by the experts. Suggestions by the experts in the field were either added and deleted accordingly. The experts were encouraged to make suggestions and criticisms of the contents and the wordings of the questions. The items in the questionnaires were then adjusted wherever necessary. The questionnaires were prepared in Malay and English languages in order to avoid the misunderstanding of terms as used in Logistics Pharmacy Unit of public hospitals in Malaysia. Respondents for this survey were Heads of Pharmacy who are familiar with inventory management (drug management) practices in the Logistics Pharmacy Unit of public hospitals in Malaysia. They are from the management level group who are directly involved in managing, organizing and controlling the drug management activities.

Table 4.2
Participating Panel of Experts

No.	Backgrounds	Experts
1.	Lecturer, School of Technology Management & Logistics, Universiti Utara Malaysia (Supply Chain Strategy, Supply Chain Quality, MEAT for Marine Parks)	Dr Abdul Aziz Othman
2.	BPharm (Hons), MPharm (Clin.Pharm), PhD (Pharm Pract), Senior Lecturer & Researcher Faculty of Pharmacy, Universiti Teknologi MARA (Bertam Campus)	Dr Maryam Farooqui
3.	Lecturer, Polytechnic Seberang Perai, Pulau Pinang (Diploma in Logistics & Supply Chain Management)	Cik Aida Zuraina Mir Talaat
4.	Pharmacy Officer U52, Hospital Seberang Jaya, Pulau Pinang	Encik Subramaniam Thanimalai
5.	Head of Pharmacy Officer U52, Hospital Besar Pulau Pinang	Puan Atisha Abdul Hanif
6.	Head of Pharmacy Officer U52, Hospital Kulim, Kedah	Puan Fazliza Mohd Hussein

4.6 Measurement Scale

Likert scale measurement is commonly used in research in order to measure the items concerned. Different researcher may used different measurement scale like 5-point, 6-point or 7-point likert scale with odd or even number. 6-point scale can avoid odd number while 5-point and 7-point scale disregard even numbers. Prior studies have showed that 6-point were the most reliable as compared to other points, as it can reduce the burden of potential respondents in making a decision and respondents have expressed the optimal level of confidence in their extreme judgements when these scales were applied (Birkett, 1986; Chomeya, 2010; Tang, Shaw, & Vevea 1999). Therefore, a 6- point Likert scale without a midpoint was chosen for this study as the measurement scale.

4.7 Measurement of Variables

The questionnaire was developed and consisted of 6 sections to measure respondents' and Logistics Pharmacy Unit background, inventory management performance as dependents variables construct, total quality management as moderated contruct and lastly followed by inventory management practices which combines the inventory administration, inventory control, inventory system as the independents variables contruct. The following are details of each construct.

4.7.1 Dependent Variables - Inventory Management Performance

The dimensions and items for dependent variables in this study, i.e operation performance, problem-solving performance and decision-making process performance, were adapted from the previous literature. In this present study, the inventory management performance was measured using non-financial performance. The total questions related to inventory management performance are eighteen (18), which are derived from three (3) sub-dimensions. The respondents were requested to select the appropriate answer in relation to their organization. The details of each construct are discussed as follows:

a) Operation Performance

This study employed a 6-point scale, which are as follows, (1) extremely low; (2) very low; (3) low; (4) high; (5) very high and (6) extremely high, to examine inventory management practices and inventory management performance among public hospitals in Malaysia under operation performance items. Therefore, the adapted items for measuring operation performance are presented in Table 4.3 below.

Table 4.3
Measurement for Operation Performance (8 items)

	Adapted Items	Related Sources
1.	To what extent can the complete supply of drugs supplied by Main Medical Store (MMS) can be accepted by sub-store	Bahagian Perkhidmatan Farmasi (2009)
2.	To what extent can the correct supply and quantity of indented drugs influence the credibility of MMS	Bahagian Perkhidmatan Farmasi (2009)
3.	To what extent has the nil in stock which disrupted the service happened at MMS	National Treasury, Republic of South Afrika (2009), Yeung et. al. (2003), Rao et al. (1997), Schniederjans, Parast, Nabavi, Rao, & Raghu-Nathan (2006)
4.	To what extent do the losses incurred had led to immediate action taken by MMS to solve the problem	National Treasury, Republic of South Afrika (2009), Yeung et. al. (2003), Rao et al. (1997), Schniederjans, Parast, Nabavi, Rao, & Raghu-Nathan (2006)
5.	To what extent does the accuracy and timeliness of drugs supplied is practiced to beat the demand of sub-store	National Treasury, Republic of South Afrika (2009), Yeung et. al. (2003), Rao et al. (1997), Schniederjans, Parast, Nabavi, Rao, & Raghu-Nathan (2006)
6.	To what extent are the efficiencies of MMS achieved in reducing shortage, wastage, short expiry and excess of drugs	National Treasury, Republic of South Afrika (2009), Yeung et. al. (2003), Rao et al. (1997), Schniederjans, Parast, Nabavi, Rao, & Raghu-Nathan (2006)
7.	To what extent does a sub-store return the drugs due to bad quality	Saad (2012)
8.	To what extent does a sub-store complaint had led to an immediate action taken by MMS to solve the problem	Saad (2012)

b) Problem Solving Performance

The problem solving is appreciated as a performance indicator when there is an act of accepting and displaying of a problem without hiding, no damage incurred to company's other workstations from the use of alternative solutions and the ability to solve the inventory problems faster (Basaran, 2013). All this will provides solution to the problems before they get bigger and spread throughout the whole operations. This study employed a six-point scale, which are as follows, (1) extremely low; (2) very low; (3) low; (4) high; (5) very high and (6) extremely high, to examine inventory management practices and inventory management performance among public hospitals in Malaysia under problem solving performance items. Therefore, the adapted items for measuring financial are presented in Table 4.4.

Table 4.4
Measurement for Problem-Solving Performance (5 items)

Adapted Items	Related Sources
1. To what extent does the MMS swiftly figure out the problems about inventories	Basaran (2013), Schoenfeld (1985), Hong (1998) & Xun Ge (2001)
2. To what extent does the person or unit that causes an inventory problem accept the responsibility immediately	Basaran (2013), Schoenfeld (1985), Hong (1998) & Xun Ge (2001)
3. To what extent are problems that happen relating to inventories being hidden	Basaran (2013), Schoenfeld (1985), Hong (1998) & Xun Ge (2001)
4. To what extent does solving inventory related problems brings damages to the MMS	Basaran (2013), Schoenfeld (1985), Hong (1998) & Xun Ge (2001)
5. To what extent are inventory related problems solved faster	Basaran (2013), Schoenfeld (1985), Hong (1998) & Xun Ge (2001)

c) Decision Making Process Performance

The decision making process performance is an important indicator to the organization because when the management becomes less effective in making inventory decision, the services will become weaker, leading to increasing costs and lower return on investments (Basaran, 2013). This study employed a six-point scale, which are as follows, (1) extremely low; (2) very low; (3) low; (4) high; (5) very high and (6) extremely high, to examine inventory management practices and inventory management performance among public hospitals in Malaysia under decision making-process performance items. Therefore, the adapted items for decision making process -performance are presented in Table 4.5 below.

Table 4.5
Measurement for Decision Making Process -Performance (5 items)

Adapted Items	Related Sources
1. To what extent are delivery related decisions made faster	Basaran (2013), James W. Dean & Sharfman (1996)
2. To what extent are procedures reasonable to make inventory related decisions	Basaran (2013), James W. Dean & Sharfman (1996)
3. To what extent are scientific techniques used to make inventory related decisions	Basaran (2013), James W. Dean & Sharfman (1996)
4. To what extent are the inventory related with other department decisions not in conflict	Basaran (2013), James W. Dean & Sharfman (1996)
5. To what extent are the MMS and sub store informed about inventory related decisions	Basaran (2013), James W. Dean & Sharfman (1996)

4.7.2 Moderating Variables - Total Quality Management (TQM)

Total quality management practices stresses learning and adaption to continual change as keys to organization success; while in health care, implementing TQM can be an important part of hospitals' competitive strategy in ensuring quality of the healthcare system (Patel, 2009). There are thirty-one (31) questions relating to total quality management practices. This study employed a six-point scale, which are as follows, (1) extremely low; (2) very low; (3) low; (4) high; (5) very high and (6) extremely high, to examine inventory management practices and inventory management performance among public hospitals in Malaysia under total quality management practices items. Therefore, the adapted items for Total Quality Management Practices are presented in Table 4.6 below.

Table 4.6
Measurement for Total Quality Management Practices (31 items)

Adapted Items	Related sources
Higher management commitment	
1. To what extent does the top management communicate on quality goals to the organization	Saraph et al., (1989), Kaynak and Hartley (2005), Talafha (2006), Callender (2007), Othman (2012), and Saad (2012)
2. To what extent does the top management supports long-term quality improvement process	
3. To what extent is the degree of participation by major heads in the quality improvement process	
4. To what extent is the comprehensiveness of the goal setting process for quality within the division	
5. To what extent does the top management encourage employee participation in quality management and continuous improvement activities	
Continuous improvement	
1. To what extent does the department have a clear job instructions	
2. To what extent does the department evaluates and improves its store operational processes continuously	
3. To what extent does the department have a program to continuously eliminate errors in store operations	
4. To what extent does the department have a program to find a wasted item in all store processes	
5. To what extent having an effective system that focuses on process improved the store operations	
Customer focus	
1. To what extent is the department totally committed to create satisfied customers and interested parties	
2. To what extent do the customers give us feedback on quality and delivery performance	

Table 4.6 (Continued)

3 To what extent does the department actively seeks ways to improve service in order to achieve greater customer satisfaction
4 To what extent are customer satisfaction surveys used in determining customer's requirements and measure the satisfaction level
5 To what extent does the department solves problems related to customer complaints

Benchmarking

1. To what extent is the department highly involved in benchmarking activities with other public hospital store departments
2. To what extend is the department directly involved in benchmarking activities with public or industries' store departments
3. To what extent do benchmarking activities have already improved our store department's reputation

Employee involvement

1. To what extent are quality circle or employee involvement type program implemented in the division
2. To what extent are empowerment of employees applied to correct quality problems
3. To what extent do continual enhancement of quality awareness implemented among employees
4. To what extent is feedback provided to employees on their quality performance
5. To what extent are effectiveness of implemented quality-related employee involvement program evaluated

Education and training

1. To what extent are the specific work-skills training given to hourly employees in the department
2. To what extent is the commitment of top management to employee training
3. To what extent is the availability of resources for employee training in the department
4. To what extent does the department provide sufficient on-the-job training on inventory management
5. To what extent does quality-related training given to hourly employees throughout the organization

Table 4.6 (Continued)

Reward and recognition
1. To what extent do reward and recognition activities effectively stimulate employee commitment to quality improvement
2. To what extent does the department give rewards and recognize employee participation in quality improvement
3. To what extent does the departments improve working conditions in order to recognize employee quality improvement efforts

4.7.3 Independent Variables - Inventory Management Practices

The dimensions and items in this study are inventory administration, inventory control and inventory system, which were adopted from the previous literature. The details of each construct are discussed as follows:

4.7.3.1 Inventory Administration

This study employed a six-point scale to measure the ability of the public hospitals to implement the items under inventory administration, which are as follows, (1) extremely low; (2) very low; (3) low; (4) high; (5) very high and (6) extremely high. The development of items was based from the previous literature by Singh & Singh (2014), Callender (2007), Talafha (2006), Bhakoo et al., (2012), and (Stanger et al., 2012). The total questions relating to the inventory administration are twenty-seven (27), which are derived from three (3) sub-dimensions.

a) Managing Planning

Table 4.7 below shows the fourteen (14) items relating to managing planning under inventory administration.

Table 4.7
Measurement for Managing Planning (14 items)

	Adapted Items	Related Sources
1.	To what extent is the utilization of humans effective in managing the stock of drug	Stranger et al., (2012)
2.	To what extent is the utilization of equipment effective in managing the stock of drug	Stranger et al., (2012)
3.	To what extent does the drug supply mechanism effect store customer efficiencies	Stranger et al., (2012)
4.	To what extent does drug purchase planning improves the service level	Stranger et al., (2012)
5.	To what extent does drug planning and management reduces storage problems	Stranger et al., (2012)
6.	To what extent does the sufficient drug supply built maximize service performance	Bhakoo et al., (2012)
7.	To what extent does the adoption of innovative service is enhancing the management of drugs	Bhakoo et al., (2012)
8.	To what extent does the Standard of Procedure (SOP) communicated to the staff responsible for drug management	Singh & Singh, (2014)
9.	To what extent does the management review and follow up reports of drug turnover, ageing, and drug adjustments benefit the organization	Singh & Singh, (2014)
10.	To what extent does rack labeling of drug placed in storage area important	Singh & Singh, (2014)
11	To what extent does SOP for stocktaking practiced	Singh & Singh, (2014)
12.	To what extent does SOP take immediate provision in case of short expiry, slow moving and expired drug	Talafha, (2006)
13.	To what extent does the MMS procures the drug immediately if its shortage delays or compromises patient's health	Talafha, (2006)
14.	To what extent does the Head of Hospital Pharmacy Department (HPD) has the organization structure documents of department and shares its annual budget	Talafha, (2006)

b) Managing Employee

Table 4.8 below shows the eight (8) items relating to managing employee under inventory administration.

Table 4.8
Measurement for Managing Employee (8 items)

Adapted Items	Related Sources
1. To what extent are MMS personnel qualified and well-trained	Stranger et al.(2012)
2. To what extent do the MMS personnel have adequate skills for cross-functional team	Stranger et al.(2012)
3. To what extent does the MMS provides a formal training on drug management to the personnel	Singh & Singh (2014)
4. To what extent are the skills and knowledge about drug management practices among the personnel	Callender (2007)
5. To what extent does the MMS have sufficient numbers of personnel	Talafha (2006)
6. To what extent does the MMS have sufficient categories of personnel	Talafha (2006)
7. To what extent does the MMS have written policies of listed jobs to cover all functions and responsibilities of the personnel	Talafha (2006)
8. To what extent do all the pharmacy personnel use the forms and inventory records and documents assigned by the Ministry of Health (MOH)	Talafha (2006)

c) Managing Supplier

Table 4.9 below shows the five (5) items relating to managing supplier under inventory administration.

Table 4.9
Measument for Managing Supplier (5 items)

Adapted Items	Related Sources
1. To what extent does the managing supplier ensures a continuous flow of drugs	Stranger et al., (2012)
2. To what extent does the management supplier assist the department in maintaining an adequate supply of drugs	Stranger et al., (2012)
3. To what extent does the regular supply of drugs promotes long-term relationship of members	Stranger et al., (2012)

Table 4.9 (Continued)

4. To what extent does the collaborative approach with the supplier in managing drugs useful to the MMS	Stranger et al., (2012)
5. To what extent does the managing supplier influence drug management performance	Oloko and Okibo (2013)

4.7.3.2 Inventory Control

This study employed a six-point scale to examine the implemention of the items under inventory control, which are as follows, 1 = extremely low, 2 = very low, 3 = low, 4 = high and 5 = very high and 6 = extremely high. The development of items was based on the previous literature by Talafha (2006) and Stanger et.al. (2013). The total questions related to inventory control are twenty-six (26), which are derived from three sub-dimensions.

a) Qualitative Indicator Description

Table 4.10 below shows the eight (8) items related to qualitative indicator description under inventory control.

Table 4.10
Measurement for Inventory Control (26 items)

Adapted Items	Related Sources
1. To what extent does the MMS maintains sufficient stocks of medications to cover the monthly needs in addition to emergency stocks	Stranger et al., (2012)
2. To what extent does the usage of emergency stock is the responsibility requiring the approval of the hospital director/head of HPD	Talafha (2006)
3. To what extent are the drugs stored in a manner to protect their identity and integrity	Talafha (2006)
4. To what extent are the drugs stored at proper temperatures	Talafha (2006)

Table 4.10 (Continued)

5. To what extent does the MMS have a system to monitor out of date medications or recently expired drugs	Talafha (2006)
6. To what extent do recalled or expired medications removed from stock	Talafha (2006)
7. To what extent during dispensing, has the MMS given priority to medications with shorter shelf life	Talafha (2006)
8. To what extent are the expirations or shortages of drugs due to improper estimation of needs	Talafha (2006)

b) Pharmacy records and documents

Table 4.11 below shows the six (6) items with regard to pharmacy records and documents.

Table 4.11
Measurement for Pharmacy Records and Documents (6 items)

Adapted Items	Related Sources
1. To what extent are all medications recorded in the assigned supply ledgers	Talafha (2006)
2. To what extent are all procurement invoices and supply vouchers kept in special files	Talafha (2006)
3. To what extent are all forms used designed centrally by MOH	Talafha (2006)
4. To what extent,if any, is a request raised to MOH when a form need to be added, amended or deleted	Talafha (2006)
5. To what extent are forms ordered in enough quantities to cover the needs	Talafha (2006)
6. To what extent are pharmacy documents maintained in folders to avoid mix-up	Talafha (2006)

c) Supply Process

The following questions were formulated to measure the sub-dimensions of supply process. Table 4.12 below tabulated the twelve (12) items regards to supply process.

Table 4.12
Measurement for Supply Process (12 items)

	Adapted Items	Related Sources
1.	To what extent is the drug supply order to the MMS managed at regular programmes	Talafha (2006)
2.	To what extent are the drugs dispensed from MMS in a negotiable manner according to procedures	Talafha (2006)
3.	To what extent does the hospital provide specially needed transportation for drugs	Talafha (2006)
4.	To what extent are the drugs dispensed to the sub medical store by the support staff	Talafha (2006)
5.	To what extent does dispensing of dangerous drug from MMS done according to MOH guidelines	Talafha (2006)
6.	To what extent does the MMS checks and match medication and supplies with their vouchers	Talafha (2006)
7.	To what extent does the medication distribution to satellite pharmacies done by open-negotiable quantities order form	Talafha (2006)
8.	To what extent does the MMS have a contingency planning strategy in cases of drug shortages	Talafha (2006)
9.	To what extent is the MOH informed regarding medication shortages	Talafha (2006)
10.	To what extent does the hospital director have the authority to procure medication within a limited budget if there are shortages of medication	Talafha (2006)
11.	To what extent are all stocks inspected regularly to ensure the absence of outdated, unusable or mislabeled products	Talafha (2006)
12.	To what extent are investigational drugs stored under the supervision of the head of HPD	Talafha (2006)

4.7.3.3 Inventory System

This study employed a six-point scale to measure the ability of the respondents to implement the items under inventory system, which are as follows, 1 = extremely low, 2 = very low, 3 = low, 4 = high, 5 = very high and 6 = extremely high. The total items related to inventory system are seven (7) as tabulated in Table 4.13 below.

Table 4.13
Measurement for Inventory System (7 items)

Adapted Items	Related Source
1. To what extent is the organization using information technology in managing inventory	Bhakoo et al., (2012)
2. To what extent are electronic tracking systems used to manage stock level	Stranger et al., (2012)
3. To what extent is constantly evolving technology a major barrier for implementing inventory management practices in the organization	Callender (2007)
4. To what extent is the MMS system able to monitor out-of-date medications and medical supplies	Talafha (2006)
5. To what extent is using enough technology can control the drug inventory system in a medical store	Basaran (2013)
6. To what extent does shared technology with supply chain members in the organization improves the inventory system	Chalotra (2013)
7. To what extent does the system support the identification of expired drugs	Chalotra (2013)

4.8 Method of Data Analysis

The main reason for conducting data analysis is to present and interpret the findings of the study. Method of data analysis started after obtaining the response rate of the respondent, followed by the profiling of the respondents' demographic data. Statistics of the respondents was obtained using the descriptive statistics through Statistical Package for the Social Sciences (SPSS) Version 24 software. Then, the second step was transforming the likert scale into logit value, through Rasch Measurement Model using Winsteps software for the analysis of organization's ability and difficulty in implementing the items. Logits scale is an illustrative of the individual ability, who responds to the items in different extent of difficulty (Bond et al., 2007).

The third step of this study is a Rasch Measures for Structural Equation Modelling (PLS-SEM) Analysis. Due to the limitation in Rasch measurement, Bond & Fox (2015) have proposed the solution to overcome the constraint. The solution involved the process of taking the Rasch logit value that was derived from previously Rasch analysed data on each of those data collection instruments to be imputed into the PLS-SEM software for further analysis of path coefficient, hypothesis testing of the direct relationship and testing the moderating effect. Its further explain in the study done by Boon et al. (2012), where the limitation were solved when the Rasch computed measures for each construct were used to investigate the path coefficient and hypothesis testing of the direct relationship between those variable measures. This study took the proposed idea by Bond & Fox (2015) and Boon et al. (2012) as a guideline for analysis and current studied have realized that it is relevant in analysing the relationship.

Subsequently, the researcher will employ the SPSS software for descriptive statistics, while Rasch Measurement Model and PLS-SEM will be used for inferential statistics. Therefore, Table 4.14 outlines the methods taken for data analysis that are related to this study.

Table 4.14
Method of Data Analysis, Results and Research Objective and Research Hypothesis

Types of Data Analysis	Results	Research Objective and Research Hypothesis
Statistical Package for the Social Sciences (SPSS) Software Version 24	Descriptive statistics *- Respondents' demographic data*	Not related to research objective and research hypothesis
Rasch Measurement Model *-Winsteps Software 3.9.1*	Inferential statistics *- Analysis of organization's ability and difficulty in implementing the items*	1.To investigate inventory management practices comprises dimension of inventory administration, inventory control and inventory system are moving towards unidimensionality Not related to research hypothesis 2.To investigate the ability level of the public hospitals in implementing the items of inventory management practices comprises dimension of inventory administration, inventory control and inventory system in relation to inventory management performance Not related to research hypothesis 3.To investigate the most influential dimension of inventory management practices comprises dimension of inventory administration, inventory control and inventory system that affect inventory management performance Not related to research hypothesis

Table 4.14 (Continued)

Structural model of PLS-SEM - *SmartPLS 3.0*	Inferential statistics *- Analysis of path coefficient, hypothesis testing of the direct relationship and testing moderating effect*	4.To examine the relationship between inventory management practices and inventory management performance in Malaysian public hospitals H1a There is a relationship between inventory management practices and inventory management performance for Special Hospitals in Malaysia. H1b There is a relationship between inventory management practices and inventory management performance for Non- Special Hospitals in Malaysia. 5.To test the moderating role of total quality management practice in enhancing the relationship between inventory management practices and inventory management performance among public hospitals in Malaysia H2a Total Quality Management moderates the relationship between Inventory Management Practices and Inventory Management Performance for Special Hospitals in Malaysia. H2b Total Quality Management moderates the relationship between Inventory Management Practices and Inventory Management Performance for Non-Special Hospitals in Malaysia

4.9 Ethical Considerations and Approval of the Study

In Malaysia, an ethical requirement is compulsory for conducting clinical and non-clinical observational studies. Permission and approval to conduct this study were obtained from the Medical Research & Ethics Committee (MREC), Ministry of Health Malaysia through the National Medical Research Register (NMRR). As for this study, NMRR-15-839-26146 was approved as code of registration and researcher are legally entitled to conduct a research among public hospitals in Malaysia. In addition, a written consent was also obtained from the Directors of the selected public hospitals prior to data collection. Then, The Heads of Pharmacy Officers were informed about the research initiatives and the confidentiality of their responses.

4.10 Chapter Summary

This chapter discusses the process of designing the research methodology. This research is a descriptive study that employs a survey method. Research is conducted in quantitative study by employing descriptive study, to examine the ability of organizations and difficulty in implementing the items and to examine the relationship between variables. The Head of Pharmacy Officers from the Pharmacy Logistics Unit of public hospitals in Malaysia were selected to respond to the questionnaires. The proportionately stratified and simple random sampling technique are used in order to identify representative from the target population. The design of the questionnaire was prepared and the validation of the instrument content was conducted by a panel of experts. This is to ensure the item of each section is reliable, can be accepted and the respondensts could understand the questions without any confusion. The questionnaires were distributed online to selected respondents using Google Doc application. Thus, the data collection will be analyzed using SPSS version 23, the Rasch Measurement Model and SmartPLS 3.0 for the purpose of descriptive statistics and inferential statistics respectively, and it will be discussed in the subsequent chapter.

CHAPTER FIVE

DATA ANALYSIS AND RESULTS

5.1 Introduction

The objective this chapter is to present and interpret the data analysis and results of the study. The Rasch Measurement Model and Partial Least Squared (SEM-PLS) Method, a covariance based Structural Equation Modelling (SEM) was used to analyze the data collected from the survey through online questionnaires. In the first step, the response rate of the respondent was obtained, followed by the profiling of the respondents demographic data. The profiles of the respondents were obtained through the descriptive statistics by using Statistical Package for the Social Sciences (SPSS) Version 24 software. The second step was further was to use the Rasch Measurement Analysis evaluation on the goodness of measure which involved data cleaning, reliability, validity, unidimensionality test and testing the result of study in Rasch Measurement Model. Structural Equation Modeling (PLS-SEM) Analysis model assessment was perform in order to support the direct relationship and testing moderating effect. Rasch Measurement Analysis model fit statistics together with assessment and results of hypotheses testing was then concluded and is finalised with the chapter summary.

5.2 Sample Size and Response Rate

Sample according to Sekaran (2006) is a subset of the population where it comprises of some participants selected from the target population. Data provided by MOH Hospitals by Types for 10th Malaysia Plan (2011-2015) was used as the resource for sampling. This study is proportionately stratified according to the types and simple random sampling based. By referring to the sampling table by Krejcie & Morgan (1970), 103 public hospitals were needed to be the respondent and approached for data collection from 143 public hospitals in Malaysia which combining of Hospital Kuala Lumpur and state hospitals (14), major specialists hospitals (25), minor specialist hospitals (27), special hospitals (11) and non-specialist hospitals (66) that located in Malaysia. More recently, Hair, Hult, Ringle, and Sarstedt (2014) suggested that the minimum sample size required in a PLS-SEM path modelling can be determined by applying the 10 times rule. Based to the procedure, researcher must multiplied the most number of paths that led or pointing to the endogenous construct by 10. Based to the conceptual model, paths leading to the endogenous constructs of inventory performance were three. Therefore, a minimum sample size of 30 would be sufficient for this study. However, studied choosed to use 103 public hospitals to be respondent as suggested by Krejcie & Morgan (1970).

Then, on-line questionnaires were email personally to the respondent which is Head of Pharmacists at the Pharmacy Store within the 103 public hospitals. Finally, the number of return feedback were 80 responses and represented a valid respond rate of 77.7% which is reasonable for this kind of inventory management study either in service or industry as achieved by previous scholars where the range of response rate were between 46.2% and 100.0%. The Table 5.1 below shows the response rate of related inventory management research.

Table 5.1
Respond Rate of Selected Studies in Inventory Management

Author(s)	Topic studied	Rates of response
Alejandra Romero (2013)	Managing Medicines in the Hospital Pharmacy : Logistics Inefficiencies	Response rate 38 from 58 individuals (65.5 %)
Ali et al. (2012)	Inventory Management and Its Effects on Customer Satisfaction	Response rate 237 from 237 customers (100.0 %)
Bhakoo et al. (2011)	Collaborative Management of Inventory in Australia Hospital Supply Chains : Practices and Issues	Response rate 10 from 10 hospitals (100.0 %)
Namagembe et al. (2012)	Information Sharing Inventory Management and Customer Satisfaction	Response rate 360 from 523 firms (69.0 %)
Ogbo, Ann I et al. (2014)	The Impact of Effective Inventory Control Management on Organisational Performance : A Study on 7up Bottling Company Nile Mile Enugu, Nigeria	Response rate 71 from 83 firms (86.0 %)
Thogori M. & Gathenya (2014)	Role of Inventory Management on Customer Satisfaction among the Manufacturing Firms in Kenya : A Case Study of Delmonte Kenya	Response rate 50 from 55 employees (90.0 %)
Mogere et al. (2013)	Effect of Inventory Control System on Operational Performance of Tea Processing Firms : A Case Study of Gianchore Tea Factory, Nyamira Country, Kenya	Response rate 55 from 119 employees (46.2 %)
Rajeev Narayana Pillai (2010)	Inventory Management Performance in Machine Tool SMEs	Response rate 91 from 100 machine tool SMEs (91.0 %)

5.3 Profile of Respondents

There are 80 public hospitals involved in this study. Responses from respondents are tabulated for the convenience of conducting the analysis. The demographic section of the responses is keyed-in according to certain coding into the table matrix. The pattern for describing the demographic section is as follows and in Table 5.2;

yyxabcdefgh where;

yy – acts as a counter that determines the number of respondents involved; starts from 01.

x – Name of hospital;

a – hospital according to state;

J – Johor

K – Kedah

D – Kelantan

M – Melaka

N – Negeri Sembilan

F – Putrajaya

C – Pahang

A – Perak

R - Perlis

P - Penang

S - Sabah

B - Selangor

Q - Sarawak

T - Terengganu

L - Labuan

b – Hospital according to category;

1 HKL / State Hospital

2 Major Hospital

3 Minor Hospital

4 Special Hospital

5 Non-Special Hospital

c – Respondent current position;

d – Respondent name and contact number;

e – Respondent working experience in pharmacy area;

1 1 – 5 years

2 6 – 10 years

3 11 – 15 years

4 16 years and above

f - Main Medical Store (MMS) been in operation in the hospital;

1 1 – 5 years

2 6 – 10 years

3 11 – 15 years

4 16 years and above

g – Number of pharmacists involved in medical store management;

1 1 – 2 pharmacists

2 3 – 4 pharmacists

3 5 – 6 pharmacists

4 7 pharmacists and above

h - Number of administrative staff involved in medical store management;

1 1 – 10 staff

2 11 – 20 staff

3 21 – 30 staff

4 31 staff and above

Table 5.2

Summary of Respondents Profile

yy	a	b	e	f	g	h
01	R	1	4	4	1	2
02	A	1	4	4	2	3
03	A	5	2	4	1	1
04	P	5	2	4	2	1
05	C	5	3	4	1	1
80	D	5	4	4	1	1

This section provide descriptive statistics information of hospitals and respondents profile who participated in this study. However, six (6) limited set of characteristics from nine (9) questions in demographic section will be discussed here which were expected to be important in the interpretation of the results. Its include respondents according to state, category of hospital, respondents working experience in pharmacy area, Main Medical Store (MMS) been in operation in the hospital, number of pharmacists involved in medical store management and number of administrative staff involved in medical store management.

5.3.1 Hospitals According to State

Based on the above table, coding "a" represents the hospitals according to state in Malaysia. This is further showed by Table 5.3 where majority of the hospitals (15 percent) are from the Perak, followed by Kedah (11.3 percent), and Sabah (10 percent). The subsequent hospitals according to state are held by Selangor, Kelantan, Johor and Sarawak (8.8 percent), Pulau Pinang (7.5 percent), Terengganu, Negeri Sembilan and Pahang (5 percent), Melaka (2.5 percent) and lastly Perlis, Putrajaya and Kuala Lumpur (1.3 percent).

Table 5.3
Hospitals According to State

State	Frequency (n=80)	Percent (Total 100%)
Perlis	1	1.3
Kedah	9	11.3
Pulau Pinang	6	7.5
Perak	12	15.0
Selangor	7	8.8
Kelantan	7	8.8
Terengganu	4	5.0
Melaka	2	2.5
Negeri Sembilan	4	5.0
Pahang	4	5.0
Johor	7	8.8
Sabah	8	10.0
Sarawak	7	8.8
Putrajaya	1	1.3
Kuala Lumpur	1	1.3

5.3.2 Category of Hospital

Category of hospital is showed by code "b". Based on Table 5.4, a majority (46.3 percent) of the hospital category are from the non-special hospitals, 21.3 percent are from major hospitals, 16.3 percent are from minor hospitals, 13.8% are from HKL/state hospitals and 2.5 percent from special hospitals involved in this study, representing the different categories of public hospitals in Malaysia.

Table 5.4
Category of Hospital

Category	Frequency (n=80)	Percent (Total 100%)
HKL / State Hospital	11	13.8
Major Hospital	17	21.3
Minor Hospital	13	16.3
Special Hospital	2	2.5
Non-Special Hospital	37	46.3

5.3.3 Respondents Working Experience in Pharmacy Area

Respondents working experience in pharmacy area is showed by code "e". It can be concluded from Table 5.5 that the majority (36.3 percent) of the Heads of Pharmacy have more than 16 years of experience in the field of pharmacy, 32.1 percent between 11-15 years, 24.7 percent between 6-10 years and only 5 percent have the experience between 1-5 years.

Table 5.5
Respondents Working Experience in Pharmacy Area

Years	Frequency (n=80)	Percent (Total 100%)
1-5 years	5	6.3
6 -10 years	20	25.0
11-15 years	26	32.5
16 years and above	29	36.3

5.3.4 Main Medical Store (MMS) been in operation in the hospital

In terms of the years of the Main Medical Store has been in operations (Code "f"), it shows that the majority (78.8 percent) have been operating for more than 16 years, 10.0 percent between 11-15 years and 11.3 percent between 6-10 years. This is shown in Table 5.6 below.

Table 5.6
Main Medical Store (MMS) been in operation in the hospital

Years	Frequency (n=80)	Percent (Total 100%)
6 -10 years	9	11.3
11-15 years	8	10.0
16 years and above	63	78.8

5.3.5 Number of Pharmacists Involved in Medical Store Management

The following discussion describes the number of pharmacists involved in medical store management (Code "g"). As shown in Table 5.7, majority (68.8 percent) of the Main Medical Store have between 1 to 2 pharmacists, while 23.8 percent have between 3 to 4 pharmacists, 23.8 percent between 5-6 pharmacists and only 5 percent have 7 pharmacists and above depending on the category of the hospital.

Table 5.7
Number of Pharmacists Involved in Medical Store Management

Number of pharmacists	Frequency (n=80)	Percent (Total 100%)
1-2 pharmacists	55	68.8
3-4 pharmacists	19	23.8
5-6 pharmacists	4	5.0
7 pharmacists and above	2	2.5

5.3.6 Number of Administrative Staff Involved in Medical Store Management

The number of administrative staff involved in medical store management are coded as "h". Detail results of this number of administrative staff are shown in Table 5.8. In terms of the number of administrative staff involved in medical store management, the majority (85 percent) are managed by 1 to 10 staff, 12.5 percent by 11-20 staff and 2.5 percent by 21-30 staff.

Table 5.8
Number of Administrative Staff Involved in Medical Store Management

Number of administrative staff	Frequency (n=80)	Percent (Total 100%)
1-10	68	85.0
11-20	10	12.5
21-30	2	2.5

5.4 Analysis on Goodness of Fit

Data cleaning and screening was done in Rasch model by using the Winstep version 3.92.1 software in order to prepare a much more accurate data for analysis of the valid instrument (Mohd Ishar & Masodi, 2012). A common data analysis measurement model requires an acceptable goodness of fit and specific evidence of construct validity where it shows how well the specified model fits the data (Hair et al., 2010; Bond & Fox, 2007). In this context the data have to fulfil principle to test whether data is measured on a linear interval scale particularly in a cumulative response process (Azrilah, 1996). Some common essential aspects of Rasch analysis are used such as its internal consistency through the Polytomous Model (PRM) fit statistics and the Person Separation Index for the reliability of the scale (Bond & Fox, 2007). However, before further analysis is conducted, the data cleaning and screening, reliability analysis, fit statistics, and unidimensionality analysis activities take place.

5.4.1 Data Cleaning and Screening

In any study, it is important to conduct further tests on the variables once the data was collected. The screened data activities was take place for any missing, errors in putting coding or input errors itself. In order to derive the missing data for this study, output from Winsteps version 3.92.1 software was used. Table 5.9 below tabulated the frequency of respondents on the categories. The total results are reported as 8720, with 109 items from 80 respondents. From the table, it was noted that there were no errors in data entry based on category score. Hence, the data collected was clean due to the control online questionnaires (Mohd Asaad, 2012).

Table 5.9
Frequency of Responses

Category label	Category score	Observed count	%
1	1	35	0
2	2	92	1
3	3	400	5
4	4	2236	26
5	5	4126	47
6	6	1831	21
Total		8720	100
Missing		**0**	

5.4.2 Fit Statistics

In order for the data collected to be considered as fit to the Rasch Model it must meet the following criteria which are Point Measure Correlation (PMC); 0.4<PMC<.0.80, Outfit Mean Square (MNSQ); 0.5<MNSQ value <1.5 and Outfit Z-Standard(ZSTD); -2<ZSTD<+2 (Norhasni, Asaad, Saad, & Yusoff, 2015; Saad & Adam Saifudin, 2015; Saad & Asaad, 2015; Saad, Yusuff, Abas, Aziz, & Saidfudin, 2011). Due to that, the investigation and decision has to be made if any data did not meet any one of the criteria (Mohd Assad et al., 2015). Result for item analysis can be extracted from *'Item Misfit Table'* and *'Summary Statistics'* in Winsteps version 3.92.1 software.

a) Inventory Administration

Inventory administration comprises of managing planning, managing employee and managing supplier. It is represented by 27 items and Table 5.10 below describes the overall findings with regard to inventory administration.

Table 5.10
Descriptive Statistic of Inventory Administration Items

	Measure	Outfit MNSQ	Outfit ZSTD
Mean	0.00	1.00	-0.30
Standard Deviation	1.19	0.53	1.80
Maximum	3.21	3.37	3.70
Minimum	-2.12	0.26	-3.90
Separation	5.80		
Reliability	0.97		

The mean value for items under inventory administration is 0.00 logit, with a standard deviation of 1.19 logit. The minimum and maximum value for inventory administration items are between -2.12 logit and 3.21 logit respectively and this shows that there are easy as well as difficult items with regards to inventory administration. The separation index is at 5.80 logit while item reliability is 0.97 logit. As for the fit statistics, Table 5.11 indicates that the outfit MNSQ value for inventory administration items does not met the specified range (0.50 – 1.50) because the value was within 0.26 logit and 3.37 logit. This dimension also failed to fulfil the outfit ZSTD criteria. It is noted that the ZSTD value was -3.90 and 3.70 which is more than +2 and -2. Further investigation is needed to check on the items which are unfit to the meet the model condition. It was found that there are items that placed outside the 95% confidence level and there were 4 misfits items identified from Table 5.11 below.

Table 5.11
Inventory Administration – Misfit Item Measures

Item	Measure	Outfit MNSQ	Outfit Zstd	Pt Corr
A19	3.21	**2.39**	**6.5**	0.48
A20	3.14	**1.82**	**4.3**	0.53
A12	-0.62	0.66	**-2.3**	0.77
A18	0.66	0.62	**-2.7**	0.77

4 items of inventory administration in Table 5.11 (standard of procedure-A19, skills & knowledge-A20, numbers of personnel-A12 and categories of personnel-A18) have been diagnosed as misfit items because outfit MNSQ and outfit Zstd radius fall outside the range of 0.5<MNSQ value <1.5 and -2<Zstd<+2 as proposed by Bond & Fox, (2007). Figure 5.1 shows the Group Characteristic Curve (GCC) for inventory administration that collapse outside the suggested range. After reviewing all the misfit items, the decision was made to exclude 4 misfit items out of 27 items from the instruments to measure inventory administration. The results after excluded processed showed the remaining 23 items are in the range specified as in Figure 5.2 Group Characteristic Curve (GCC) for inventory administration and proved that

there are an improvement in terms of outfit MNSQ and outfit Zstd. Thus 23 items that meet the quality data will be used for further analysis.

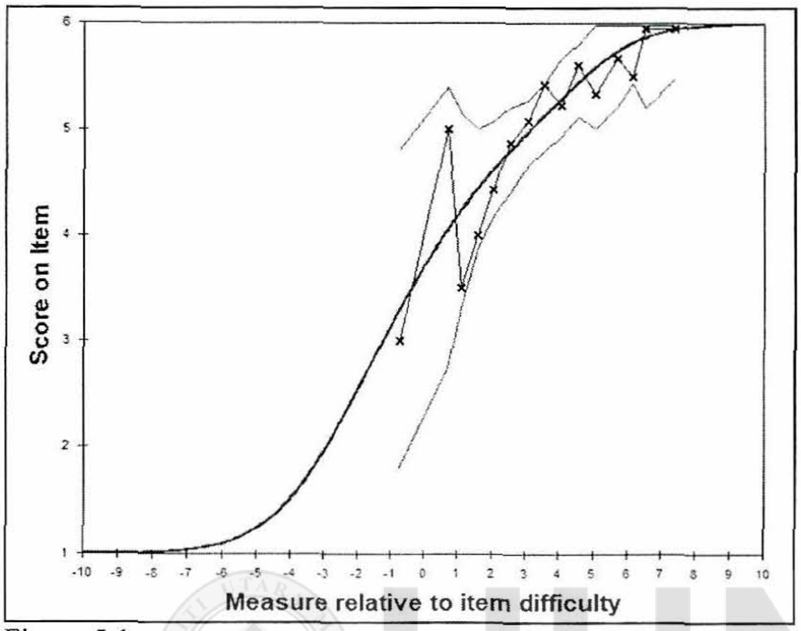

Figure 5.1
GCC Graph for Inventory Administration before Items Removal

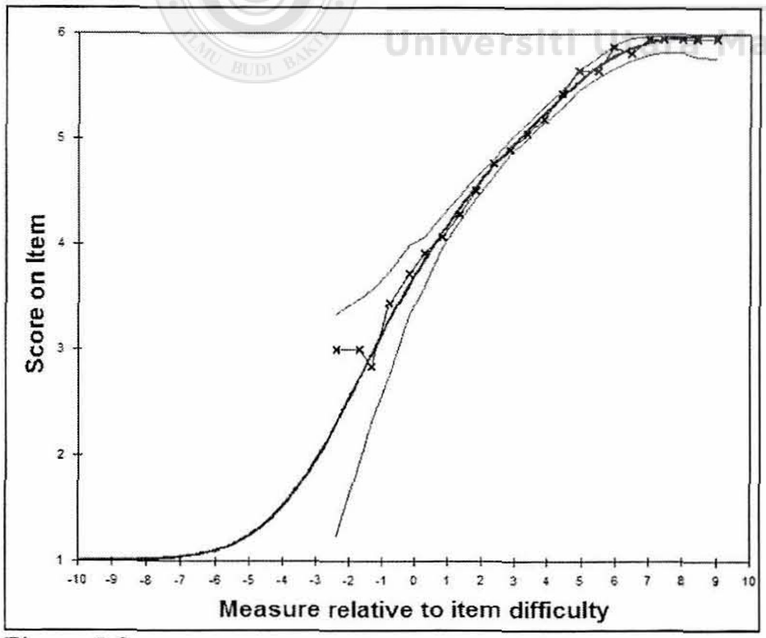

Figure 5.2
GCC Graph for Inventory Administration after Items Removal

b) Inventory Control

Inventory control is represented by qualitative indicator description, pharmacy records & documents and supply process which consists of 26 items. Table 5.12 below indicates the finding related to inventory control.

Table 5.12
Descriptive Statistic of Inventory Control Items

	Measure	Outfit MNSQ	Outfit ZSTD
Mean	0.00	1.00	-0.00
Standard Deviation	0.72	0.28	1.60
Maximum	1.12	1.61	3.30
Minimum	-1.75	0.58	-3.00
Separation	3.54		
Reliability	0.93		

The mean value for items under inventory control is 0.00 logit, with a standard deviation of 0.72 logit. The minimum and maximum value for inventory control items are between -1.75 logit and 1.12 logit respectively and this shows that there are easy as well as difficult items with regards to inventory administration. The separation index is at 3.54 logit while item reliability is 0.93 logit. As for the fit statistics, Table 5.13 indicates that the outfit MNSQ value for inventory control items does not met the specified range (0.50 – 1.50) because the value was within 0.58 logit and 1.61 logit. This dimension also failed to fulfil the outfit ZSTD criteria. It is noted that the ZSTD value was -3.00 and 3.30 which is more than +2 and -2. Further investigation is needed to check on the items which are unfit to the meet the model condition. It was found that there are items that placed outside the 95% confidence level and there were 5 misfits items identified from Table 5.13 below.

Table 5.13
Inventory Control – Misfit Item Measures

Item	Measure	Outfit MNSQ	Outfit Zstd	Pt Corr
C24	0.59	1.61	3.3	0.64
C8	1.12	1.56	3.0	0.18
C18	0.93	1.45	2.5	0.31
C15	-0.03	0.67	-2.2	0.66
C1	-0.13	0.58	-3.6	0.64

5 items of inventory control in Table 5.13 (sufficient stock of drugs-C1, shortages of drugs-C8, drug supply order-C15, drugs dispensed-C18 and authority to procure drugs-C24) have been diagnosed as items did not qualified for quality data criteria because outfit MNSQ, outfit Zstd and Point Measure Correlation radius fall outside the range of 0.5<MNSQ value <1.5, -2<Zstd<+2 and 0.4<Pt Corr<0.8 as proposed by Bond & Fox, (2007). Figure 5.3 below shows the misfit items through Group Characteristic Curve (GCC) for inventory control (Bond & Fox, 2007). Therefore, after reviewing all the misfit items, the decision was made to exclude 5 misfit items out of 26 items from the instruments to measure inventory control.

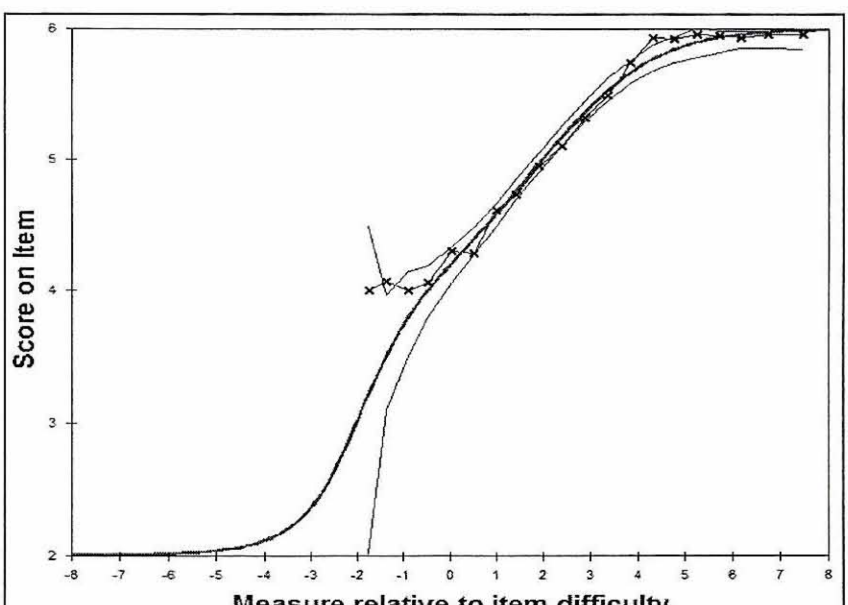

Figure 5.3
GCC Graph for Inventory Control after Items Removal

After the 5 items have deleted, Table 5.14 below indicates that outfit MNSQ for the items have improved and located between 0.68 logit and 1.44 logit. Meanwhile, the value of outfit ZSTD is in the range between -1.7 logit to 2.1 logit. However, according to Azrilah (2010), Bond & Fox (2007) & Linacre (2012), researcher have right not to remove the remaining misfit items because it still contributed to the discussion of this study, even there are other items falls outfit of 95% confidential interval between data. Thus, 21 items of inventory control are retained for further analysis.

Table 5.14
Descriptive Statistics for Inventory Control Items after Removal

	Measure	Outfit MNSQ	Outfit Zstd
MEAN	0.00	1.01	0.10
S.D.	0.74	0.23	1.30
Max	1.16	1.44	2.1
Min	-1.69	0.68	-1.7
Separation	3.57		
Reliability	0.93		

c) Inventory System

Inventory system is represented by 7 items. Table 5.15 below indicates the descriptive statistics of inventory system.

Table 5.15
Descriptive Statistic of Inventory System Items

	Measure	Outfit MNSQ	Outfit ZSTD
Mean	0.00	1.02	0.10
Standard Deviation	0.41	0.15	0.90
Maximum	0.64	1.21	1.20
Minimum	-0.64	0.73	-1.60
Separation	1.83		
Reliability	0.77		

The value for item mean with regards to inventory system is 0.00 logit with a standard deviation of 0.41 logit. Items are located between the minimum value of -0.64 logit and maximum value of 0.64 logit and this shows that there are easy as well as difficult items with regards to inventory system. The separation index is at 1.83 logit while item reliability is 0.77 logit. As for the fit statistics, the value of outfit MNSQ is within 0.73 logit and 1.21 logit while outfit ZSTD is located between -1.60 logit and 1.20 logit, within the acceptance area of 95 % confidence interval. Table 5.16 provide the details of the item measures and it shows that 7 inventory system items are within the acceptance level of 95% confidence interval.

Table 5.16
Inventory System – Item Measures

Item	Measure	Outfit MNSQ	Outfit Zstd	PTMEA Corr
S7	-0.05	1.21	1.2	0.65
S1	-0.64	1.12	0.7	0.63
S3	0.64	1.12	0.7	0.55
S6	0.23	0.95	-0.2	0.68
S4	0.33	1.06	0.4	0.60
S2	-0.09	0.93	-0.3	0.53
S5	-0.43	0.73	-1.6	0.73

As mention earlier, the quality data need to fulfil Rasch requirements fit, through three criteria: PTMEA CORR, Outfit MNSQ and Outfit ZSTD (Azrilah, 1996; Bond & Fox, 2007). Based on Table 5.16, all items for inventory system have met the three criteria of fit. The value of outfit MNSQ is between 0.50 and 1.50. The value of outfit ZSTD is within the range of -2 and 2. The items also satisfy the point measure correlation with values above 0.40 and less than 0.80. Therefore, there will be no deletion for the unfit items. Items for inventory system are fit for analysis and 7 items are maintain for this study.

All items have a combination of positive and negative logit values. Thus, it is clear indication that these items are easy and difficult which located on the lower end and upper end continuum in the person-item variable map. Based on Figure 5.4, Group Characteristic Curve (GCC) is the ogive-shape plot of probabilities of a correct response for inventory system items and it shows that all the items are within the acceptance level of 95% confidence interval.

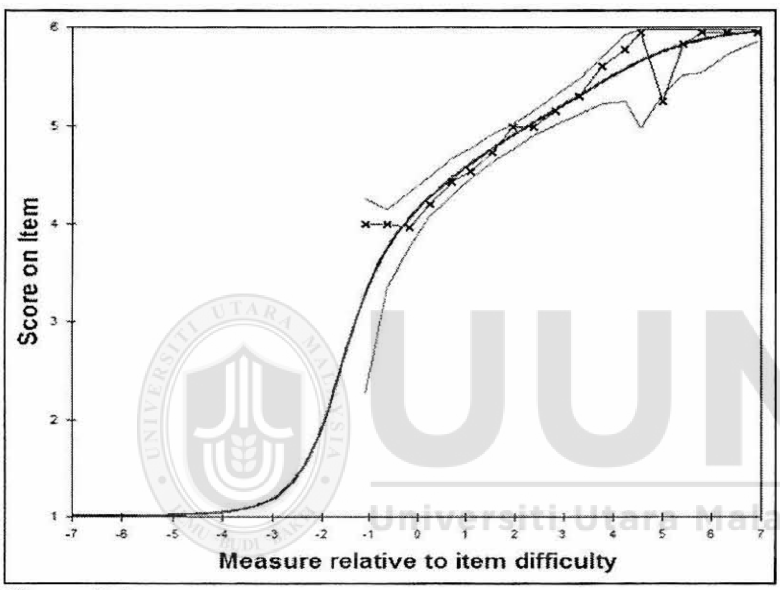

Figure 5.4
GCC Graph for Inventory System

d) Total Quality Management

There are 31 items representing the Total Quality Management. These 31 items are divided into sub-dimensions that are higher management commitment, continuous improvement, customer focus, benchmarking, employee involvement, education and training, reward and recognition. Table 5.17 below describes the overall findings with regard to Total Quality Management.

Table 5.17
Descriptive Statistic of Total Quality Management Items

	Measure	Outfit MNSQ	Outfit ZSTD
Mean	0.00	1.04	0.10
Standard Deviation	0.80	0.40	1.70
Maximum	1.58	2.43	4.90
Minimum	-1.61	0.44	-3.50
Separation	3.70		
Reliability	0.93		

The mean value for items under total quality management is 0.00 logit, with a standard deviation of 0.80 logit. The minimum and maximum value for total quality management items are between -1.61 logit and 1.58 logit respectively and this shows that there are easy as well as difficult items with regards to total quality management. The separation index is at 3.70 logit while item reliability is 0.93 logit. As for the fit statistics, it is noted that minimum and maximum outfit MNSQ value is between 0.44 logit and 2.43 logit while outfit ZSTD value is between -3.50 logit and 4.90 logit. Both indicators are beyond the fit criteria where some items are located outside the 95% confidence interval. As shown in Table 5.18, there are 5 items from 31 items did not qualified for quality data criteria. Therefore, these items are misfits and it is suggested to exclude in order to improve analysis on the items (Green & Frantom, 2002).

Table 5.18
Total Quality Management – Misfit Item Measures

Item	Measure	Outfit MNSQ	Outfit Zstd	Pt Corr
Q18	-0.15	2.43	4.9	0.38
Q26	1.08	1.81	3.7	0.56
Q29	0.94	1.76	3.5	0.57
Q15	-1.05	1.53	1.9	0.62
Q21	0.17	0.44	-3.50	0.81

5 items (customer complaint-Q15, benchmarking activities-Q18, continual enhancement-Q21, employee training-Q26 and reward and recognition–Q29) have been diagnosed as misfit items because outfit MNSQ, outfit ZSTD and Point Measure Correlation (Pt Corr) radius fall outside the range of 0.5<MNSQ value <1.5, -2<ZSTD<+2 and 04< as Pt Corr<0.8 proposed by Bond & Fox, (2007) as shown in Figure 5.5. After reviewing all the misfit items, the decision was made to exclude 5 misfit items out of 31 items from the instruments to measure total quality management. The results after excluded processed showed the remaining 26 items are in the range specified as Figure 5.6 Group Characteristic Curve (GCC) for total quality management and proved that there are an improvement for the misfit items. Thus 26 items that meet the quality data will be used for further analysis.

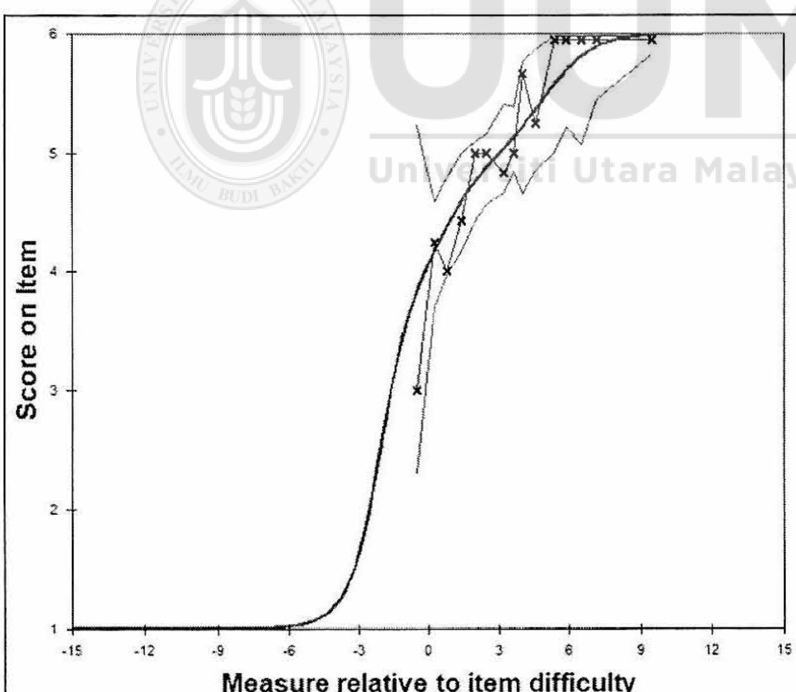

Figure 5.5
GCC Graph for Total Quality Management before Items Removal

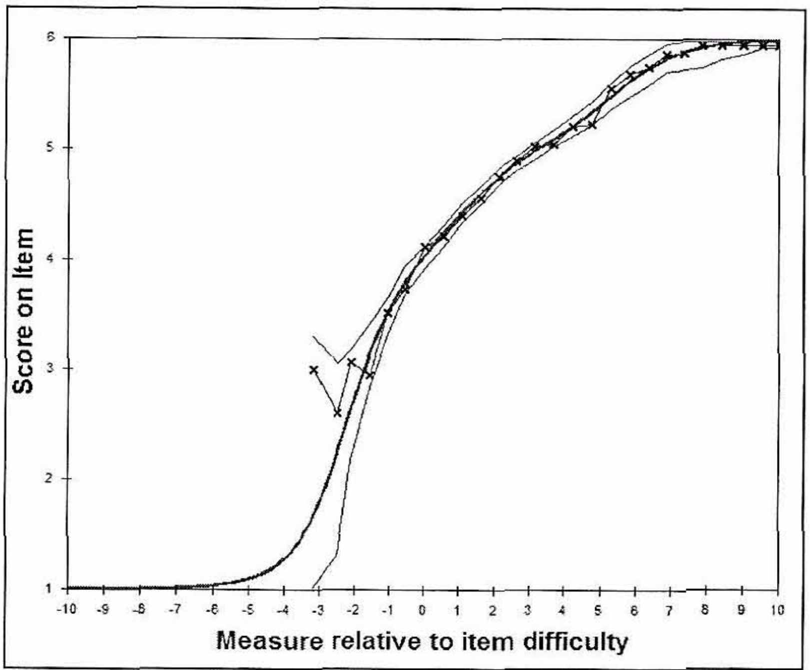

Figure 5.6
GCC Graph for Total Quality Management after Items Removal

e) Inventory Management Performance

There are 18 items contributed to inventory management performance. These 18 items are divided into sub-dimensions that are dimension of inventory administration, inventory control and inventory system. The Table 5.19 below describes the overall findings with regard to inventory management performance.

Table 5.19
Descriptive Statistic of Inventory Performance Items

	Measure	Outfit MNSQ	Outfit ZSTD
Mean	0.00	0.99	-0.30
Standard Deviation	0.68	0.31	2.30
Maximum	1.85	1.36	2.20
Minimum	-0.98	0.43	-4.90
Separation	2.98		
Reliability	0.90		

The mean value for items under inventory management performance is 0.00 logit, with a standard deviation of 0.68 logit. The minimum and maximum value for inventory management performance items are between -0.98 logit and 1.85 logit respectively and this shows that there are easy as well as difficult items with regards to inventory management performance. The separation index is at 2.98 logit while item reliability is 0.90 logit. As for the fit statistics, it is noted that minimum and maximum outfit MNSQ value is between 0.43 logit and 1.36 logit while outfit ZSTD value is between -4.90 logit and 2.20 logit. Outfit ZSTD indicators are beyond the fit criteria where some items are located outside the 95% confidence interval. As shown in Table 5.20, there are 4 items from 18 items did not qualified for quality data criteria. Therefore, these items are misfits and it is suggested for removal in order to improve analysis on the items (Green & Frantom, 2002).

Table 5.20
Inventory Management Performance – Misfit Item Measures

Item	**Measure**	Outfit MNSQ	Outfit Zstd	Pt Corr
P14	-0.44	0.54	-3.7	0.70
P6	-0.32	0.43	- 4.9	0.72
P13	0.81	1.30	1.70	-0.01
P15	-0.44	0.52	- 3.9	0.74

4 items (efficiencies of MMS-P6, problems solve faster-P13, delivery related decision-P14 and procedures related decision-P15) have been diagnosed as misfit items because outfit MNSQ, outfit ZSTD and Point Measure Correlation (Pt Corr) radius fall outside the range of 0.5<MNSQ value <1.5, -2<ZSTD<+2 and 0.4<Pt Corr<0.8 as proposed by Bond & Fox, (2007). Figure 5.7 shows the Group Characteristic Curve (GCC) for inventory administration that collapse outside the suggested range. After reviewing all the misfit items, the decision was made to exclude 4 misfit items out of 18 items from the instruments to measure inventory

management performance. The results after excluded processed showed the remaining 14 items are in the range specified as Figure 5.8 Group Characteristic Curve (GCC) for inventory management performance and proved that there are an improvement for the misfit items. Thus 14 items that meet the quality data will be used for further analysis.

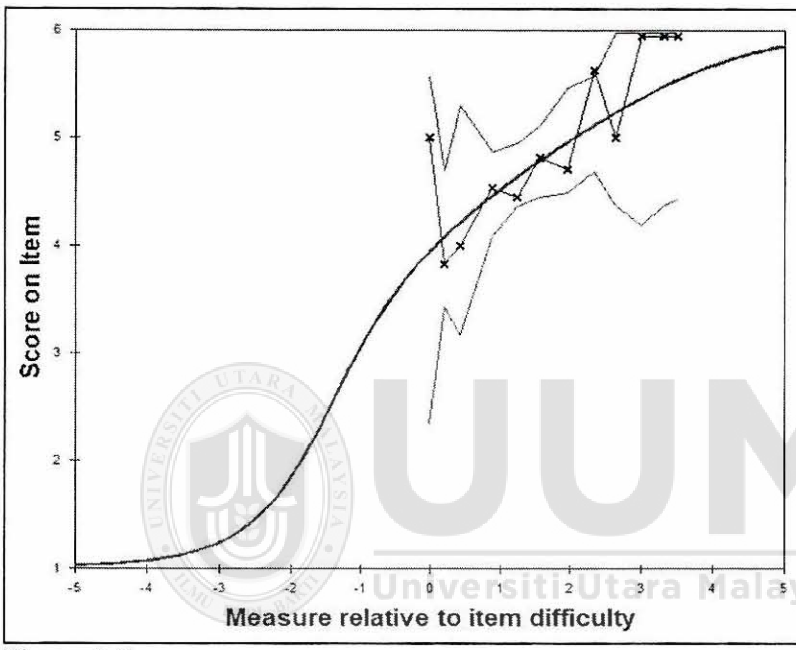

Figure 5.7
GCC Graph for Inventory Management Performance before Items Removal

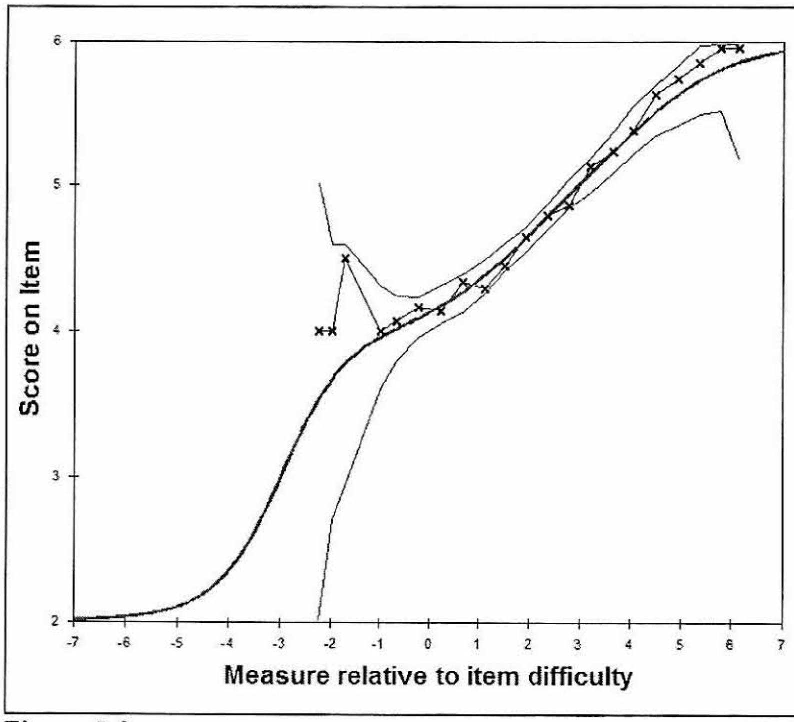

Figure 5.8
GCC Graph for Inventory Management Performance after Items Removal

5.4.3 Unidimensionality Analysis

A clear concept of the variable under examination is the Rasch concept of unidimensionality. It is an important analysis to confirm that all the items relate to the same latent variable and point in the same direction (Bond & Fox, 2015). Due to that, dimensionality analysis are the fundamental requirements of the Rasch measurement (Bond & Fox, 2007; Linacre, 2011; and Greene & Frantom, 2002). It is based on the value of raw variance explained by measure and unexplained variance in the first contrast produced by Principal Component Analysis (PCA). Unidimensionality was assessed through analysis of item fit statistics and through PCA of residuals (Smith, 2002).

Rasch analysis applied the Principal Component Analysis (PCA) of the residuals for researchers comprehend on how much variance of the instrument measuring that hypothetically to measure and to ensure that the latent variable is sufficiently unidimensional. Rasch analysis requires at least a minimum of 40% raw variance explained by measures as proposed by Fisher (2007) while Linacre (2007) proposed that is better to exceed 60%. On the other hand, this study taken the guidelines from Conrad et al. (2009) where if raw variance explained by measures $\geq$ 40% is considered a strong measurement dimension, $\geq$ 30% is considered a moderate measurement dimension, and $\geq$ 20% is considered a minimal measurement dimension. The 20 percent criterion is taken from Reckase (1979). While Fisher (2007) suggests the variance value unexplained by 1st contrast (size) < 3% is excellent, 3-5% is very good, 5-10% is good, 10-15% is moderate and > 15% is poor. As Linacre (2007) suggests the value of unexplained variance explained by 1st contrast (size) < 3.0 units is good, and the value of unexplained variance explained by 1st contrast (size) < 5% is well accepted. The following discussion are related to unidimensionality analysis for inventory administration, inventory control, inventory system and inventory management practices.

a) Inventory Administration

Table 5.21 shows the PCA of the residuals for inventory administration. Within the Rasch Measurement Analysis (RMA), the raw variance explained by measures is 52.0 percent more than 40.0 percent which is considered a strong measurement dimension according to Conrad et al., (2009). Meanwhile, the unexplained variance in 1st contrast is calculated as 11.0 percent which is acceptable and has a fair indicator because it was in the range of 10 percent to 15 percent (Fisher, 2007). Therefore, it can be concluded that the 23 items have one single overarching dimension and supports unidimensionality in measuring the inventory practices for drugs management in Malaysian public hospitals.

Table 5.21
Standardized Residual Variance for Inventory Administration (in Eigenvalue units)

	Empirical			Modelled
Total raw variance in observations	47.9	100.0%		100.0%
Raw variance explained by measure	24.9	52.0%		52.1%
Raw variance explained by person	14.9	31.2%		31.2%
Raw variance explained by item	10.0	20.8%		20.9%
Raw unexplained variance (total)	23.0	48.0%	100.0%	47.9%
Unexplained variance in 1st contrast	2.5	5.3%	11.0%	

b) Inventory Control

Table 5.22 shows the PCA of the residuals for inventory control. Within the Rasch Measurement Analysis (RMA), the raw variance explained by measures is 42.8 percent more than 40.0 percent which is considered a strong measurement dimension according to Conrad et al., (2009). Meanwhile, the unexplained variance in 1st contrast is calculated as 10.2 percent which is acceptable and has a fair indicator because it was in the range of 10 percent to 15 percent (Fisher, 2007). Therefore, it can be concluded that the 21 items have one single overarching dimension and supports unidimensionality in measuring the inventory practices for drugs management in Malaysian public hospitals.

Table 5.22
Standardized Residual Variance for Inventory Control (in Eigenvalue units)

	Empirical			Modelled
Total raw variance in observations	36.7	100.0%		100.0%
Raw variance explained by measure	15.7	42.8%		43.6%
Raw variance explained by person	7.9	21.4%		21.8%
Raw variance explained by item	7.9	21.4%		21.8%
Raw unexplained variance (total)	21.0	57.2%	100.0%	56.4%
Unexplained variance in 1st contrast	2.1	5.8%	10.2%	

c) Inventory System

Table 5.23 shows the PCA of the residuals for inventory system. Within the Rasch Measurement Analysis (RMA), the raw variance explained by measures is 36.8 percent less than 40.0 percent which is considered a moderate measurement dimension according to Conrad et al., (2009). Meanwhile, the unexplained variance in 1st contrast is calculated as 26.5 percent which is acceptable and has a poor indicator because it was more than 15 percent (Fisher, 2007). Therefore, it can be concluded that the 7 items have one single overarching dimension and supports unidimensionality in measuring the inventory practices for drugs management in Malaysian public hospitals.

Table 5.23
Standardized Residual Variance for Inventory System (in Eigenvalue units)

	Empirical			Modelled
Total raw variance in observations	11.1	100.0%		100.0%
Raw variance explained by measure	4.1	36.8%		38.7%
Raw variance explained by person	2.4	21.6%		22.7%
Raw variance explained by item	1.7	15.2%		16.0%
Raw unexplained variance (total)	7.0	63.2%	100.0%	61.3%
Unexplained variance in 1st contrast	1.9	16.7%	26.5%	

d) Inventory Management Practices

Table 5.24 below shows the PCA of the residuals for inventory management practices. Within the Rasch Measurement Analysis (RMA), the raw variance explained by measures is 46.8 percent more than 40.0 percent which is considered a strong measurement dimension according to Conrad et al., (2009). Meanwhile, the unexplained variance in 1st contrast is calculated as 8.10 percent which is acceptable and has a good indicator because it was in the range of 5 percent to 10 percent (Fisher, 2007). Therefore, it can be concluded that the 51 items have one single overarching dimension and supports unidimensionality in measuring the inventory practices for drugs management in Malaysian public hospitals.

Table 5.24
Standardized Residual Variance for Inventory Practices (in Eigenvalue units)

		Empirical		**Modelled**
Total raw variance in observations	105.2	100.00%		100.00%
Raw variance explained by measure	49.2	46.80%		48.10%
Raw variance explained by person	21.6	20.50%		21.10%
Raw variance explained by item	27.6	26.20%		27.00%
Raw unexplained variance (total)	56	53.20%	100.00%	51.90%
Unexplained variance in 1st contrast	4.5	4.30%	8.10%	

5.4.4 Summary on Fit Statistics and Unidimensionality Analysis

After completed data cleaning through analysis of item fit statistics, it can be summarized that about 18 items from 109 items representing five constructs were identified as misfit as shown in Table 5.25. Those 18 misfit items which representing 17.0% are items that did not meet the three criteria of quality control. According to Kline (2015&2011) and Grace et al. (2016), item that adapt and adopt from previous study can't delete more than 20.0%. Therefore, the percentage of 17.0 is still under the rule of thumbs. Hence, total usable items for further analysis stage is 91. Item reliability value of 0.94 suggesting that the instrument had 'an excellent' reliability level (Fisher, 2007).

Table 5.25
Summary on Misfit and Usable Items

Item	No. of Items	No. of Misfit Items	Usable Items
Inventory Administration	27	4	23
Inventory Control	26	5	21
Inventory System	7	0	7
Total Quality Management	31	5	26
Inventory Performance	18	4	14
	109	**18**	**91**
Item Reliability for Usable Items = 0.94			

As for unidimensionality analysis, it can be resolved that inventory administration (23 items), inventory control (21 items), inventory system (7 items) and inventory management practices (51 items) have one single primary dimension and supports unidimensionality grounded the guideline by Smith (2002) and Conrad et al. (2009). Table 5.26 below show the summary of unidimensionality analysis.

Table 5.26
Summary of Unidimensionality Analysis

Dimension	Raw variance explained by measure	Unexplained variance in 1st contrast
Inventory Administration	52.0%	11.0%
Inventory Control	42.8%	10.2%
Inventory System	36.8%	26.5%
Inventory Practices	**46.8%**	**8.1%**

The following section will answer the research questions under this study based on the 91 items representing the instrument of inventory management practices comprises of inventory administration, inventory control and inventory system, total quality management and inventory management performance with 80 respondents from Malaysian public hospitals.

5.5 Results

The results presented in this sub-section will be divided into two (2) parts. Firstly, Rasch Measurement Analysis was used in this study as main investigation in order to answer research questions one, two and three after analyzing the data collected. Accordingly, the first analysis will answer the first research questions of this study towards unidimensionality analysis. Second objective followed by measuring the implementation level of inventory administration, inventory control, inventory system, inventory management practices and inventory management performance.

While, third objective involved the investigation of the most influential variables that affect inventory management performance. Analysis will be based on 91 items with 80 Head of Pharmacist Officers from Malaysian public hospitals participated in this study. The summary of research objectives, research hypothesis and *Rasch Measurement Analysis* are presented in Table 5.27 below.

Table 5.27
Research Objectives, Research Hypothesis and Rasch Measurement Analysis

No.	Research Objectives	Research Hypothesis/testable statement	Data Analysis
1.	To investigate inventory management practices comprises dimension of inventory administration, inventory control and inventory system are moving towards unidimensionality	Not related	Rasch Measurement Model -*Winsteps Software 3.9.1*
2.	To investigate the ability of the public hospitals in implementing the items of inventory management practices comprises dimension of inventory administration, inventory control and inventory system in relation to inventory management performance	Not related	Rasch Measurement Model -*Winsteps Software 3.9.1*
3.	To investigate the most influential dimension of inventory management practices comprises dimension of inventory administration, inventory control and inventory system that affect inventory management performance	Not related	Rasch Measurement Model -*Winsteps Software 3.9.1*

Research Question 1

"Are inventory management practices, which comprised of the dimensions of inventory administration, inventory control and inventory system moving towards unidimensionality?"

5.5.1 Unidimensionality Analysis

The above research question is designed in order to achieve the first research objective, and investigates do inventory management practices comprises dimension of inventory administration, inventory control and inventory system are moving towards unidimensionality. In order to answer the above research question, the analysis will be based on 80 respondents and 51 items that are formed under one variables with three dimensions. In this study, the three dimension and inventory management practices comprises dimension of Inventory Administration, Inventory Control and Inventory System is the latent variable that were being measured.

As shown in Table 5.28 below, the raw variance explained by measure for individual dimension represented by Inventory Administration, Inventory Control and Inventory System was 52 percent, 42.8 percent and 36.8 percent respectively closely match to the modelled value 52.1 percent, 43.6 percent and 38.7 percent. Based on the guidelines for variance explained by the measure from Conrad et al. (2009), dimension of Inventory Administration and Inventory Control is considered strong but moderate for Inventory Control.

Meanwhile, the unexplained variance in 1^{st} contrast calculated for Inventory Administration and Inventory Control are 11.0 percent and 10.2 percent which is acceptable and has a fair indicator because it was in the range of 10 percent to 15 percent (Fisher, 2007). As for Inventory Control the unexplained variance in 1st contrast calculated was 26.5 percent, which is acceptable and has a poor indicator because it was more than 15 percent (Fisher, 2007).

Table 5.28
Summary of Standardized Residual Variance of Inventory Management Practices Comprises Dimension of Inventory Administration, Inventory Control and Inventory System (In Eigenvalue Units)

Dimension	**Raw variance explained by measure**	**Modelled**	**Result of Quality Criteria**	**Unexplained variance in 1st contrast**	**Result of Quality Criteria**
Inventory Administration	52.0%	52.1%	Strong	11.0%	Fair
Inventory Control	42.8%	43.6%	Strong	10.2%	Fair
Inventory System	36.8%	38.7%	Moderate	26.5%	Poor
Inventory Practices	**46.8%**	**48.1%**	**Strong**	**8.1%**	**Good**

Furthermore, analysis of measurement dimension for inventory practices comprises dimension of Inventory Administration, Inventory Control and Inventory System as it appears from Table 5.28 indicates that 46.8 percent respectively closely match to the modelled value 48.1 percent. It can be considered that inventory practices has a strong measurement dimension. Interestingly, the unexplained variance in 1st contrast calculated for inventory practices 8.1% provides evidence that it turn to good indicator. As a result, it can be concluded that the 56 items have one single predominant dimension, supports and moving towards unidimensionality in measuring the inventory practices for drugs management in Malaysian public hospitals. This finding is consistent with findings of past studies by Mueller (2006) which revealed that, Rasch analysis should not be employed if the assumption of unidimensionality is not met. In addition, each item in the instrument should be a meaningful measure of the unidimensional construct (Bond & Fox, 2007).

Research Question 2

"What is the ability of the public hospitals in implementing the inventory management practices comprises dimension of inventory administration, inventory control and inventory system in relation to inventory management performance?"

5.5.2 Measuring the Implementation Level of Inventory Management Practices in Relation to Inventory Management Performance among Public Hospitals in Malaysia

The above research question is designed in order to achieve the second research objective which is to investigates the ability of the Malaysian public hospitals in implementing the inventory management practices comprises dimension of inventory administration, inventory control and inventory system, in relation to inventory management performance. In order to answer the above research question, the analysis will be based on 80 respondents and 65 items that are formed under the three dimensions based on the conceptual framework earlier. In answering this research question also, all the items and persons or respondents are placed on the same Person-item map as shown in Figure 5.9 and the ability of the organizations which in this study referring to public hospitals, will be analyzed against the difficult items. The Person-item map is divided into two parts on the same continuum. Along the line on the left-hand side, the respondents are represented by organizations as the unit of analysis is aligned in the increasing ability from bottom to top. The person measure for each respondent is listed in Table 5.29.

Table 5.29
Person Measure Order

Person	Measure *Logit*	Person	Measure *Logit*
T54411	5.67	J52411	2.66
J44411	5.57	D14422	2.58
S23311	5.39	K14222	2.54
N12411	5.00	L33411	2.54
K53411	4.80	K34411	2.50
K23411	4.74	N52411	2.46
B34421	4.74	S23322	2.42
K53411	4.62	P52421	2.35
J53411	4.24	A52421	2.35
J24421	4.18	S24421	2.35
B54411	3.99	Q52411	2.31
S14432	3.85	D33311	2.31
A32221	3.75	A24411	2.31
Q32411	3.62	F14442	2.31
A52411	3.62	Q23411	2.23
D54411	3.62	Q23421	2.19
T54311	3.57	M53311	2.19
C34411	3.49	N24421	2.19
Q51211	3.49	J23411	2.15
A14423	3.44	R14412	2.11
P14442	3.44	J53411	2.11
T34411	3.44	J52411	2.07
C53411	3.27	P53421	2.07
P34311	3.23	C52411	1.99
Q14433	3.19	B53411	1.99
P23332	3.19	A52411	1.76
D24411	3.15	D24411	1.76
T13421	3.11	N53211	1.72
C52211	3.03	N52211	1.68
B21321	3.03	C24221	1.68
A52411	2.98	K22421	1.56
B51411	2.98	Q32411	1.45
K53411	2.94	Q54411	1.41
K24221	2.90	Q51411	1.33
A42411	2.86	K53411	1.14
F23412	2.82	S52411	1.14
P33421	2.78	B23231	0.87
K53411	2.70	A33411	0.57
M14422	2.70	D54411	0.47
A52411	2.66	S51411	-0.35
Mean	1.95		
Standard Deviation	1.14		
Maximum	5.06		
Minimum	-0.51		
Separation	**6.38**		
Reliability	0.98		

The graphical Figure 5.9 below is known as the Person-Item Variable Map. All the variables are put together and it will be analyzed together in one continuum. The assessment conducted based on guideline provided by Bond & Fox (2007) and the author is using steps proposed by Battisti, Nicolini & Salini (2010), Asaad *et al.* (2015), and Ishar & Masodi (2012). The results of the respondents will appear in the classical "Rasch Ruler" and also called the "Person-item Map". In this map, the respondents and items will be shown side by side on the same *logit* ruler. The vertical dashed line represents the ideal easy-to-difficult continuum level of difficulty. On the right of the dashed line, the items are aligned from easy to difficult. In this context, at the first step, item mean for 65 items is set at 0.00 logit. The Mean Item is always 0.00 *logit* for all the items under three dimensions and one dependent variables, but there will be a different mean logit for each of that.

It appears from Figure 5.9 that mean person is located at 2.77 logit, which is above the mean item 0.00 logit. The maximum logit for person is 5.67 which is represented by J44411 and T54441. Meanwhile, the minimum logit for person is -0.35 represented by S51411. The ability of persons was arranged in descending order from the highest to the lowest ability in performing the items. The ability of persons were grouped into six (6) category based to person separation index of 6.38. Separation is the number of statistically different performance ability levels that the test can identify in the sample (Linacre, 1998). Item and person separation index should be higher than 2.0 to be considered as an acceptable separation index (Bond & Fox; Wright & Masters, 1982). Therefore, this separation index recommended that the public hospitals were spread adequately into 6 group across the items and the trait continuum. The group were divided into two category, namely as high category (comprises of high, very high and extremely high) and low category (comprises of low, very low and extremely low).

It appears from Figure 5.9 that, 35 percent (28 respondents) of public hospitals have high ability to implement the items listed in the questionnaire. The very high abilities of group is contributing to 9 percent (7 respondents). The finding of the present study also revealed that about 5 percent (4 respondents) have extremely high abilities to perform the items measure. As for the low category, 40 percent (32 respondents) have low abilities to perform the items listed in the questionnaire. The very low abilities of group is contributing to 10 percent (8 respondents). The third group of high category is labelled as extremely low where it appears from Figure 5.9 that, only 1 percent (1 respondent) having extremely low ability to implement the items. The summary of the category, groups and number of respondents are presented in Table 5.30 below.

Table 5.30
Category, Groups and Number of Respondents

Category	Groups	Number of Respondents
	Extremely High	4
High Category	Very High	7
	High	28
	Low	32
Low Category	Very Low	8
	Extremely Low	1

The item map on the right hand-side is divided into two parts on the same continuum, easy items and difficult items. As shown in the same Figure 5.9, mean item for inventory administration (-0.09), inventory control (-0.10) and inventory system (-0.38) are reported as a negative *logit*, which indicates that most of the items can easily be performed. Generally, the most difficult dimension to achieve is inventory administration, because the mean item (1.20) is on the higher side of the continuum. It appears from the same map, the maximum *logit* item is located at 1.79 *logit,* which represents the most difficult item to implement. It represented by item P2.3, where the question asked about to what extent are problems that happen relating to inventories being hidden. The easiest item to implement was at -2.00 *logit,* which represents by item S1 under the inventory system dimension. This question is related to what extend is the organization using information technology in managing inventory. As overall, about 38 or 58% represent difficult items while 27 or 42% represent easy items.

The following section will discuss in detail the ability of the organization (public hospitals) to perform the items of individual dimension; inventory administration, inventory control, inventory system and inventory management performance. The discussion of the results will merge the six strata into two category;

(1) High category (comprises of high, very high and extremely high)

(2) Low category (comprises of low, very low and extremely low).

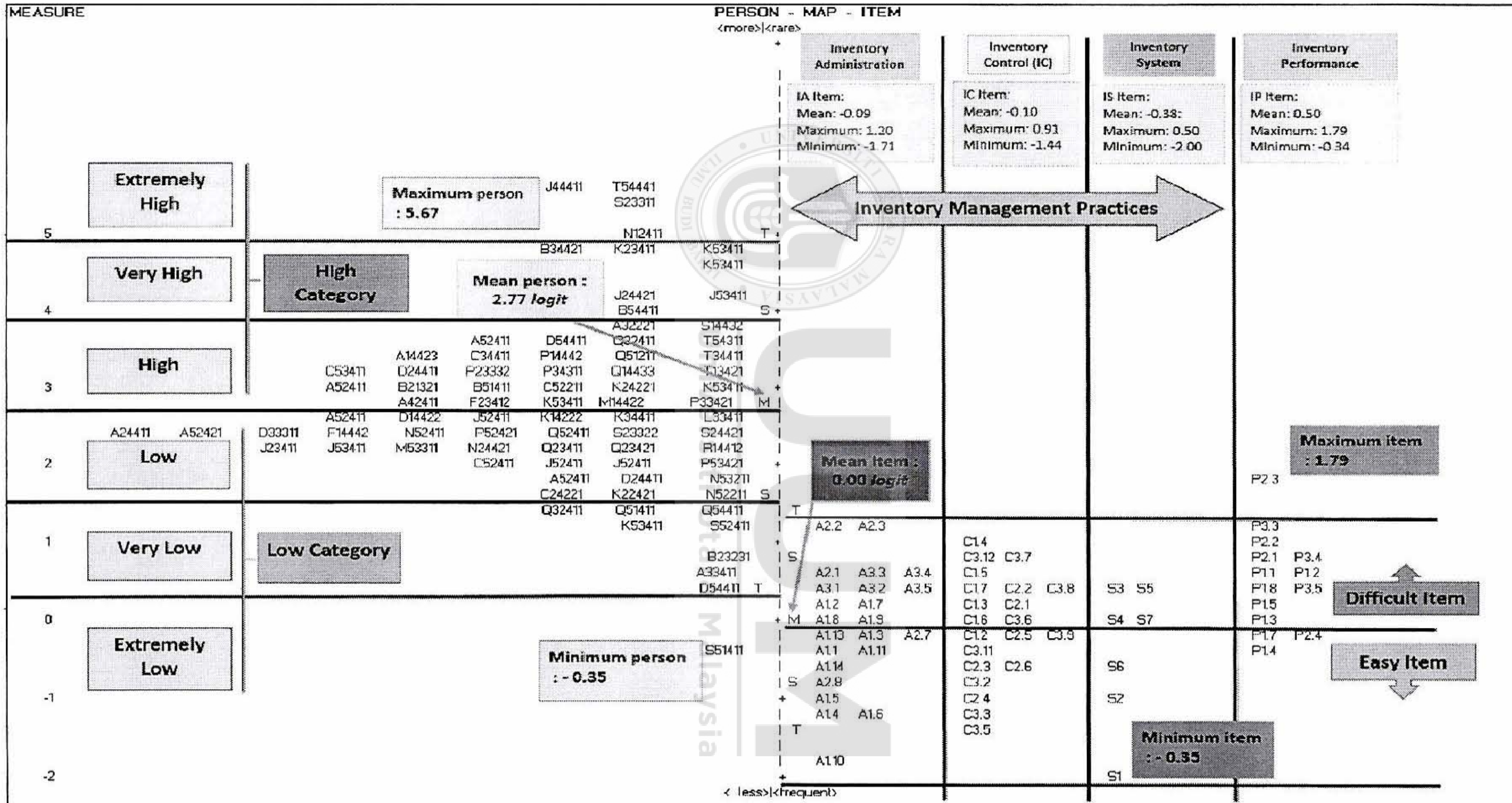

Figure 5.9
Person-Item Variable Map for Inventory Management Practices comprises of Inventory Administration, Inventory Control and Inventory System towards Inventory Management Performance

5.5.3 Ability of Public Hospitals towards Individual Dimensions

a) Ability Of Public Hospitals Towards Inventory Administration Items

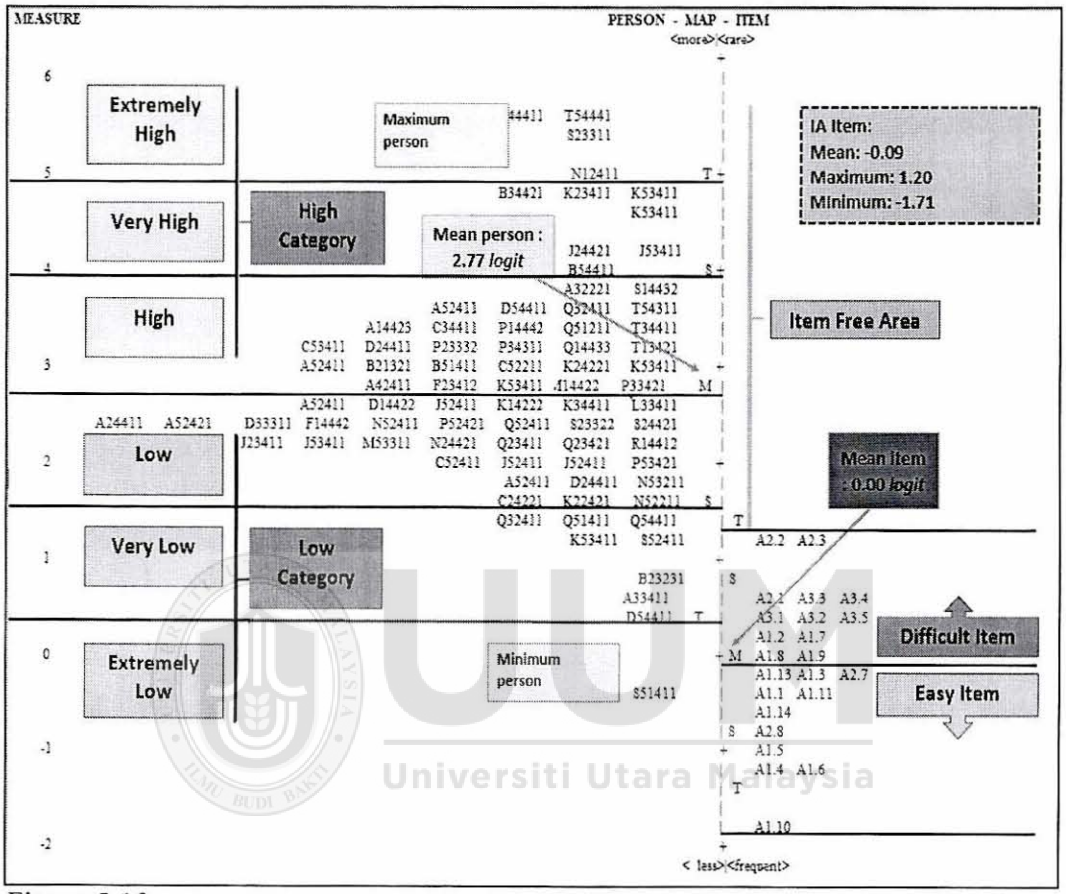

Figure 5.10

Person-Item Variable Map for Inventory Administration

In addressing outcome of inventory administration, Heads of Pharmacy Officers need to respond to 23 items. The ability to perform this dimension is presented through the Person-Item Variable Map. Based to Figure 5.10, analysis of the Rasch results show that based on the person mean 2.77 logit, about 39 public hospitals (49%) at high category have high abilities or excellence in performing inventory administration that all items are very easy for the high category hospitals to apply in their respective organisations.

In detail, results indicate that there are 4 public hospitals (J44411, T54441, S23311 and N12411 with extremely high capabilities, 7 public hospitals (B34421, K23411, K53411, K53411, J53411, J24421 and B54411) fall under very high abilities and 28 public hospitals (A32221, S14432, A52411, D54411, Q32411, T54311, A14423, C34411, P14442, Q51211, T34411, C53411, D24411, P23332, P34311, Q14433, T13421, A52411, B21321, B51411, C52211, K24221, K53411, P33421, M14422, K53411, F23412, and A42411) for high level of excellence in implementing the item measure under inventory administration.

Meanwhile, there are about 41 public hospitals (51%) fall under low category which located between item mean value and person mean value. Therefore, these hospitals perceived items that located above the mean can be classified as difficult. Analysis of the Rasch results reveal that there are about 32 hospitals in low ability category, 8 hospitals (Q32411, Q51411, Q54411, K53411, S52411, B23231, A33411 and D54411) with very low category and only 1 hospital with the code of S51411 fall under extremely low abilities in performing inventory administration items. Based to Figure 5.11, eventhough 32 hospitals (A52421, D33311, J23411, A52411, F14442, J53411, D14422, N52411, M53311, J52411, P52421, N24421, C52411, K14222, Q52411, Q23411, J52411, A52411, C24221, K34411, S23322, Q23421, J52411, D24411, K22421, L33411, S24421, R14412, P53421, N53211 AND N52211) fall under low ability categories due to below mean person, however, those hospitals still have capabilities to perform all the items.

The result from Figure 5.10 also indicates that the item mean value for inventory administration through the operation of I-SELECT is -0.09 logit. Maximum item is at 1.20 logit and minimum item located at -1.71 logit. Items that are below the mean value (A1.13, A1.3, A2.7, A1.1, A1.11, A1.14, A2.8, A1.5, A1.4, A1.6 and A1.10) are easy as compared to item located above the mean of -0.09 logit (A2.2, A2.3, A2.1, A3.3, A3.4, A3.1, A3.2, A3.5, A1.2, A1.7, A1.8 and A1.9) which study classified the items as difficult. From the person-item map, about five public hospitals (very low) with the code of K53411, S52411, A33411, B23231, and D54411 faced with difficulties in performing items for A2.2, A2.3, A2.1, A3.3, A3.4, A3.1, A3.2, A3.5, A1.2, A1.7, A1.8 and A1.9 in this category. Most of the difficult items are related to the issue as stated in Table 5.31 below.

Table 5.31
Category, Items Code, Items Issue and Measure Item Value of Inventory Administration for Low Category (Very Low)

Category	Items Code	Items Issue	Item Measure Value
Low Category – Very Low for K53411, S52411, A33411, B23231, and D54411)	A2.2	Main Medical Store personnel qualified and well-trained	1.58
	A2.3	Main Medical Store personnel have adequate skills for cross-functional team	1.58
	A2.1	Main Medical Store provides a formal training on drug management to the personnels	0.78
	A3.3	Managing supplier ensures a continuous flow of drugs	0.86
	A3.4	Managing supplier assist the department in maintaining an adequate supply of drugs	0.82
	A3.1	Regular supply of drugs promotes long-term relationship of members	0.63
	A3.2	Collaborative approach with the supplier in managing drugs useful to the MMS	0.67
	A3.5	Managing supplier influence drug management performance	0.54
	A1.2	Utilization of equipment effective in managing the stock of drug	0.34
	A1.7	Adoption of innovative service is enhancing the management of drugs	0.42
	A1.8	Standard of Procedure (SOP) communicated to the staff responsible for drugs management	0.13
	A1.9	Management review and follow up reports of drug turnover, ageing, and drug adjustments benefit the organization	0.18

Public hospitals which located below the item mean value of -0.09 logit can be considered had low abilities to implement inventory administration. Figure 5.10 Person-Item Variable Map for inventory administration had shown that only 1 public hospital with the code of S51411 fall under the low ability category (extremely low) and faced with difficulties in performing items for A1.13, A1.3, A2.7, A1.1, A1.11, A1.14, A2.8, A1.5, A1.4, A1.6 and A1.10. Most of the items that are difficult related to the issue as stated in Table 5.32:

Table 5.32
Category, Items Code, Items Issue and Measure Item Value of Inventory Administration for Low Category (Extremely Low)

Category	Items Code	Items Issue	Item Measure Value
Low Category – Extremely Low for S51411)	A1.13	Main Medical Store procures the drug immediately if its shortage delays or compromises patient's health	-0.16
	A1.3	Drug supply mechanism effect store customer efficiencies	-0.21
	A2.7	Main Medical Store have written policies of listed jobs to cover all functions and responsibilities of the personnel	-0.12
	A1.1	Utilization of humans effective in managing the stock of drug	-0.25
	A1.11	Standard of Procedure (SOP) for stock taking practiced	-0.30
	A1.14	Head of Hospital Pharmacy Department (HPD) has the organization structure documents of department and shares its annual budget	-0.75
	A2.8	All the pharmacy personnel use the forms of inventory records and documents assigned by the Ministry of Health (MOH)	-0.84
	A1.5	Drug planning and management reduce storage problems	-1.13
	A1.4	Drug purchase planning improves the service level	-1.33
	A1.6	Sufficient drug supply built maximize service performance	-1.43
	A1.10	Rack labeling of drug placed in storage area important	-2.03

As lowest achievers, these public hospital was placed at the negative logit value and lower than the item mean of -0.09 logit. All items of inventory administration are considered very difficult as compared to others due to its position at -0.35 and far lower than the mean item -0.09 logit. As for these hospital, all inventory administration items are difficult and therefore this would later affect its practices and performance except for items A1.13, A1.3 and A2.7 which located above than S51411 eventhough this items in poor category.

As a conclusion, about 49 percent (39 hospitals) at high category have high abilities to perform the items listed in the questionnaire while 51 percent (41 hospitals) are located at low category. Only 1 percent (1 hospital) who located below than 0.00 logit from the item mean. However, in general all the 23 items that represent the dimension of inventory administration provide a combination of 52% (12) difficult items and 48% (11) easy items to be implemented. This can be noticed where its item mean is -0.09 logit which is on the lower side of the continuum and indicate that the items in general are separated into two.

b) Ability of Public Hospitals Towards Inventory Control Items

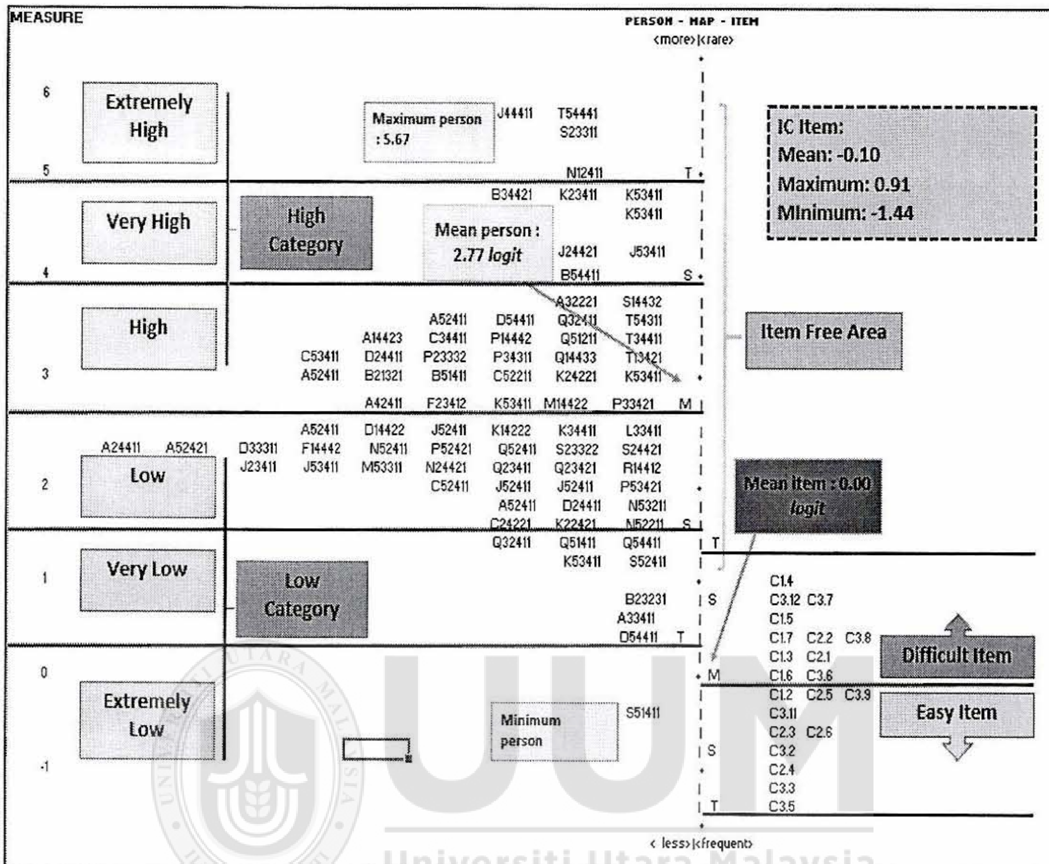

Figure 5.11
Person-Item Variable Map for Inventory Control

In addressing outcome of inventory control, Heads of Pharmacy Officers need to respond to 21 items. The ability to perform this dimension is presented through the person-item variable map. Figure 5.12 indicates the mean value for inventory control through the operation of I-SELECT is -0.10 logit. Maximum item is at 0.91 logit and minimum item located at -1.44 logit. Items that are below the mean value are easy as compared to item located above the mean of -0.10 logit. Based to Figure 5.11, analysis of the Rasch results show that based on the person mean 2.77 logit, about 39 public hospitals (49%) at high category have high abilities or excellence in performing inventory control where all 21 items are very easy for the high achievers.

Hence, the free area shows that all items are very easy for the high category hospitals to apply in their respective organisations. In detail, results indicate that there are 4 public hospitals (J44411, T54441, S23311 and N12411 with extremely high capabilities, 7 public hospitals (B34421, K23411, K53411, K53411, J53411, J24421 and B54411) fall under very high abilities and 28 public hospitals (A24411, A32221, S14432, A52411, D54411, Q32411, T54311, A14423, C34411, P14442, Q51211, T34411, C53411, D24411, P23332, P34311, Q14433, T13421, A52411, B21321, B51411, C52211, K24221, K53411, P33421, M14422, K53411, F23412) for high level of excellence in implementing the item measure under inventory control.

Meanwhile, there are about 41 public hospitals (51%) fall under low category which located between item mean value and person mean value. Therefore, these hospitals perceived items that located above the mean can be classified as difficult. Analysis of the Rasch results reveal that there are about 32 hospitals in low ability category, 8 hospitals (Q32411, Q51411, Q54411, K53411, S52411, B23231, A33411 and D54411) with very low category and only 1 hospital with the code of S51411 fall under extremely low abilities in performing inventory control items. Based to Figure 5.11, eventhough 32 hospitals (A24411, A52421, D33311, J23411, A52411, F14442, J53411, D14422, N52411, M53311, J52411, P52421, N24421, C52411, K14222, Q52411, Q23411, J52411, A52411, C24221, K34411, S23322, Q23421, J52411, D24411, K22421, L33411, S24421, R14412, P53421, N53211 and N52211) fall under low ability categories due to below mean person, however, those hospitals still have capabilities to perform all the items.

The result from Figure 5.11 also indicates that the item mean value for inventory control through the operation of I-SELECT is -0.10 logit. Maximum item is at 0.91

logit and minimum item located at -1.44 logit. Items that are below the mean value (C1.2, C2.5, C3.9, C3.11, C2.3, C2.6, C3.2, C2.4, C3.3 and C3.5) are easy as compared to item located above the mean of -0.10 logit (C2.1, C1.6, C3.6, C1.4, C3.12, C3.7, C1.5, C1.7, C2.2, C3.8 and C1.3) which study classified the items as difficult. From the person-item map, about five public hospitals (very low) with the code of K53411, S52411, A33411, B23231, and D54411 faced with difficulties in performing items for C2.1, C1.6, C3.6, C1.4, C3.12, C3.7, C1.5, C1.7, C2.2, C3.8 and C1.3 in this category. Most of the difficult items are related to the issue as stated in Table 5.33 below.

Table 5.33
Category, Items Code, Items Issue and Measure Item Value of Inventory Control for Low Category (Very Low)

Category	Items Code	Items Issue	Item Measure Value
Low Category – Very Low for A33411, B23231, and D54411)	C2.1	To what extent are all medications recorded in the assigned supply ledgers	-0.91
	C1.6	To what extent do recalled or expired medications removed from stock	-0.29
	C3.6	To what extent does the MMS checks and match medication and supplies with their vouchers	-0.67
	C1.4	To what extent are the drugs stored at proper temperatures	-0.60
	C3.12	To what extent are investigational drugs stored under the supervision of the head of HPD	0.34
	C3.7	To what extent does the medication distribution to satellite pharmacies done by open-negotiable quantities order form	0.84
	C1.5	To what extent does the MMS have a system to monitor out of date medications or recently expired drugs	0.06
	C1.7	To what extent during dispensing, has the MMS given priority to medications with shorter shelf life	-0.44
	C2.2	To what extent are all procurement invoices and supply vouchers kept in special files	-1.13

Table 5.33 (Continued)

	C3.8	To what extent does the MMS have a contingency planning strategy in cases of drug shortages	0.37
	C1.3	To what extent are the drugs stored in a manner to protect their identity and integrity	-0.29

Public hospitals which located below the item mean value of -0.10 logit can be considered had low abilities to implement inventory control. Figure 5.12 Person-Item Variable Map for inventory control had shown that only 1 public hospital with the code of S51411 fall under the low ability category (extremely low) and faced with difficulties in performing items for C3.11, C2.3, C2.6, C3.2, C2.4, C3.3 and C3.5. Most of the items that are difficult related to the issue as stated in Table 5.34:

Table 5.34
Category, Items Code, Items Issue and Measure Item Value of Inventory Control for Low Category (Extremely Low)

Category	Items Code	Items Issue	Item Measure Value
Low Category – Extremely low for S51411)	C3.11	To what extent are all stocks inspected regularly to ensure the absence of outdated, unusable or mislabeled products	-0.29
	C2.3	To what extent are all forms used designed centrally by MOH	0.31
	C2.6	To what extent are pharmacy documents maintained in folders to avoid mix-up	0.06
	C3.2	To what extent are the drugs dispensed from MMS in a negotiable manner according to procedures	-0.11
	C2.4	To what extent, if any, is a request raised to MOH when a form need to be added, amended or deleted	1.16
	C3.3	To what extent does the hospital provide specially needed transportation for drugs	1.13
	C3.5	To what extent does dispensing of dangerous drug from MMS done according to MOH guidelines	-1.69

As lowest achievers, these public hospital was placed at the negative logit value and lower than the item mean of -0.10 logit. All items of inventory control are considered very difficult as compared to others due to its position at -0.35 and far lower than the mean item -0.10 logit. As for these hospital, all inventory control items are difficult and therefore this would later affect its practices and performance except for items C1.2, C2.5 and C3.9 which located above than S51411 eventhough this items in low category.

As a conclusion, about 49 percent (39 hospitals) at high category have high abilities to perform the items listed in the questionnaire while 51 percent (41 hospitals) are located at low category. Only 1 percent (1 hospital) who located below than 0.00 logit from the item mean. However, in general all the 21 items that represent the dimension of inventory control provide a combination of 52% (11) difficult items and 48% (11) easy items to be implemented. This can be noticed where its item mean is -0.10 logit which is on the lower side of the continuum and indicate that the items in general are separated into two.

c) Ability of Public Hospitals towards Inventory System Items

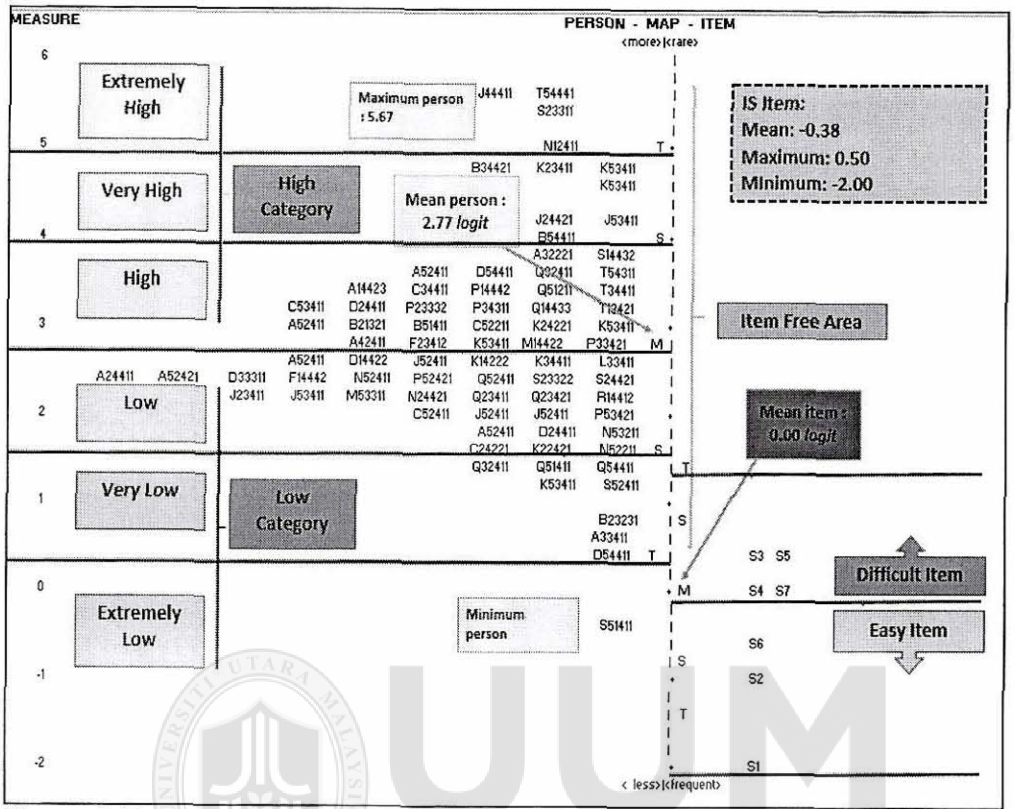

Figure 5.12

Person-Item Variable Map for Inventory System

In addressing outcome of inventory system, Heads of Pharmacy Officers need to respond to 7 items. The ability to perform this dimension is presented through the person-item variable map. Figure 5.12 indicates the mean value for inventory system through the operation of I-SELECT is -0.38 logit. Maximum item is at 0.50 logit and minimum item located at -2.00 logit. Items that are below the mean value are easy as compared to item located above the mean of -0.38 logit. Based on the person mean 2.77 logit, 39 public hospitals have high abilities or excellence in performing inventory system where all items are very easy for the high achievers. Hence, the free area shows that all items are very easy for the hospitals to apply in their respective organisations.

In detail, results indicate that there are 4 public hospitals (J44411, T54441, S23311 and N12411 with extremely high capabilities, 7 public hospitals (B34421, K23411, K53411, K53411, J53411, J24421 and B54411) fall under very high abilities and 28 public hospitals (A24411, A32221, S14432, A52411, D54411, Q32411, T54311, A14423, C34411, P14442, Q51211, T34411, C53411, D24411, P23332, P34311, Q14433, T13421, A52411, B21321, B51411, C52211, K24221, K53411, P33421, M14422, K53411, F23412) for high level of excellence in implementing the item measure under inventory system.

Meanwhile, there are about 41 public hospitals (51%) fall under low category which located between item mean value and person mean value. Therefore, these hospitals perceived items that located above the mean can be classified as difficult. Analysis of the Rasch results reveal that there are about 32 hospitals in low ability category, 8 hospitals (Q32411, Q51411, Q54411, K53411, S52411, B23231, A33411 and D54411) with very low category and only 1 hospital with the code of S51411 fall under extremely low abilities in performing inventory systerm items. Based to Figure 5.12, eventhough 32 hospitals (A24411, A52421, D33311, J23411, A52411, F14442, J53411, D14422, N52411, M53311, J52411, P52421, N24421, C52411, K14222, Q52411, Q23411, J52411, A52411, C24221, K34411, S23322, Q23421, J52411, D24411, K22421, L33411, S24421, R14412, P53421, N53211 and N52211) fall under low ability categories due to below mean person, however, those hospitals still have capabilities to perform all the items.

The result from Figure 5.12 also indicates that the item mean value for inventory system through the operation of I-SELECT is -0.38 logit. Maximum item is at 0.50 logit and minimum item located at -2.00 logit. Items that are below the mean value

(S6, S2 and S1) are easy as compared to item located above the mean of -0.38 logit (S5, S4, S7 and S3) which study classified the items as difficult. From the person-item map, about five public hospitals (very low) with the code of D54411 faced with difficulties in performing items for S3, S5, S4 and S7 in this category. Most of the difficult items are related to the issue as stated in Table 5.35 below.

Table 5.35
Category, Items Code, Items Issue and Measure Item Value of Inventory System for Low Category (Very Low)

Category	Items Code	Items Issue	Item Measure Value
Low Category – Very Low for D54411)	S3	To what extent is constantly evolving technology a major barrier for implementing inventory management practices in the organization	0.64
	S5	To what extent is using enough technology can control the drug inventory system in a medical store	0.43
	S4	To what extent is the MMS system able to monitor supply of medications	0.33
	S7	To what extent does the system support the identification of expired drugs	-0.05

Public hospitals which located below the item mean value of -0.38 logit can be considered had low abilities to implement inventory system. Figure 5.12 Person-Item Variable Map for inventory system had shown that only 1 public hospital with the code of S51411 fall under the low ability category (extremely low) and faced with difficulties in performing items for S6, S2 and S1. Most of the items that are difficult related to the issue as stated in Table 5.36:

Table 5.36
Category, Items Code, Items Issue and Measure Item Value of Inventory System for Low Category (Extremely Low)

Category	Items Code	Items Issue	Item Measure Value
Low Category – Extremely Low for S51411)	S6	To what extent does shared technology with supply chain members in the organization improves the inventory system	0.23
	S2	To what extent are electronic tracking systems used to manage stock level	-0.09
	S1	To what extent is the organization using information technology in managing inventory	-0.64

As lowest achievers, these public hospital was placed at the negative logit value and lower than the item mean of -0.38 logit. All items of inventory system are considered very difficult as compared to others due to its position at -0.35 and far lower than the mean item -0.38 logit. As for these hospital, all inventory system items are difficult and therefore this would later affect its practices and performance except for items S3, S5, S4 and S7 which located above than S51411 eventhough this items in low category.

As a conclusion, about 49 percent (39 hospitals) at high category have high abilities to perform the items listed in the questionnaire while 51 percent (41 hospitals) are located at low category. Only 1 percent (1 hospital) who located below than 0.00 logit from the item mean. However, in general all the 7 items that represent the dimension of inventory system provide a combination of 57% (4) difficult items and 43% (3) easy items to be implemented. This can be noticed where its item mean is -0.38 logit which is on the lower side of the continuum and indicate that the items in general are separated into two.

d) Ability of Public Hospitals towards Inventory Management Performance Items

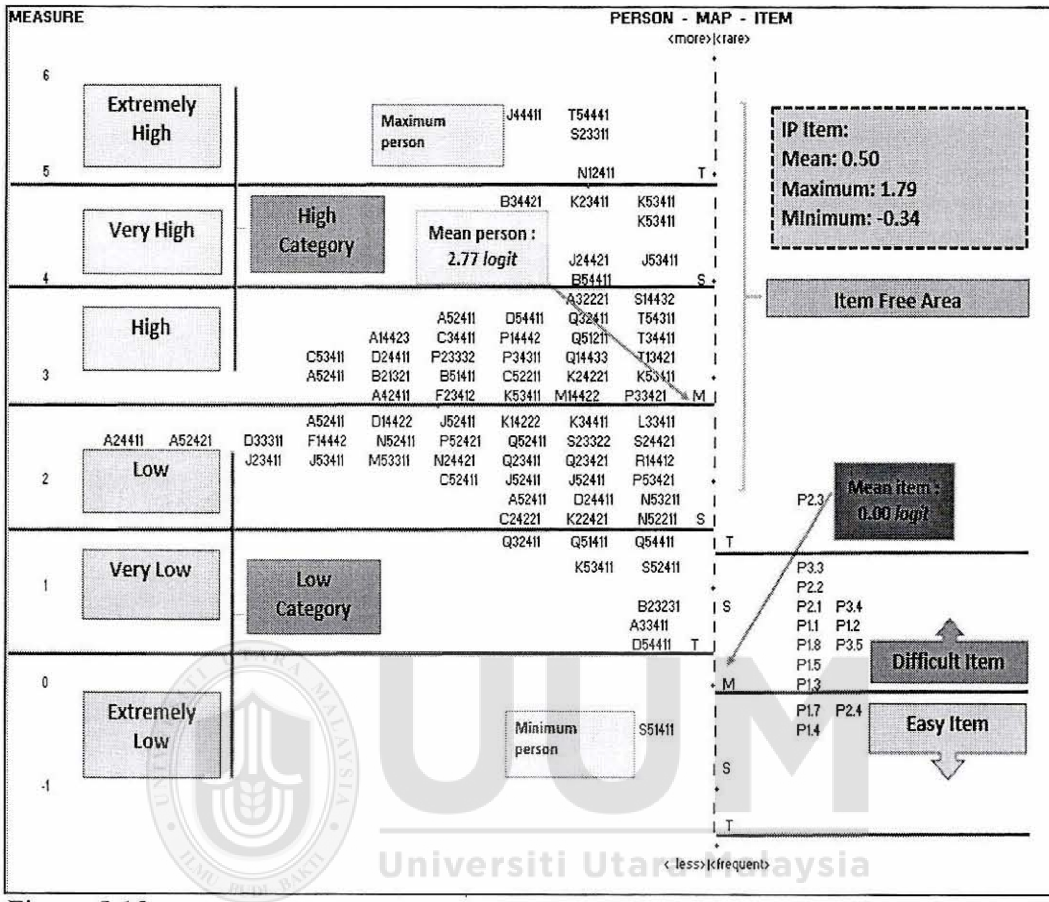

Figure 5.13

Person-Item Variable Map for Inventory Management Performance

In addressing outcome of inventory management performance, Heads of Pharmacy Officers need to respond to 14 items. The ability to perform this dimension is presented through the person-item variable map. Figure 5.13 indicates the mean value for inventory management performance through the operation of I-SELECT is 0.50 logit. Maximum item is at 1.79 logit and minimum item located at -0.34 logit. Items that are below the mean value are easy as compared to item located above the mean of 0.50 logit. Based on the person mean 2.77 logit, 39 public hospitals are in high abilities category or excellence where all items are very easy for the high achievers in performing inventory management performance. Hence, the free area shows that all items are very easy for the hospitals to apply in their respective organisations.

In detail, results indicate that there are 4 public hospitals (J44411, T54441, S23311 and N12411 with extremely high capabilities, 7 public hospitals (B34421, K23411, K53411, K53411, J53411, J24421 and B54411) fall under very high abilities and 28 public hospitals (A32221, S14432, A52411, D54411, Q32411, T54311, A14423, C34411, P14442, Q51211, T34411, C53411, D24411, P23332, P34311, Q14433, T13421, A52411, B21321, B51411, C52211, K24221, K53411, P33421, M14422, K53411, F23412, and A42411) for high level of excellence in implementing the item measure under inventory management performance.

Meanwhile, there are about 41 public hospitals (51%) fall under low category which located between item mean value and person mean value. Therefore, these hospitals perceived items that located above the mean can be classified as difficult. Analysis of the Rasch results reveal that there are about 32 hospitals in low ability category, 8 hospitals (Q32411, Q51411, Q54411, K53411, S52411, B23231, A33411 and D54411) with very low category and only 1 hospital with the code of S51411 fall under extremely low abilities in performing inventory management performance items. Based to Figure 5.14, eventhough 32 hospitals (A52421, D33311, J23411, A52411, F14442, J53411, D14422, N52411, M53311, J52411, P52421, N24421, C52411, K14222, Q52411, Q23411, J52411, A52411, C24221, K34411, S23322, Q23421, J52411, D24411, K22421, L33411, S24421, R14412, P53421, N53211 AND N52211) fall under low ability categories due to below mean person, however, those hospitals still have capabilities to perform all the items.

The result from Figure 5.13 also indicates that the item mean value for inventory management performance through the operation of I-SELECT is 0.50 logit. Maximum item is at 1.79 logit and minimum item located at -0.34 logit. Items that are below the mean value (P1.7, P2.4 and P1.4) are easy as compared to item located above the mean of 0.50 logit (P3.3, P2.2, P2.1, P1.1, P1.8, P1.5, P1.3, P3.4, P1.2 and P3.5) which study classified the items as difficult. There are six public hospitals (low) with the code of A52411, C24221, D24411, K22421, N53211 and N52211 faced with difficulties in performing items for P2.3 in this category. The item are related to the issue as stated in Table 5.37 below.

Table 5.37
Category, Items Code, Items Issue and Measure Item Value of Inventory Management Performance for Low Category (Low)

Category	Items Code	Items Issue	Item Measure Value
Low Category – Low for A52411, C24221, D24411, K22421, N53211 and N52211	P2.3	To what extent are problems that happen relating to inventories being hidden	1.71

From the person-item map, about five public hospitals (very low) with the code of K53411, S52411, A33411, B23231, and D54411 faced with difficulties in performing items for P2.3, P3.3, P2.2, P2.1, P1.1, P1.8, P3.4, P1.2 and P3.5 in this category. Most of the difficult items are related to the issue as stated in Table 5.38 below.

Table 5.38
Category, Items Code, Items Issue and Measure Item Value of Inventory Management Performance for Low Category (Very Low)

Category	Items Code	Items Issue	Item Measure Value
Low Category – Very Low for K53411, S52411, A33411, B23231 and D54411)	P3.3	To what extent are scientific techniques used to make inventory related decisions	0.73
	P2.2	To what extent does the person or unit that causes an inventory problem accept the responsibility immediately	0.45
	P2.1	To what extent does the MMS swiftly figure out the problems about inventories	0.22
	P1.1	To what extent can the complete supply of drugs supplied by Main Medical Store (MMS) can be accepted by sub-store	0.18
	P1.8	To what extent does a sub-store complainthad led to an immediate action taken by MMS to solve the problem	-0.22
	P3.4	To what extent are the inventory related with other department decisions not in conflict	0.26
	P1.2	To what extent can the correct supply and quantity of indented drugs influence the credibility of MMS	0.07
	P3.5	To what extent are the MMS and sub store informed about inventory related decisions	-0.22

Public hospitals which located below the item mean value of 0.50 logit can be considered had low abilities to implement inventory management performance. Figure 5.13 Person-Item Variable Map for inventory management performance had shown that only 1 public hospital with the code of S51411 fall under the low ability category (extremely low) and faced with difficulties in performing items for P1.4. Item that are difficult related to the issue as stated in Table 5.39:

Table 5.39
Category, Items Code, Items Issue and Measure Item Value of Inventory Management Performance for Low Category (Extremely Low)

Category	Items Code	Items Issue	Item Measure Value
Low Category – Extremely Low for S51411)	P1.4	To what extent do the losses incurred had led to immediate action taken by MMS to solve the problem	-0.93

As lowest achievers, these public hospital was placed at the negative logit value and lower than the item mean of 0.50 logit. All items of inventory management performance are considered very difficult as compared to others due to its position at -0.35 and far lower than the mean item 0.50 logit. As for these hospital, only one inventory management performance items are difficult and therefore this would later affect its practices and performance except for items P3.3, P2.2, P2.1, P.1.1, P1.8, P1.5, P1.3, P1.7, P3.4, P1.2, P3.5 and P2.4 which located above than S51411 eventhough this items in low category.

As a conclusion, about 49 percent (39 hospitals) at high category have high abilities to perform the items listed in the questionnaire while 51 percent (41 hospitals) are located at low category. Only 1 percent (1 hospital) who located below than 0.00 logit from the item mean. However, in general all the 7 items that represent the dimension of inventory system provide a combination of 57% (4) difficult items and 43% (3) easy items to be implemented. This can be noticed where its item mean is -0.50 logit which is on the lower side of the continuum and indicate that the items in general are separated into two.

Research Question 3

"Which is the most influential dimension of inventory management practices comprises dimension of inventory administration, inventory control and inventory system that affect inventory management performance?"

5.5.4 Measuring the Most Influential Dimension of Inventory Management Practices Comprises Dimension of Inventory Administration, Inventory Control and Inventory System that Affect Inventory Management Performance

The above research question is designed in order to achieve the third research objective, and investigates the most influential inventory management practices dimension that affect the inventory management performance. In order to answer the stated research question, the analysis will be based on 80 respondents and 65 items that are formed under the three dimensions and one variables. The descriptive statistics of the research are shown in Table 5.40 below.

Table 5.40 below shows the average score for inventory administration, inventory control, inventory system and inventory management performance that fit to the Rasch model of 0.0 logit with standard deviation 0.74. The minimum and maximum size was between -2.00 and 1.79. The person reliability stood at 0.96 while item reliability stood at 0.93 which according to Bond & Fox (2007), an acceptable reliability index should be equal to or higher than 0.80. Separation index of 3.65 can be considered as an acceptable separation index if the item and person separation index higher than 2.0 (Bond & Fox, 2007; Fisher, 2007. The average outfit mean square is reported as 1.02 indicated that all the data is located within the range of 0.5< OMNSQ value < 1.5, which is close to 1, which indicates that the residual of items is small and the data is located close to the model. The outfit Z-std value of

0.00 indicated that all the data is located within ± 2 Zstd, which is within the 95% confidence interval between data. Data shows that the value is in the trusted level of reliability, fit to the model and can be use for analysis.

Table 5.40
Summary Statistics of Inventory Administration, Inventory Control, Inventory System and Inventory Management Performance

Mean Item	SD	Max	Min	OMNSQ	OZStd
0.00	0.74	1.79	-2.00	1.02	0.00

Person Reliability = 0.96
Item Reliability = 0.93
Item Separation = 3.65
Standard Error of Item Mean = 0.09

Based to Table 5.41 below shows the mean item *logit* according to the dimensions in public hospitals. Findings was reported that the mean item *logit* for each dimension as inventory administration (-0.09 logit), inventory control (-0.10 logit), and inventory control (-0.38 logit) taken from Figure 5.10. According to the Rasch model the probability of success of an event is equal to the difference between a person's ability and item difficulty. Rasch measurement model is expressed as the ratio of the success of an event;

$$P(\theta) = \frac{e^{(\beta_n - \delta_i)}}{1 + e^{(\beta_n - \delta_i)}}$$

Where:

e = logarithm base and Euler number; 2.7183

βn = person ability

δi = item difficult

The probability of success can be used to determine the level of implementation of inventory administration, inventory control and inventory system towards increased performance. By using the logit score for each person responded (2.77), mean item value for inventory administration, inventory control and inventory system (-0.09, -0.10 & -0.38 logit) into the probability formula, Table 5.31 tabulates the probability of success performed by each of the dimension. As shown in Table 5.31, the probability of success for inventory administration implementation in the public hospitals is 94.5% and the probability of success for inventory control implementation in the organization is 94.6%.

Meanwhile, as for inventory system implementation, the probability of success is 95.8%. The level of mean inventory system item is -0.38 logit, below the mean level of inventory control -0.10 logit and inventory administration -0.09 item logit. This indicates that it is easier to implement inventory system (P(Θ)=95.8%) in public hospitals compared to inventory control and inventory administration (Mohd Assad et al., 2015). Hence, it is noted that the mean item *logit* for inventory administration dimension -0.09 with probability of success 94.5% was observed to be the most difficult dimension to implement under inventory management practices in public hospitals. It can be interpreted that the higher the ability of an organization to perform the related items under inventory administration, the higher the probability of getting higher inventory management performance (Bond & Fox, 2007).

Table 5.41
Level of Implementation of Inventory Administration, Inventory Control & Inventory System towards Inventory Management Performance

Dimensions	**Mean Person**	**Mean Item *Logit***	**Probability of Success P(Θ)**
Inventory Administration	2.77	-0.09	94.5%
Inventory Control	2.77	-0.10	94.6%
Inventory System	2.77	-0.38	95.8%

5.5.5 Rasch Measures for Structural Equation Modelling (PLS-SEM) Analysis

Second part of this study is a Rasch Measures for Structural Equation Modelling (PLS-SEM) Analysis for path coefficient, hypothesis testing of the direct relationship and testing the moderating effect. Due to the limitation in Rasch measurement, Bond & Fox (2015) proposed the solution to overcome the constraint. The solution involved the process of taking the interval-level person Rasch measures and their standard errors for each latent variable that derive from previously Rasch analysed data on each of those data collection instruments to be imputed into the PLS-SEM software for further analysis. Its further explain in the study done by Boon et al. (2012) where the limitation were solved when the Rasch computed measures for each construct were used to investigate the path coefficient and hypothesis testing of the direct relationship between those variable measures. Therefore, this study took the proposed idea by Bond & Fox (2015) and Boon et al. (2012) as a guideline for analysis and researcher realized it is relevant in analysing the relationship. Furthermore, this second part of result from SEM-PLS is important to support the result of this study as stated in Table 5.42.

Table 5.42

Research Objectives, Research Hypothesis and PLS-SEM Data Analysis

No.	Research Objectives	Research Hypothesis/testable statement	Data Analysis
4.	To examine the relationship between inventory management practices and inventory management performance in Malaysian public hospitals	H1a There is a relationship between inventory management practices and inventory management performance for Special Hospitals in Malaysia. H1b There is a relationship between inventory management practices and inventory management performance for Non-Special Hospitals in Malaysia.	Structural Model of PLS-SEM - *SmartPLS 3.0*
5.	To test the moderating role of total quality management practice in enhancing the relationship between inventory management practices and inventory management performance among public hospitals in Malaysia	H2a Total Quality Management moderates the relationship between Inventory Management Practices and Inventory Management Performance for Special Hospitals in Malaysia. H2b Total Quality Management moderates the relationship between Inventory Management Practices and Inventory Management Performance for Non-Special Hospitals in Malaysia	Structural Model of PLS-SEM - *SmartPLS 3.0*

5.5.6 Assessment of Structural Model

Once the analysis on goodness of fit was done and achieved as fit in Rasch Measurement Model, the next step of Rasch analysis was proceeded in order to answer research question one, two and three. The procedure comprises of taking the interval-level person Rasch measures and their standard errors for each latent variable that derive from previously Rasch analysed data on each of those data to be imputed into the PLS-SEM software for further analysis. Then the second part of this study took place which was followed by the assessment of the structural model. Before an analysis was done to test the hypotheses that were previously generated for this study and determine their significance level, the bootstrapping procedure with re-sampling techniques needed to be performed (Hair, Hult, et al., 2014). Based on the suggestions by Hair, Hult, et al. (2014) and Ringle, Sarstedt, and Zimmermann (2011), a 500 re-sampling was used to estimate the standard errors and the significance of parameter estimates in this study.

Becker *et al.* (2012) and Hair *et al.* (2014a) suggesting to examine the relationship of the constructs directly with the dependent variable, instead of assessing the dependent variable with the highly-order components directly. Following the recommendations, this study has examined the relationships between inventory management practices towards inventory management performance and the moderating effect of total quality management between the predictors and the criterion variable to fulfil the objective of the study mentioned detail in the Chapter One and Chapter Two. Moderation studies using PLS-SEM consist of several alternative approaches, and, for the purpose of this study, the researcher choose the bootstrapping approach. PLS-SEM relies heavily on a non-parametric bootstrapping procedure to test coefficients for the significant result of outer weights, loadings and path coefficients (Hair et al., 2014b).

The assessment steps involved as suggested by Hair et al., (2014) & Sarstedt et al, (2014) were (a) assessment of collinearity, (b) assessment of coefficient of determination R^2, (c) assessment of structural model path coefficient, (d) assessment of predictive relevance, and (e) assessment of effect size.

a) Assessment of Collinearity

Once the construct measures have been confirmed as reliable and valid, the next step is to assess the structural model for collinearity using collinearity diagnostics in linear regression based on tolerance value and Variance Inflation Factor (VIF). VIF values in SmartPLS 3.2.4 are used in order to assess and measure the collinearity. Therefore, analysis need to examine each set of predictor constructs separately for each subpart of the structural model and need to check whether there are significant levels of collinearity between each set of predictor variables (constructs). Analysis consider VIF above 5 (VIF > 5) in the predictor constructs as indicative of collinearity that is too high. If collinearity is exceeds these thresholds, study should consider eliminating constructs, merging predictors into a single construct, or creating higher-order constructs to deal with collinearity problems.

As mentioned by Hair et al., (2014), a potential collinearity problem occurs when the tolerance value of 0.20 or below and a VIF value of 5 and higher. For this model, there is one variable which is inventory performance as dependent variables because there are paths pointing towards it. As for that, analysis of linear regression was run in order to obtain the VIF values for the variables as proposed by Wong (2016). Table 5.43 presents the VIF values for the dependent variables, inventory management performance. The values for VIF reported less than 5 indicates that there is no collinearity issues of predictor variables.

Table 5.43
Collinearity Assessment

Types of Hospital	Variables	VIF	Collinearity Problem? (VIF>5?)
Special hospitals	Inventory Practices	4.218	No
	Dependent Variable: Inventory Performance		
Non-Special hospitals	Inventory Practices	3.462	No
	Dependent Variable: Inventory Performance		

b) Assessment of Coefficient of Determination (R^2)

The second criterion assessed in the assessment of the inner model was to investigate for the predictive accuracy (R^2) and is calculated as the squared correlation between a specific endogenous contruct's actualand predicted values. The coefficient represents the exogenous latent variables combined effects on the endogenous latent variables. This model is a reflective model where only one variable, inventory practices that consists of three dimensions namely, inventory administration, inventory control and inventory system. The R^2 value was assessed for every endogenous variable in the framework. Hair et al., (2014) provides guideline for the value of R^2 of 0.25, 0.5 and 0.7 are often interpreted as weak, moderate and strong coefficient of determination. In this model, inventory practices explained by inventory administration, inventory control and inventory system are able to explain 75.7% and 88.6% the variance of inventory performance for special and non-special hospitals as shown in Figure 5.14 and Figure 5.15.

Figure 5.14 and Figure 5.15 PLS Path Model Estimation Diagram for special hospitals and non-special hospitals also shows that the higher order construct (HOC), inventory practices has strong relationship with its lower order construct (LOC), inventory administration (0.937, 0.956), inventory control (0.940, 0.954) and inventory system (0.865, 0.854). This result clearly indicates that the LOC (inventory administration, inventory control and inventory system) are highly correlated with HOC, inventory practices and each LOC able to explain more than 50% of its variance. Table 5.44 summarized the R^2 Values of Endogenous Latent Variables for Special and Non-Special Hospitals.

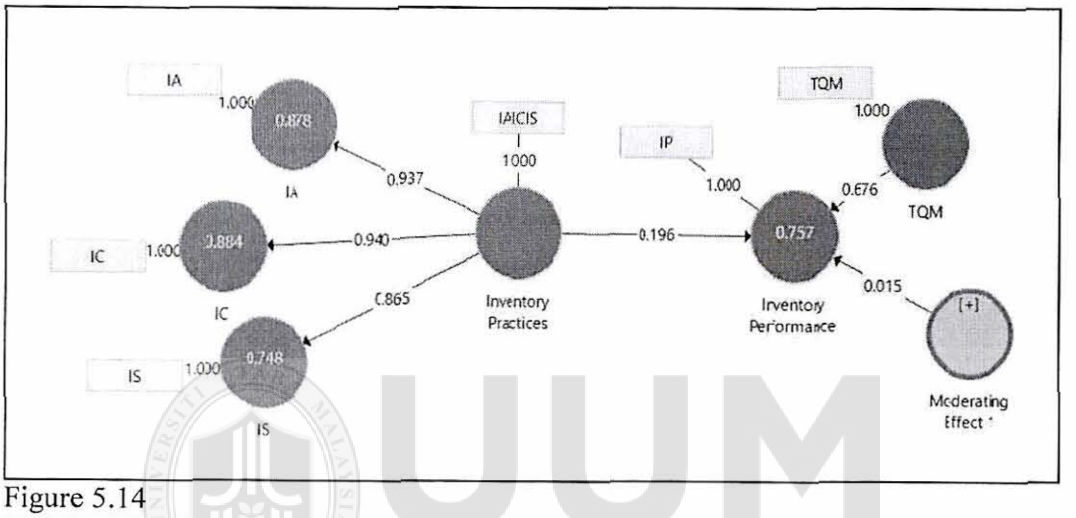

Figure 5.14
PLS Path Model Estimation Diagram for Special Hospitals

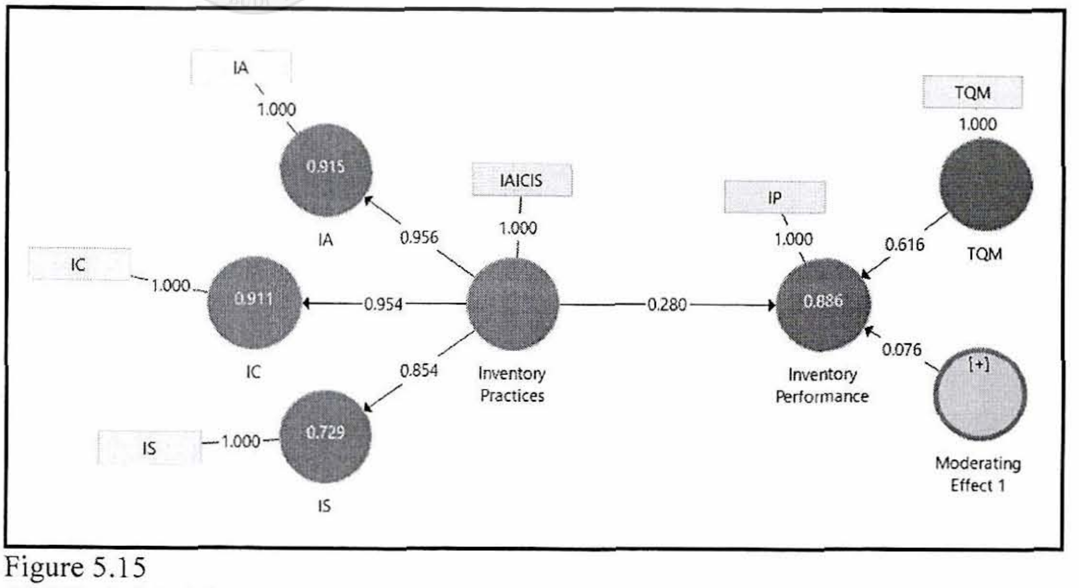

Figure 5.15
PLS Path Model Estimation Diagram for Non-Special Hospitals

Table 5.44
R^2 Values of Endogenous Latent Variables for Special and Non-Special Hospitals

Types of Hospital	**Variable**	**R^2**	**Standard Error**	**T-Value**	**P Values**	**Variance Explained**
Special hospitals	IA	0.878	0.033	26.254	0.000	Strong
	IC	0.884	0.027	32.428	0.000	Strong
	IS	0.748	0.068	10.948	0.000	Strong
	Inventory Performance	0.757	0.062	12.162	0.000	Strong
Non-Special hopsitals	IA	0.915	0.023	39.881	0.000	Strong
	IC	0.911	0.029	31.249	0.000	Strong
	IS	0.729	0.098	7.456	0.000	Strong
	Inventory Performance	0.886	0.043	20.834	0.000	Strong

As shown in the table 5.44, the R^2 squared value of the endogenous latent variable (inventory performance) for special hospitals and non-special hospitals are 75.7% and 88.6% that falls in the range of strong, as per the above mentioned category.

c) Assessment of Structural Model Path Coefficient

Becker *et al.* (2012) and Hair *et al.* (2014a) suggesting to examine the relationship of the constructs directly with the dependent variable, instead of assessing the dependent variable with the highly-order components directly. Following the recommendations, this study has split into two section: (i) to examine the relationships between inventory management practices and inventory management performance and (ii) to examine the moderating effect of total quality management relationships between the predictors and the criterion variable in order to fulfil the objective of the study in the earlier mentioned in detail in the chapter one and chapter two. The path coefficient and hypothesis testing of the direct relationship and testing the moderating effect was divided into two: (i) special hospitals and non-special hospitals.

Research Question 4

"What is the relationship between inventory management practices and inventory management performance in Malaysian public hospitals?"

5.5.7 Path Coefficient and Hypothesis Testing of the Direct Relationship

PLS bootstrapping with a resample of 500 (Chin, 2010) was run in order to get the t-value in assessing the direct relationship, significant or not significant. The bootstrapping sample is considered adequate, going by Henseler (2012) and Wilson (2011) study. The path coefficients and hypothesis testing for special hospitals and non-special hospitals were produced as shown in Figure 5.16 while Table 5.45 shows the result of path coefficient and hypotheses testing for direct relationship. This subsection will answer the above research questions:

a) Path Coefficient and Hypothesis Testing of the Direct Relationship for Special Hospitals

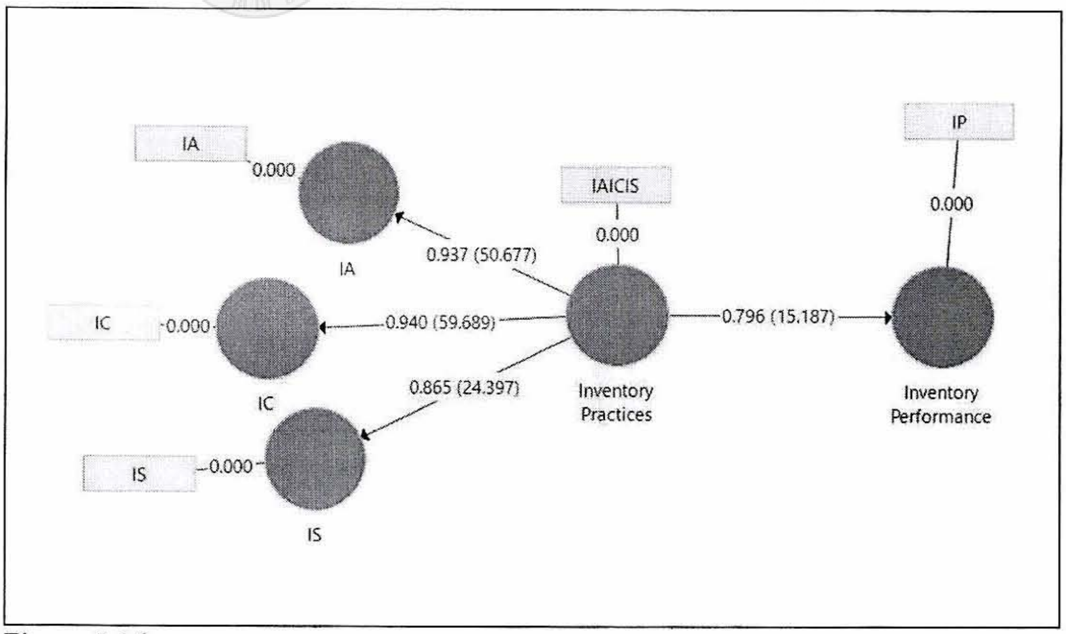

Figure 5.16
Direct Path Coefficient of the Structural Model (Bootstrapping) with t- values for Special Hospitals

The path coefficient in the relationship between inventory management practices and inventory management performance was examined. Further examination showed that inventory management practices ($\beta = 0.796$, $t = 15.187$, $p < 0.05$) was found positive and significantly related on inventory management performance. Here, it was explained that inventory management practiced by the Malaysian special hospitals give a significant influence on the inventory management performance regards to drugs management in the Main Medical Store. Thus, *H1a* was statistically gave a significant influence by the results of this study. Table 5.45 summarizes the hypothesis testing for direct relationship.

Table 5.45
Result of Path Coefficient and Hypotheses Testing for Direct Relationship (Special Hospitals)

	Relationship	**Path Coefficient**	**Standard Error**	**T-Value**	**P-Values**	**Decision**
H1a	Practices -> Performance	0.796	0.052	15.187*	0.000**	Supported

Note: p <0.05**; t > 1.96*

T-value 15.187 was higher than the cut off value of 1.96, indicating that the result statistically significant. Thus, this study accepted the null hypothesis. The result indicated there is a credible evidence of direct relationship between inventory management practices and inventory management performance ($\beta = 0.796$, $t = 15.187$, $p < 0.05$). Hence, hypothesis *H1a* is supported.

b) Path Coefficient and Hypothesis Testing of the Direct Relationship for Non-Special Hospitals

Bootstrapping with a resample of 500 was run in order to get the t-value in assessing the direct relationship, significant or not significant. The path coefficients and hypothesis testing for non-special hospitals were produced as shown in Figure 5.17 while Table 5.46 show the result of path coefficient and hypotheses testing for direct relationship.

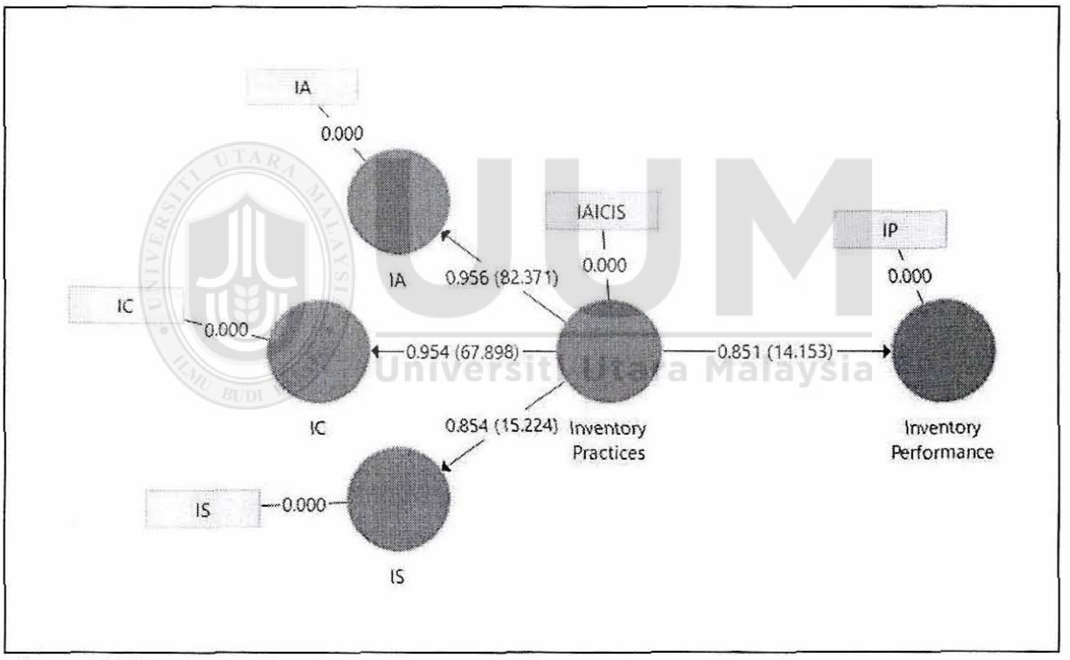

Figure 5.17
Direct Path Coefficient of the Structural Model (Bootstrapping) for Non-Special Hospitals with t-values

The path coefficient in the relationship between inventory management practices and inventory management performance was examined. Further examination showed that inventory management practices ($\beta = 0.851$, $t = 14.153$, $p < 0.05$) was found to have a positive and significant effect on inventory management performance. Here, it was explained that inventory management practiced by the Malaysian non- special hospitals have a significant influence on the inventory management performance regards to drugs management in the Main Medical Store. Thus, *H1b* was statistically significant by the results of this study. Table 5.47 summarizes the hypothesis testing for direct relationship.

Table 5.47
Result of Path Coefficient and Hypotheses Testing for Direct Relationship (Non Special Hospitals)

	Relationship	Path Coefficient	Standard Error	T-Value	P-Values	Decision
H1b	Practices -> Performance	0.851	0.060	14.153*	0.000**	Supported

Note: ** p <0.05; * t > 1.96

T-value 14.153 was higher than the cut off value of 1.96, indicating that the result statistically significant. Thus, this study accepted the null hypothesis. The result indicated that there is a credible evidence of direct relationship between inventory management practices and inventory management performance (β = 0.851, t = 314.153, p < 0.05). Hence, hypothesis *H1b* is supported.

Research Question 5

"Do total quality management practice moderate the relationship between inventory management practices and inventory management performance among public hospitals in Malaysia?"

5.5.8 Testing the Moderating Effect

In examining the interaction effects of moderators using PLS-SEM, this study applied the product indicator approach as suggested by Hair, Hult, et al. (2014) in detecting the moderating effect of total quality management. The significant impact of total quality management to strengthen the relationship between inventory management practices and inventory management performance for special hospital and non-special hospital was assessed by using a bootstrapping re-sampling with 500 re-samples. The moderating effect testing for special hospitals and non special hospitals were produced as shown in Figure 5.18 while Table 5.48 shows the result of path moderating effect testing for direct relationship. This subsection will answer the above research questions:

a) Testing the Moderating Effect for Special Hospital

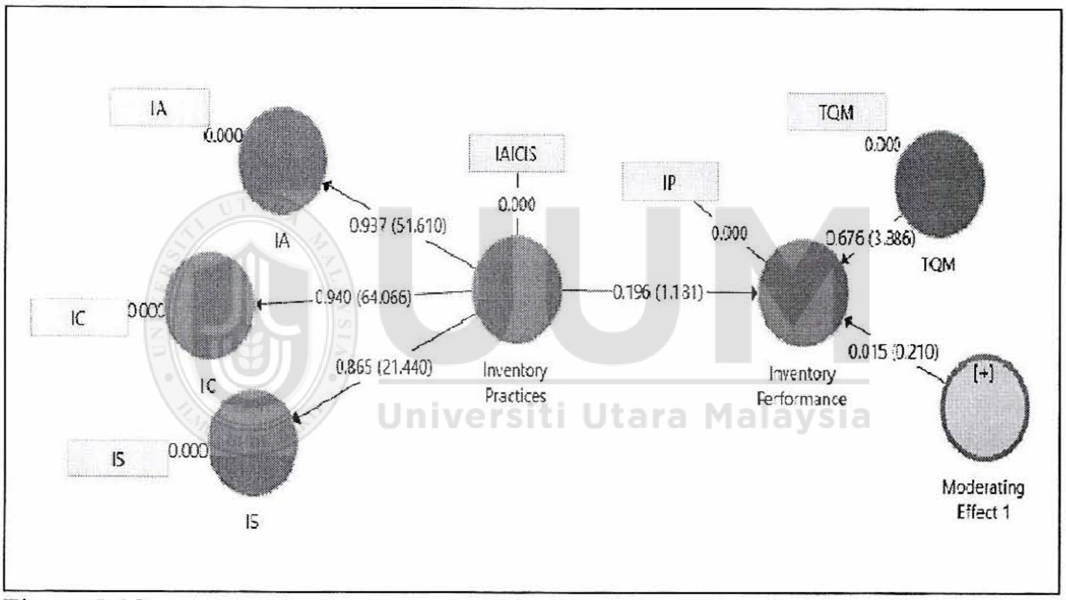

Figure 5.18
Moderating Effects Model of the Structural Model (Bootstrapping) with t-values for Special Hospitals

Bootstrapping with a resample of 500 was run in order to get the t-value in assessing the moderation effect. Based on the results in Figure 5.18, it demonstrated that the moderating impact by total quality management on the relationship between the inventory management practices and inventory management performance ($\beta = 0.015$, $t = 0.210$, $p<0.05$) was statiscally insignificant. Table 5.48 summarizes the hypothesis testing result for moderating effects.

Table 5.48
Result of Path Coefficient and Hypotheses Testing for Moderators (Special Hospital)

	Relationship	Path Coefficient	Standard Error	T-Value	P-Values	Decision
H2a	Practices*TQM->Performance	0.015	0.071	0.210	0.417	Not Supported

Note: p <0.05**; t > 1.96*

When the influence of an exogenous variable on an endogenous variable is contingent upon the values of another variable, there is said to exist moderating effect where in such variable moderates the relationship between the exogenous and endogenous variables (Hair *et al.*, 2013). In this study, total quality management was hypothesized *H2a* to moderate the relationship between inventory management practices and inventory management performance. However, the result indicated that T-value 0.210 was lower than the cut off value of 1.96, indicating that the result was not statistically significant. Thus, this study failed to reject the null hypothesis.

The result indicated no moderating effect credible evidence of total quality management on the relationship between inventory management practices and inventory management performance (β = 0.015, t = 0.210, p<0.05). Here, it was explained that the total quality management implemented by special hospitals in Malaysia did not give a significant influence on the relationship between inventory management practices and inventory management performance. Hence, hypothesis *H2a* was rejected and no conclusion can be drawn (Lane, 2011; Rainey, 2012).

b) Testing the Moderating Effect for Non-Special Hospital

In examining the interaction effects of moderators using PLS-SEM, this study applied the product indicator approach as suggested by Hair, Hult, et al. (2014) in detecting the moderating effect of total quality management. The significant impact of total quality management to strengthen the relationship between inventory management practices and inventory management performance for non-special hospital was assessed by using a bootstrapping re-sampling with 500 re-samples. The moderating effect testing for non-special hospitals were produced as shown in Figure 5.19 while Table 5.49 show the result of path moderating effect testing for direct relationship.

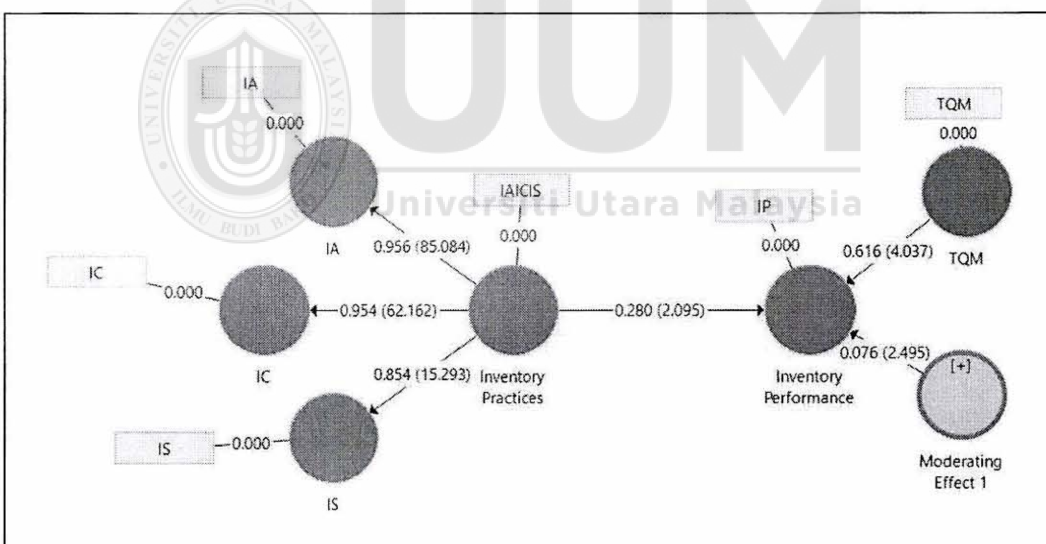

Figure 5.19
Moderating Effects Model of the Structural Model (Bootstrapping) with t-values

Based on the results in Figure 5.20, it was found to have a positive and significant moderating impact by total quality management on the relationship between the inventory management practices and inventory management performance ($\beta = 0.076$, t = 2.495, p<0.05). Thus, *H2a* was statistically significant by the results of this study. Table 5.49 summarizes the hypothesis testing result for moderating effects.

Table 5.49
Result of Path Coefficient and Hypotheses Testing for Moderators (Non-Special Hospital)

	Relationship	Path Coefficient	Standard Error	T-Value	P-Values	Decision
H2b	Practices*TQM->Performance	0.076	0.031	2.495*	0.006**	Supported

Note: p <0.05**; t > 1.96*

When the influence of an exogenous variable on an endogenous variable is contingent upon the values of another variable, there is said to exist moderating effect where in such variable moderates the relationship between the exogenous and endogenous variables (Hair *et al.*, 2013). In this study, total quality management was hypothesized *H2b* to moderate the relationship between inventory management practices and inventory management performance. The result indicated that T-value 2.495 was higher than the cut off value of 1.96, indicating that the result was statistically significant. Thus, this study accepted the null hypothesis.

The result indicated there is moderating effect credible evidence of total quality management on the relationship between inventory management practices and inventory management performance (β = 0.076, t = 2.495, p<0.05). Here, it was explained that the total quality management implemented by non-special hospitals in Malaysia give a significant influence on the relationship between inventory management practices and inventory management performance. Hence, Hypothesis *H2b* was supported.

5.5.9 Assessment of Predictive Relevance of the Model

The next analysis done was the assessment of Stone-Geisser's the predictive relevance (Q^2), which was performed by running the blindfolding procedure for a certain omission distance *D* as guided by Hair et al., 2014. This assessment is important because it is able to confirm if the data points of indicators of endogenous construct in the reflective measurement can be predicted accurately. The author use the blindfolding procedure. The blindfolding procedure is only applied to the endogenous variables with reflective measurement and also to a single-item endogenous variable. Based on Hair et al. (2014) suggestion, a Q^2 value that is greater than 0 indicates the presence of the model's predictive relevance whereas $Q^2 \leq 0$ indicates the lack of predictive relevance. The authors further suggested that the Q^2 values of 0.02, 0.15 and 0.35 reflect small, medium and large predictive relevance of certain endogenous variables on an endogenous variable.

At this stage, model has good predictive relevance for all of the endogenous variables. In order for the model to have a predictive relevance, the Q^2 value must be more than 0 (Chin, 1998, 2010), where the highest value of inventory performance is 0.663 for non-special hospitals and the lowest value is 0.539 for special hospitals. Both predictive relevance of inventory performance were large (Q^2 = 0.663, Q^2 = 0.539). Summary of the result for Coefficient of Determination (R^2) and Predictive Relevance (Q^2) is presented in the Table 5.50.

Table 5.50
Predictive Relevance (Q^2)

Types of Hospital	**Variable**	R^2	Q^2	**Predictive Relevance**
Special Hospitals	Inventory Performance	0.757	0.539	Large
Non Special Hospitals	Inventory Performance	0.886	0.663	Large

Following Hair et al. (2013) who suggested that if Q^2 larger than 0, the model has predictive relevance whilst if Q^2 below than 0, the model has absence of predictive relevance. As shown in the Table 5.50 column 4, Q^2 showed an acceptably large predictive relevance (0.663, 0.539) for the criterion variable (inventory management performance), indicating that both model of special hospitals and non-special hospitals of this study have a predictive relevance.

5.5.10 Assessment of Effect Size

The effect sizes for both direct and indirect relationships were next to be assessed. In this section, the effect sizes of independent variable which refer to inventory management practices was examined. Next, the effects of moderating factor, total quality management on inventory management performance was estimated. According to Sullivan and Feinn (2012), effect size is the core in a quantitative study and should be reported in the abstract and findings sections of a research report. The effect size is very important in order to determine if the relationship between the variables is significant because of the large sample size and to understand the magnitude of the differences found (Sullivan & Feinn, 2012). In assessing f^2, we employed Cohen (1988) rule of thumb assessment of effect sizes. According to the author, the f^2 values of 0.02, 0.15 and 0.35 represent small, medium and large effects respectively.

i) Assessment of Direct Effect Size (f^2)

By referring to Table 5.51, it is shown that both exogenous variables towards endogenous variable for special hospitals and non-special hospitals had a substantial impact on the endogenous variable. Both relationships for special hospitals showed a small effect sizes but inventory management practices and moderating effect relationship were insignificant in the structural model (Figure 5.18). Meanwhile, for non-special hospitals, both relationships showed medium and large effect size respectively. Result showed that inventory management practices and moderating effect relationship for non-special hospitals were significant in the structural model (Figure 5.19).

Table 5.51
The Direct Effect Size (f^2)

Types of Hospital	Exogenous Variable	Endogenous Variable	f^2	Effect size
Special hospitals	Inventory Management Practices	Inventory Performance	0.038	Small
	Moderating effect	Inventory Performance	0.004	Small
Non-Special hospitals	Inventory Management Practices	Inventory Performance	0.198	Medium
	Moderating effect	Inventory Performance	0.474	Large

ii) Assessment of Moderating Effect Size (f^2)

Further computation was also carried out to evaluate the effect size (f^2) of the moderator model against the main effect model (Cohen, 1988; Henseler & Fassott, 2010). The procedure is to compare the coefficient of determination (R^2) of the main effect model (without interacting term) and the moderating effect model (all variable plus interacting terms). Therefore, similar to the exogenous variables' effect size described above for the main effect model, the same formula and evaluating criteria was followed to assess the effect size of the moderating effect. Effect size for R^2, f2 refer to the observation of changes in R^2 value after an exogenous variable omitted from the model (Hair et al., 2014). This value will be translated as small (0.02), medium (0.15) and large (0.35) (Hair et al., 2014). The value of f2 has been calculated based on the following equation,

$$f2 = (R^2\text{include} - R^2\text{exclude})/1 - R^2\text{include})$$

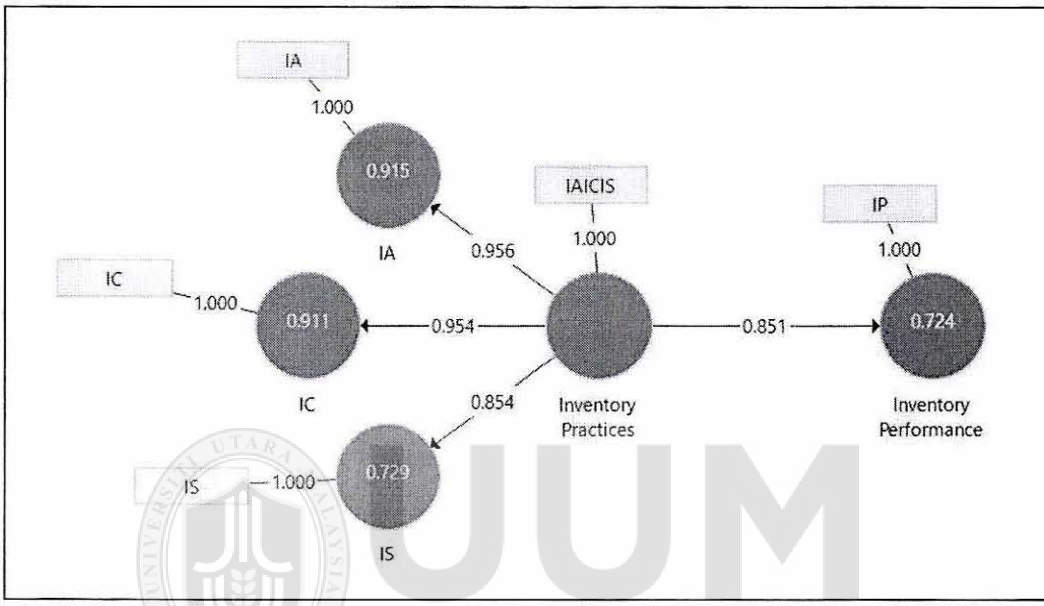

Figure 5.20
Structural Model (Bootstrapping) with R^2-values for non-special hospitals excluding interaction effect

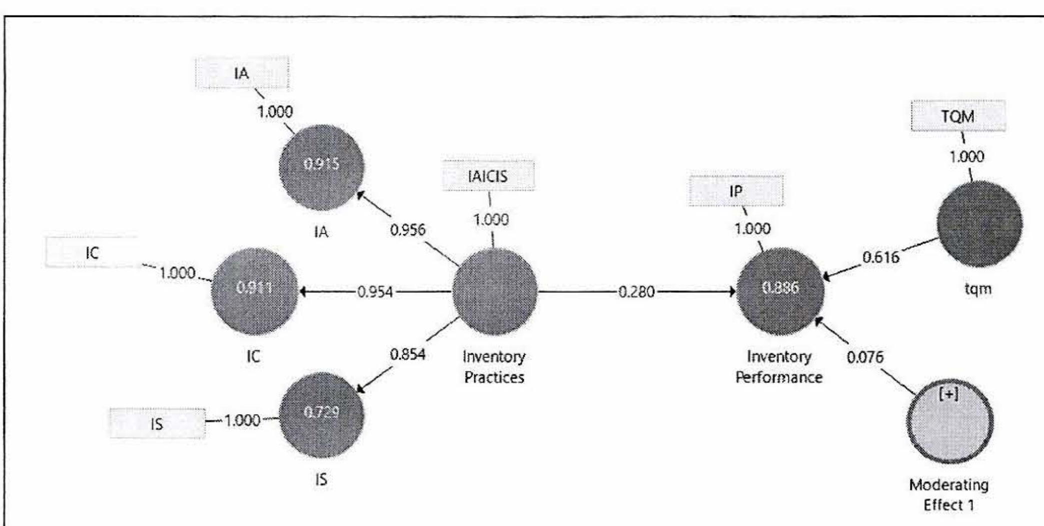

Figure 5.21
Structural Model (Bootstrapping) with R^2-values for non-special hospitals including interaction effect

The R^2 value in the main effect model is 0.724 (Figure 5.20). However, when the interacting terms were created and calculated the standard PLS-SEM algorithm, the R^2 value increased to 0.886 (Figure 5.21). Therefore the R^2 included and the R^2 excluded were substituted in the f^2 formula. The result in Table 5.52 reveals that the moderating effect model has large effect size (1.42), based on Cohen (1988).

Table 5.52
Strenght of Moderating Effect

Category	**Endogenous Variable**	**Exogenous Variable**	**R^2include**	**R^2exclude**	**f^2**	**Decision**
Non-special hospitals	Inventory management performance	Inventory management practices	0.886	0.724	1.42	Large

As following the guidelines by Cohen (1988) and Henseler and Fassott (2009), the results showed the strength of the moderating was large.

iii) The Moderator Plots

According to Baron&Kenny (1986), moderator is referring to the "variable that affects the direction and/or strength of the relation between an independent or predictor variable and a dependent or criterion variable". However, Henseler and Fassott (2010) argued that "the idea of a moderating effect is that the slope of the independent variable is no longer constant, but depends linearly on the level of the moderator". Interestingly, Hayes (2013) argued that visual presentation of moderating effect can be an excellent way of interpreting an interaction.

Therefore in order to produce such visual, Hayes (2013) recommended the use of any available graphic program. Example of such programs are by Lowry and Gaskin (2014)'s template and Dawson (2014) where an interaction plot can be drawn for visualizing moderation effect, thus it was adapted. Therefore graphical illustrations for significant moderating paths were plotted as depicted in Figures 5.22. In smart PLS, there has been an advanced to this effect and there are several templates and software that are available to make this process much simpler. One of them is by Professor Jeremy Dawson which can be downloaded from this URL:www.jeremydawson.co.uk/slopes.htm. The Microsoft Excel template uses path coefficient values of the independent, predictor and the moderating variable, as well as the interacting term, to calculate and deliver the graphical slopes.

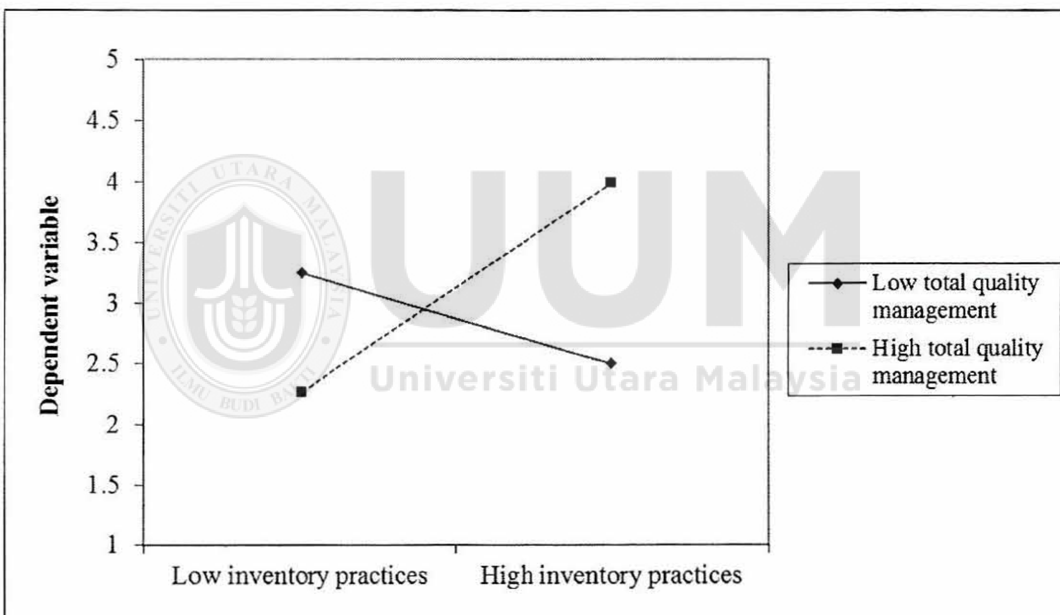

Figure 5.22

Moderating Effect of Total Quality Management on the Relationship between Inventory Management Practices and Inventory Management Performance

H2b Total Quality Management Moderates the Relationship between Inventory Management Practices and Inventory Management Performance for Non-Special Hospitals in Malaysia

The interpretation of the interaction plots are to look at the gradient of the slopes. As can be seen in Figure 5.22, the line labelled high total quality management has a steeper gradiant compared to low total quality management indicating that the positive relationship is stronger when the total quality management is high. Total quality management has evidently strengthened the positive relationship between inventory management practices and inventory management performance. Thus, the above H2b research hypothesis is supported as that was hypothesized before the analysis in Chapter 2.

5.5.11 Result of Hypotheses Testing

The current study aimed to investigate the relationship of inventory management practices towards inventory management performance. Study also aimed to test the moderating role of total quality management in strengthening the relationship between both variables. In total, four main hypotheses were tested. Result reported that out of 4 hypotheses, two posed a direct relationship and two assessed for the moderating impacts on the relationship between predictors and the criterion variables. Table 5.53 summarized all the hypothesis that were accepted possessing a t-value which greater than or equal to 1.96, except for *H2a*.

Table 5.53
Result of Hypotheses Testing

H	Relationship	T-value	Decision
H1a	Inventory Management Practices -> Inventory Management Performance for Special Hospitals	15.187	Supported
H1b	Inventory Management Practices -> Inventory Management Performance for Non-special Hospitals	14.153	Supported
H2a	Moderating Effect 1 -> Inventory Management Performance for Special Hospitals	0.210	Not Supported

Table 5.53 (Continued)

H2b	Moderating Effect 1 -> Inventory Management Performance for Non-special Hospitals	2.495	Supported

**p<0.05, results are significant with 1 tail as below:
T-values > 1.96 (p-values < 0.05)

5.6 Chapter Summary

This chapter reported the results of the study. SPSS was used to describe the respondent's profile. However, Rasch Measurement Model from the Winsteps software was employed to test the analysis on goodness of fit and to answer the first three objective; unidimensionality issue, ability dan difficulty among public hospitals in Malaysian in implementing inventory management practices towards inventory management performance and determination of the most influential dimension. The result is discussed based on Item Respond Theory where the ability of respondents are identified against the item difficulties. The technique of bootstrapping in PLS-SEM analysis was used to test the research hypothesis on the relationship between inventory management practices and inventory management performance and the moderating effect of total quality management between both variables. The final stage discusses the findings on Rasch Analysis and Rasch Measures for Structural Equation Modelling (PLS-SEM) Analysis accompanied by conclusion and recommendations for future studies. Some concluding remarks end the thesis.

CHAPTER SIX

DISCUSSION, CONCLUSION AND RECOMMENDATION

6.1 Introduction

This chapter discusses the findings of the research in detail. It started with recapitulation and summary of the study. The discussion of findings is then followed with theoretical, managerial and methodological implications of the study. This chapter also describes the insights of contributions, implications and limitations obtained from the study and in turn suggesting a number of directions for future studies in this inventory management area. Finally, a conclusion that recapitulates the entire research is presented to mark the final stage of this chapter and to end up with the chapter summary.

6.2 Recapitulation and Summary of the Study

This study is designed to examine inventory management practices and inventory management performance among public hospitals in Malaysia. Studies have been conducted from various perspectives in the field of inventory management practices, which comprises of inventory administration, inventory control and inventory system to denote its definitions, theoretical views, implementation, significance and impacts, contributing factors and its relationship to inventory management performance. Most of the studies would incorporate a few of these elements. However, a comprehensive study relative to the context of Malaysia is still limited and previous researches that examined the relationship between the variables showed fragmented and inconclusive results. These issues have been highlighted and discussed earlier in Chapter 1.

An intensive literature review was conducted on inventory practices, inventory administration, inventory control and inventory system on general concerns. Past and recent perspectives of inventory management performance from the perspective of operational performance, problem-solving performance and decision-making performance were discussed focusing on the introduction, its definitions, evolution, level of practising, and the significant contribution of the dimensions (inventory administration, inventory control and inventory system) in achieving the performance among industries, public sectors and public healthcare concerns in Malaysia. Drawing from the intensive literature review, the researcher derived problem statements, research objectives, research questions, and conceptual framework. The notion of this study was deliberated using the System Theory, Stakeholder Theory and Item Response Theory as the selected underpinning theories for this research. In Chapter 2, these issues have been highlighted and discussed.

The theoretical discussion was further elaborated in Chapter 3 with a conceptual framework comprising of the dependent variable, which is inventory management performance; independent variables, which is inventory management practices comprising of inventory administration, inventory control and inventory system; and the moderator, which is total quality management. It was concluded that two direct relationships and two moderating effect should be established between the independent variables (inventory management practices) and dependent variable (inventory management performance), with total quality management as the moderating variable which involved special hospitals and non-special hospitals.

Following this chapter is Chapter 4, which is the outline for research methodology. In describing the study's research methodology, The Rasch Model and Partial Least

Squared (PLS) Method, a covariance-based Structural Equation Modelling (SEM) was used to analyze the data collected from the survey through online questionnaires.The instrument development was guided and advised by several experts as well as academicians, which also taking into consideration the Modern Test Theory or Item Response Theory, specifically the Polytomous Rasch Model (PRM). This study is stratified and the sample random sampling-based. In order to achieve these objectives, the current study employed a quantitative approach, in order to get the results by using a sample comprising 80 Heads of Pharmacists at the Pharmacy Stores in Malaysian public hospitals. The Rasch approach for data collection and analysis were executed through the computer software Winsteps 3.69. This process is elaborated in Chapter 5.

The research objectives of the study were discussed in detail in the following sub-chapter of 6.3 based on the hypotheses, with the theoretical support and justification from previous research. Factors influencing the evidences are being discussed, and with suggestions being made. Non-significant and contradictory findings are commented with the possible reasons given.

6.3 Discussion of Research Objectives

The major objective of this study is to investigate the unidimensionality of inventory management practices which comprised of dimension of inventory administration, inventory control and inventory system; to investigate the ability of the public hospitals in implementing the items of inventory management practices which comprised dimension of inventory administration, inventory control and inventory system and determination of the most influential dimension of inventory management practices towards inventory management performance. In addition, the study is done to examine the relationship of inventory management practices on inventory management performance. Another main objective is to test the moderating effect of total quality management on the influence of inventory management practices towards inventory management performance. As a result, five research objectives were formulated. The objectives were transmuted into research questions. Then, these research questions were transformed into hypotheses and later being tested. The subsequent discussions assess the research objectives and emphasize the outcome concluded.

The results of this study will be discussed based on research objectives and hypotheses formulated in the earlier chapter. The author has prepared discussions for this study based on research objectives. The first, second and third research objective wereas addressed by first part, which is Part A of this study that includes the discussion of unidimensionality, ability of inventory management practices and implementation and determination of the most influential dimension of inventory management practices towards inventory management performance. The fourth and fifth research objective were addressed by second part, which is Part B of this study, that includes on direct relationship and moderation effect that involved several hypotheses (H1a, H1b, H2a and H2b). The following sections present the discussions about the results gained from this study. This research was designed to respond to the following research objectives:

6.3.1 Discussion on Unidimensionality of Inventory Management Practices Comprising the Dimension of Inventory Administration, Inventory Control and Inventory System

Research Objective 1

"To investigate inventory management practices comprises dimension of inventory administration, inventory control and inventory system are moving towards unidimensionality"

The first objective of this study is to investigate the inventory management practices comprising the dimension of inventory administration, inventory control and inventory system are moving towards unidimensionality. Unidimensionality is crucial for establishing the measurement is assessing the specific goal. Because of that, in order to fulfill and satisfy unidimensionality, the items in the research instrument must measure the same composite of abilities.

In this study, inventory administration, inventory control and inventory system are the latent variable that is being measured under inventory management practices. Each item in the research instrument should be a meaningful measure of the unidimensional construct (Bond & Fox, 2007). A Principal Component Analysis will be employed to ensure that the latent variable is sufficiently unidimensional. If the assumption of unidimensionality is not met, then Rasch analysis should not be employed (Mueller, 2006). Using Rasch analysis, researchers are able to develop ordered continuums in which latent variables can be measured by means of a unidimensional construct (Bond & Fox, 2007). Unidimensionality is perhaps the most important underlying assumption of the Rasch Model, as unidimensionality signifies that only one attribute or latent trait will be measured at a time (Bond & Fox, 2007; Mueller, 2006).

Rasch analysis applied the Principal Component Analysis (PCA) of the residuals for researchers to comprehend on how much variance that the instrument would hypothetically measure. A Rasch analysis also requires at least a minimum of 40% raw variance explained by measures. As proposed by Fisher (2007) and Linacre (2007), they also suggests that is better to exceed 60%. Fisher (2007) also suggests that the variance value unexplained by 1st contrast (size) <3% is excellent, 3-5% is very good, 5-10% is good, 10-15% is moderate, and 15% is poor.

As shown in Table 5.28, the raw variance as explained by measure for individual dimension and represented by inventory administration, inventory control and inventory system was 52 percent, 42.8 percent and 36.8 percent respectively, closely matching the modelled value 52.1 percent, 43.6 percent and 38.7 percent. Based on the guidelines for variance as explained by the measure from Conrad et al. (2009), the dimension of inventory administration and inventory control is considered strong but moderate for inventory control.

Meanwhile, the unexplained variance in 1st contrast calculated for inventory administration and inventory control are 11.0 percent and 10.2 percent, which is acceptable and has a fair indicator because it was in the range of 10 percent to 15 percent (Fisher, 2007). As for inventory control, the unexplained variance in 1st contrast calculated was 26.5 percent, which is acceptable and has a poor indicator because it was more than 15 percent (Fisher, 2007).

Another evidence of unidimensionality was to compare the observed variance and modeled variance. If the observed variance and modeled variance were almost close or matched, then the data met the assumption of the unidimensionality and the Rasch model (Hall et al., 2012). Furthermore, the analysis of measurement dimension for inventory practices which comprises of the dimension of inventory administration, inventory control and inventory system, as it appears from Table 5.28 indicates that 46.8 percent respectively, closely matching to the modelled value 48.1 percent. It can be considered that inventory practices have a strong measurement dimension. Interestingly, the unexplained variance in 1st contrast calculated for inventory practices at 8.1% which provides evidence that it has turned out to be a good indicator with above the satisfactory guides (Monsurat Olusola Mosaku, Mohamed Najib Abdul Ghafar & Khan, 2014), and the results for the Rasch model dimensionality supported the existence of a common factor, which indicated the unidimensionality of the scale.

Linacre (2009) indicated that most of the items (i.e., or all items in a perfect sense which is unlikely to happen in reality) are supposed to share a common latent trait, and thus, the scale should be unidimensional to form the test construct, but each item has its uniqueness and adds something that other items cannot. The findings from this study indicated that it is reasonable to assume the inventory management practices is unidimensional, based on the original intent and design of the instrument to assess the drugs management and moreover, with the majority of variance being explained on one latent trait: inventory management practices. Rasch analyses should be conducted after determining unidimensionality through factor analysis (Bonk & Ockey, 2003).

As a result, it can be concluded that the 56 items have one single predominant dimension, supports and moving towards unidimensionality in measuring the inventory practices for drugs management in Malaysian public hospitals. This finding is consistent with findings of past studies by Mueller (2006) which revealed that, Rasch analysis should not be employed if the assumption of unidimensionality is not met. In addition, each item in the instrument should be a meaningful measure of the unidimensional construct (Bond & Fox, 2007).

As highlighted by Monsurat Olusola Mosaku, Mohamed Najib Abdul Ghafar & Khan (2014), within Rasch Measurement Analysis (RMA), dimensionality indicated that items making up the test must summed up together in the form of unidimensionality scale. The test construct measured a common latent trait and goodness of items fit were necessary evidence for the construct validity. Thus, the findings from this current study provided sufficient evidence that the three types of dimension are moving towards unidimensionality and should be composed as inventory management practices factor to drive inventory management performance in hospitals pharmaceutical inventory management.

6.3.2 Discussion on the Implementation Level of Inventory Management Practices Comprises Dimension of Inventory Administration, Inventory Control and Inventory System in relation to Inventory Management Performance

Research Objective 2

"To investigate the ability of the public hospitals in implementing the items of inventory management practices comprises dimension of inventory administration, inventory control and inventory system in relation to inventory management performance"

The above research question is designed in order to achieve the second research objective which is to investigates the ability of the Malaysian public hospitals in implementing the inventory management practices comprising the dimension of inventory administration, inventory control and inventory system, in relation to inventory management performance. In order to answer the above research question, the analysis will be based on 80 respondents and 65 items that are formed under the three dimensions and one independent variable, based on the conceptual framework earlier. In answering this research question also, all the items and persons or respondents are placed on the same Person-item map as shown in Figure 5.9 and the ability of the organizations, which in this study referring to public hospitals, will be analyzed against the difficult items. The Person-item map is divided into two parts on the same continuum. Along the line on the left-hand side, the respondents are represented by organizations as the unit of analysis is aligned according to the increasing ability from bottom to top.

It appears from Figure 5.9 that, about 39 respondents (49%) have high abilities to perform the items listed in the questionnaire; therefore, the public hospitals are grouped under the high category which comprises of high (4@10%), very high (7@18%) and extremely high (28@72%) abilities, where their location are above the person mean value. The second category is labelled as low category, where their location are below the person mean value. About 41 respondents (51%) have low abilities to perform the items listed in the questionnaire; therefore, the public hospitals are group under low category which comprises of low (32@78%), very low (8@20%) and extremely low (1@2%) abilities.

The establishment of this second research question is to address the issues related to the level of inventory management practices comprising of inventory administration, inventory control and inventory system being implemented towards inventory management performance among public hospitals in Malaysia. Those items that above the Mean Item but lower than Mean Person is considered as difficult items to be implemented, while those items below the Mean Item but higher than the lowest person logit is referred as the easy items. The relationship between the ability of an organizations and item difficulty can also be calculated using the P (θ) formula, which is probability of success. The result from the calculation is tabulated in the Table 6.1 until Table 6.6 below.

The following section will discuss in detail the ability of the organization under this study to perform difficult items under each dimensions comprising inventory administration, inventory control, inventory system and a dependent variable of inventory management performance.

6.3.2.1 Inventory Administration

In general, all the 23 items that represent the dimension of inventory administration didn't provide any difficulties to be implemented by the public hospitals. This can be noticed in Figure 5.10, where its item mean is -0.09 logit which is on the lower side of the continuum, indicating that the items in general are easily implemented. The matter of fact is that, those items asked are common items to most of the public hospitals that have inventory management practices of inventory administration.

Table 6.1 below summarized the probability of success between the ability of the person in implementing the difficult items for the five public hospitals. There are five public hospitals of K53411, S52411, A33411, B23231, and D54411 which are categorized in the low category (very low); they are represented by three non-specialist hospitals, one minor specialist hospital and one major specialist hospital.

Meanwhile, there is public hospitals of S51411 which is under low category (extremely low) coming from a non-specialist hospitals. However, these five respondents found that out of 23 items, there are 12 items fall under difficult items and the most difficult items to implement are A2.2 and A2.3 which are located at the 1.20 logit, and which are related to Main Medical Store personnel that are qualified and well-trained and Main Medical Store personnel who have adequate skills for cross-functional team.

Usually, if six public hospitals (K53411, S52411, A33411, B23231, D54411 and S51411) under this position are able to overcome the items concerned, they have the chances to move from "extremely low" and "very low" ability group to be in the low category and high category ability group according to the P(θ) formula as discussed in Chapter 2. P(θ) formula is applied to calculate the probability of the public hospitals with the code of K53411, S52411, A33411, B23231, D54411 and S51411 to implement item A2.2 and A2.3. By using the person measure of 2.97 logit for K53411, 1.59 logit for S52411, 0.48 logit for A33411, 0.13 logit for B23231, -0.10 logit for D54411 and -2.34 logit for S51411 with the item measure for A2.2 and A2.3 located at the 1.20 logit, the probability of these public hospitals to implement this item are 80% and 50% respectively as shown in Table 6.1 below.

Table 6.1
Probability of Success to Implement Difficult Items-Inventory Administration

Person	Logit Person Measure	Item	Logit Item Measure	Probability of Success P(Θ)
K54311	2.97	A2.2	1.58	0.80
S52411	1.59	A2.3	1.58	0.50
A33411	0.48	A2.1	0.78	0.43
B23231	0.13	A3.3	0.86	0.33

Table 6.1 (Continued)

D54411	-0.10	A3.4	0.82	0.29
		A3.1	0.63	0.33
		A3.2	0.67	0.32
		A3.5	0.54	0.35
		A1.2	0.34	0.39
		A1.7	0.42	0.37
		A1.8	0.13	0.44
		A1.9	0.18	0.43

However, onepublic hospital, represented by S51411 which is positioned at -2.34 logit, is located below the items and at the lowest continuum, perceived that all the items are difficult to implement or those items are implemented not being at the level of probability. Further investigation is required on this S51411 to identify the root of the problems concerned as summarized items in Table 6.2 below.

Table 6.2
Items Code, Items Issue and Item Measure Value for S51411

Items Code	Items Issue	Item Measure Value
A2.2	Main Medical Store personnel qualified and well-trained	1.58
A2.3	Main Medical Store personnel have adequate skills for cross-functional team	1.58
A2.1	Main Medical Store provides a formal training on drug management to the personnels	0.78
A3.3	Managing supplier ensures a continuous flow of drugs	0.86
A3.4	Managing supplier assist the department in maintaining an adequate supply of drugs	0.82
A3.1	Regular supply of drugs promotes long-term relationship of members	0.63
A3.2	Collaborative approach with the supplier in managing drugs useful to the MMS	0.67
A3.5	Managing supplier influence drug management performance	0.54
A1.2	Utilization of equipment effective in managing the stock of drug	0.34
A1.7	Adoption of innovative service is enhancing the management of drugs	0.42
A1.8	Standard of Procedure (SOP) communicated to the staff responsible for drugs management	0.13

Table 6.2 (Continued)

A1.9	Management review and follow up reports of drug turnover, ageing, and drug adjustments benefit the organization	0.18
A.13	Main Medical Store procures the drug immediately if its shortage delays or compromises patient's health	-0.16
A1.3	Drug supply mechanism effect store customer efficiencies	-0.21
A2.7	Main Medical Store have written policies of listed jobs tocover all functions and responsibilities of the personnel	-0.12

More broadly, research is also needed to determine another concern, which is to what extent does the level of inventory administration implementation influence the overall inventory management performance. In order to answer this concern, the inventory administration and inventory management performance are placed side by side, as shown in Figure 5.10 above. The Mean Item reported as -0.09 and 0.50 for inventory administration and inventory management performance respectively. These Mean Item value indicates that even though the items under inventory administration are easy to implement, the organization is still faced with difficulties to achieve the items under inventory management performance.

In order to find the chances of implementing inventory administration that influence the inventory management performance, one way is by calculating the probability of success of person's measure in performing the mean item. If the organization has a high ability to perform the items under inventory administration, it also has higher chances to obtain good inventory management performance. This can be seen from the following Table 6.3 below. Before the analysis was conducted, the two dimensions were put side by side on the same ruler, where the respondents on the left side and the items on the right hand side. The value of Mean Item for inventory administration and Mean Item for inventory management performance are -0.09 logit and 0.50 logit respectively. This was illustrated in Figure 5.10. The most difficult item to achieve in measuring the inventory management performance is item P2.3, located at 1.79 logit which is related to problems that happen relating to inventories being hidden.

In order to find the chances of implementing inventory administration that influence the inventory management performance, the probability of success of a person's measure in performing the mean item of the dimensions will be calculated. If the organization has a high ability to perform the items under inventory administration, it is also perceived to have higher chances to obtain good inventory management performance (Mohd Assad et al., 2015; Saad & Asaad, 2015). This can be seen from the following Table 6.3 below.

Table 6.3
Probability of Success of Inventory Administration (IA) and Inventory Management Performance (IP)

Person	Logit Person Measure	Item	Logit Item Mean	Probability of Success P(Θ) IA	Probability of Success P(Θ) IP
K53411	2.97	IA	-0.09	0.96	0.92
S52411	1.59	IP	0.50	0.84	0.75
A33411	0.48			0.64	0.50
B23231	0.13			0.55	0.41
D54411	-0.10			0.50	0.35
S51411	-2.34			0.09	0.05

Table 6.3 above shows the relationship between implementing the items under inventory administration and the probability in obtaining the inventory management performance of the organization. As the ability of the public hospitals increased in performing the items, the chances to improve inventory management performance also increased. For the public hospitals like A52411, D24411, N53211, C24221,

K22421, N52211, Q32411, Q51411, Q54411, K53411, S52411, B23231, A33411, D54411 and S51411, they have a better chance to improve their inventory management performance by focusing more on the needs of inventory administration. The probability of success for public hospitals of K54311 located at 2.97 logit is 96% in achieving their inventory management performance if the public hospitals of K54311 is able to overcome the inventory administration. While at the same time, it will provide 92% higher probability of success towards inventory management performance (Saad & Asaad, 2015).

The research study by Singh & Singh (2014) indicated that proper management of inventory can enhance an organization's supply chain to run efficiently. Meanwhile, as noted by Romero (2013), drugs administration from the point of view of the healthcare sector is referring to the ability of healthcare and pharmaceutical organizations to optimize the pharmaceuticals being used. The finding supports the finding in this study, where the higher the probability of success in performing items under inventory administration, the better the chances to achieve inventory management performance (Mohd Assad et al., 2015; Saad & Asaad, 2015). In addition, inventory management provides the information to managers who make more accurate and timely decisions to manage their operations. (Deveshwar & Modi, 2013).

Results have shown that if Main Medical Store of Pharmacy Department among the public hospitals in Malaysia can solved the items concerned as summarize in Table 6.3 above, and items on inventory management performance which are related to any problems that happen with regard to inventories being open, it can enhance the probability of success of Main Medical Store, to practice better inventory administration in the Pharmacy Department towards inventory management performance.

6.3.2.2 Inventory Control

In general, all the 21 items that represent the dimension of inventory control don't provide any difficulties to be implemented by the public hospitals. This can be noticed in Figure 5.11, where its item mean is -0.10 logit which is on the lower side of the continuum, indicating that the items in general are implemented in a straightforward manner. The matter of fact is that, those items asked are common items to most of the public hospitals that have inventory management practices of inventory control.

Table 6.4 below summarized the probability of success between the ability of the person in implementing the difficult items for the four public hospitals. There are three public hospitals of B23231, A33411 and D54411 which are categorized in the low category (very low), and which comprised of a major, minor and non-specialists hospitals respectively. Meanwhile, there is a public hospitals of S51411 which is under low category (extremely low), coming from a non-specialist hospital. However, these four respondents found that out of 21 items, there are 11 items fall under difficult items and the most difficult item to implement is C1.4, located at the 0.91 logit which related to what extent are the drugs stored at proper temperatures.

Usually, if four public hospitals (A33411, B23231, D54411 and S51411) under this position are able to overcome the items concerned, they have the chances to move from "extremely low" and "very low" ability to be in the high category ability group, according to the P(θ) formula as discussed in Chapter 2. P(θ) formula is applied to calculate the possibility of the public hospitals A33411, B23231, D54411 and S51411 to implement item C1.4. By using the person measure of -0.22 logit for A33411, 0.12 logit for B23231 and -0.43 logit for D54411 and the item measure for C1.4 located at the 0.91 logit, the likelihood of this public hospitals to implement this item is 31% as shown in Table 6.4 below.

Table 6.4
Probability of Success to Implement Difficult Items-Inventory Control

Person	Logit Person Measure	Item	Logit Item Measure	Probability of Success P(Θ)
B23231	0.12	C1.4	0.91	0.31
A33411	-0.22	C3.7	0.84	0.26
D54411	-0.43	C3.8	0.37	0.31
		C3.12	0.34	0.32
		C1.5	0.06	0.38
		C1.3	-0.29	0.47
		C1.6	-0.29	0.47
		C1.7	-0.44	0.50
		C3.6	-0.67	0.56
		C2.1	-0.91	0.42
		C2.2	-1.13	0.67

However, public hospital represented by S51411 which is positioned at -0.72 logit, which is located below the items and is at the lowest continuum, perceived that all the items are difficult to implement or those items to be implemented are not at the level of probability. Further investigation is required on this S51411 to identify the root of the problems for the concerned as summarized items in Table 6.5 below.

Table 6.5
Items Code, Items Issue and Item Measure Value for S51411

Items Code	Items Issue	Item Measure Value
C2.1	To what extent are all medications recorded in the assigned supply ledgers	-0.91
C1.6	To what extent do recalled or expired medications removed from stock	-0.29
C3.6	To what extent does the MMS checks and match medication and supplies with their vouchers	-0.67
C1.4	To what extent are the drugs stored at proper temperatures	-0.60
C3.12	To what extent are investigational drugs stored under the supervision of the head of HPD	0.34
C3.7	To what extent does the medication distribution to satellite pharmacies done by open-negotiable quantities order form	0.84
C1.5	To what extent does the MMS have a system to monitor out of date medications or recently expired drugs	0.06
C1.7	To what extent during dispensing, has the MMS given priority to medications with shorter shelf life	-0.44
C2.2	To what extent are all procurement invoices and supply vouchers kept in special files	-1.13
C3.8	To what extent does the MMS have a contingency planning strategy in cases of drug shortages	0.37
C1.3	To what extent are the drugs stored in a manner to protect their identity and integrity	-0.29
C1.2	To what extent does the usage of emergency stock is the responsibility requiring the approval of the hospital director/head of HPD	0.68
C2.5	To what extent are forms ordered in enough quantities to cover the needs	0.74
C3.9	To what extent is the MOH informed regarding medication shortages	0.74

More broadly, research is also needed to determine another concern relating to what extent does the level of inventory control implementation influence the overall inventory management performance. In order to answer this concern, the inventory control and inventory management performance are placed side by side as shown in Figure 5.11 above. The Mean Item is reported as -0.10 and 0.50 for inventory administration and inventory management performance respectively. These Mean Item value indicated that even though the items under inventory administration are easy to implement, but the organization still faced with difficulties to achieve the items under inventory management performance.

In order to find the chances of implementing inventory control that influence the inventory management performance, the probability of success of person's measure in performing the mean item of the dimensions will be calculated. If the organization has a high ability to perform the items under inventory control, it is also perceived to have higher chances to obtain good inventory management performance (Mohd Assad et al., 2015; Saad & Asaad, 2015). This can be seen from the following Table 6.4 below. Before the analysis was conducted, the two dimensions were put side by side on the same ruler, where the respondents on the left side and the items on the right hand side. The value of Mean Item for inventory administration and Mean Item for inventory management performance are -0.10 logit and 0.50 logit respectively. This was illustrated in Figure 5.11. The most difficult item to achieve in measuring the inventory management performance is item P2.3 located at 1.79 logit which is related to problems that happen with regard to inventories being hidden.

Table 6.6
Probability of Success of Inventory Control (IC) and Inventory Management Performance (IP)

Person	Logit Person Measure	Item	Logit Item Mean	Probability of Success P(Θ) IC	Probability of Success P(Θ) IP
B23231	0.12	IC	-0.10	0.55	0.41
A33411	-0.22	IP	0.50	0.47	0.33
D54411	-0.43			0.42	0.28
S51411	-0.72			0.35	0.55

Table 6.6 above shows the relationship between implementing the items under inventory control and the probability in obtaining the inventory management performance of the organization. As the ability of the public hospitals increases in

performing the items, the chances to improve inventory management performance also increased.

For the public hospitals like A33411, B23231, D54411 and S51411, they have a better chance to improve their inventory management performance by focusing more on the needs of inventory control. The probability of success for a public hospitals of B23231 located at 0.12 logit is 55% in achieving their inventory management performance if public hospitals of B23231 is able to overcome the inventory control. At the same time, it will provide 41% higher probability of success towards inventory management performance (Saad & Asaad, 2015).

The research study by Ali et al., (2014) indicated that good inventory control means that every order is fulfilled on time and orders stays low. Meanwhile, as noted by Lwiki et. al., (2013), a good inventory control means improving managerial efficiency in all functional areas of management. An inventory control practice in pharmacy is the process of managing inventory in order to meet customer demand at the lowest possible cost and with a minimum investment (Anil K et al., 2012). Thus, it is suggested for material managers to be more focused and giving more attention to the areas of inventory control, process of procurement and relationship towards vendors and physicians. This finding supports the finding in this study, where the higher the probability of success in performing items under inventory control, the better the chances to achieve inventory management performance (Mohd Assad et al., 2015; Saad & Asaad, 2015).

Results have shown that if the Main Medical Store of Pharmacy Department among public hospitals in Malaysia can solve the issues on items concerned as summarized in Table 6.6 above and items on inventory management performance which relate to any problems that happen with regard to inventories being open, it can enhance the probability of success of the Main Medical Store to practice better inventory control in the Pharmacy Department towards improved inventory management performance.

6.3.2.3 Inventory System

In general, all the 7 items that represented the dimension of inventory system do not provide any difficulties to be implemented by the public hospitals. This can be noticed in Figure 5.12, where its item mean is -0.38 logit which is on the lower side of the continuum, indicating that the items in general are easily implemented. The matter of fact is that, those items asked are mutual items to most of the public hospitals that have inventory management practices of the inventory system.

Table 6.7 below summarized the probability of success between the ability of the person in implementing the difficult items for the two public hospitals. There is one public hospitals of D54411 categorized in the low category (very low), which is represented a non-specialists hospitals. Meanwhile, there is a public hospitals of S51411 which is under low category (extremely low), coming from a non-specialist hospitals. However, these two respondents found that out of 7 items, there are 4 items which fall under difficult items and the most difficult items to implement are S3 and S5 located at the 0.50 logit, which was related to what extent constantly evolving technology a major barrier for implementing inventory management practices in the organization and the use of enough technology control the drug inventory system in a medical store.

Usually, if public hospitals of D54411 and S51411 under this position be able to overcome the items concerned, they have the chances to move from "extremely low" and "very low" ability, to be able to move into high category ability group according to the P(θ) formula, as discussed in Chapter 2. P(θ) formula is applied to calculate the possibility of the public hospitals D54411 and S51411 to implement item S3 and S5. By using the person measure of -0.43 logit for D54411 and the item measure for S3 and S5 located at the 0.50 logit, the likelihood of these public hospitals to implement this item is 22% as shown in Table 6.7 below.

Table 6.7
Probability of Success to Implement Difficult Items-Inventory System

Person	Logit Person Measure	Item	Logit Item Measure	Probability of Success P(Θ)
D54411	-0.10	S3	0.64	0.22
		S4	0.33	0.28
		S5	-0.43	0.46
		S7	-0.05	0.37

However, public hospital represented by S51411 which is positioned at -0.10 logit, is located below the items and at the lowest continuum, perceived that all the items are difficult to implement or those items are implemented are not at the level of probability. Further investigation is required on this S51411 to identify the root of the problems for the issues concerned as summarized items in Table 6.8.

Table 6.8
Items Code, Items Issue and Item Measure Value for S51411

Items Code	Items Issue	Item Measure Value
S3	To what extent is constantly evolving technology a major barrier for implementing inventory management practices in the organization	0.64
S5	To what extent is using enough technology can control the drug inventory system in a medical store	0.43
S4	To what extent is the MMS system able to monitor supply of medications	0.33
S7	To what extent does the system support the identification of expired drugs	-0.05

More broadly, a research is also needed to determine another concern relating to what extent does the level of inventory system implementation influence the overall inventory management performance. In order to answer this concern, the inventory system and inventory management performance are placed side by side, as shown in Figure 5.12 above. The Mean Item reported as -0.38 and 0.50 for inventory system and inventory management performance respectively. These Mean Item value indicate that even though the items under inventory system are easy to implement, the organization is still faced difficulties to achieve the items under inventory management performance.

In order to find the chances of implementing inventory system that influence the inventory management performance, the probability of success of a person's measure in performing the mean item of the dimensions will be calculated. If the organization has a high ability to perform the items under inventory system, it is also perceived to have higher chances to obtain good inventory management performance (Mohd Assad et al., 2015; Saad & Asaad, 2015). This can be seen from the following Table 6.9 below. Before the analysis was conducted, the two dimensions were put side by side on the same ruler, where the respondents are on the left side and the items are on the right hand side. The value of Mean Item for inventory system and Mean Item for inventory management performance are -0.38 logit and 0.50 logit respectively. This was illustrated in Figure 5.12. The most difficult item to achieve in measuring the inventory management performance is item P2.3, located at 1.79 logit which is related to problems that happen with regards to inventories being hidden.

Table 6.9
Probability of Success of Inventory System (IS) and Inventory Management Performance (IP)

Person	Logit Person Measure	Item	Logit Item Mean	Probability of Success P(Θ) IS	Probability of Success P(Θ) IP
D54411	-0.10	IS	-0.38	0.57	0.40
S51411	-0.60	IP	0.50	0.58	0.36

Table 6.9 above shows the relationship between implementing the items under inventory system and the probability in obtaining the inventory management performance of the organization. As the ability of the public hospitals increases in performing the items, the chances to improve inventory management performance also increased.

For the public hospitals like D54411 and S51411, they have a better chance to improve their inventory management performance by focusing more on the needs of inventory system. The probability of success for public hospitals of D54411 located at -0.10 logit is 57% in achieving their inventory management performance if public hospitals of D54411 able to overcome the inventory system (Saad & Asaad, 2015). At the same time, it will provide 40% higher probability of success towards inventory management performance.

The research study by Ali (2013) indicated that a good inventory system means that the organization will have an up to date inventory volume at all times, giving precise information to customer, giving good customer service, and develops image of the organizations (Ali, 2013). It is vital that inventory management system allows managers to receive real time information on inventory. This will assist the management to make accurate made informed decisions, anywhere, anytime and would save time and cost used for labor and thus working on inventory management properly (Mathaba, Dlodlo, Smith, & Adigun, 2011). Meanwhile, as noted by Koumanakos (2008), a properly managed inventory system can considerably improve the firm's performance. Without a doubt, the upgrade in the form of technological change will increase the expenditure of health care, but the best parts and among the benefits from its are technologies become cheaper, faster, mobile and more featured (Medical Development Division, 2011).

Furthermore, inventory system will provide an up-to-date inventory count at all times, giving good customer service, accurate inventory information and would improve image of organization (Ali, 2012). With increasing volumes of inventories in organizations, computer based inventory systems will prove to be more effective than manual based system (Ann I et.al, 2014) and using technology in inventory management will improve customer service and vendor partnership, increase data integrity, and produce detailed performance measurements (Eckert, 2007). This finding supports the finding in this study, where the higher the probability of success in performing items under inventory system, the better the chances to achieve inventory management performance (Mohd Assad et al., 2015; Saad & Asaad, 2015). Result have shown that if Main Medical Store of the Pharmacy Department among public hospitals in Malaysia can solved the issues on items concerned as summarized in Table 6.9 above and items on inventorv ™

which relate

any pto ems With regard to inventories being open, it cm

Department towards inventory management performance.

Pertinent to second research question, the following research question will discuss the findings on the most influential dimension of inventory management practices that affect inventory management performance.

6.3.3 Discussion on the Most Influential Dimension of Inventory Management Practices Comprises Dimension of Inventory Administration, Inventory Control and Inventory System That Affect Inventory Management Performance

Research Objective 3

"To investigate the most influential dimension of inventory management practices comprises dimension of inventory administration, inventory control and inventory system that affect inventory management performance "

The third objective of this study is to investigate the most influential dimension of inventory management practices comprising the dimension of inventory administration, inventory control and inventory system that affect inventory management performance. Table 6.10 below shows the mean item *logil* according to the dimensions in public hospitals. Findings reported that the mean item *logit* for each dimension as inventoiy administration (-0.09 logit), inventory comrol (-0.10 logit), and inventory control (-0.38 logit), as tahen horn Figure 5.9. The - item for inventory administration, inventoiy contro) and inventory system are reponed as

Unfortunately, based to Figure 5.13, the Person-Item Variable Map for Inventory Management Performance notified that there are 6 public hospitals fall under moderate group level category which located between item mean value and person mean value which are not able to implement the items for the three dimensions.

Table 6.10 below indicates that the most difficult dimension to achieve is inventory administration, because the mean item is on the highest (-0.90) compare to inventory control and inventory system. The maximum logit item is located at 1.20 logit, which represents the most difficult item to implement as shown in Table 6.10 below. This item is represented by item A2.2 and item A2.3, where the question asked about the Main Medical Store personnel qualified and well-trained and Main Medical Store personnel have adequate skills for cross-functional team. The easiest item to implement was at -1.71 logit, which represents by item A1.9. This question is related to the management review and follow up reports of drug turnover, ageing, and drug adjustments benefit the organization.

Consequently, the levels of inventory management practices which comprised of the dimension of inventory administration, inventory control and inventory system implementations were discussed by calculating probability of success in performing the constructs and inventory management performance. The probability of success can be used to determine the level of implementation of inventory administration, inventory control and inventory system towards increased inventory management performance. As shown in Table 6.10 below, the probability of success for inventory administration implementation in the public hospitals is 94.5% and the probability of success for inventory control implementation in the organization is 94.6%. Meanwhile, as for inventory system implementation, the probability of success is

95.8%. The level of mean inventory system item is -0.38 logit, below the mean level of inventory control -0.10 logit and inventory administration -0.09 item logit.

This indicates that it is easier to implement inventory system (P(Θ)=95.8%) in public hospitals compared to inventory control and inventory administration (Mohd Assad et al., 2015). Hence, it is noted that the mean item *logit* for inventory administration dimension -0.09 with a probability of success at 94.5% was observed to be the most difficult dimension to implement under inventory management practices in public hospitals, followed by inventory control and inventory system. It can be interpreted that the higher the ability of an organization to perform the related items under inventory administration, the higher the probability of getting higher inventory management performance (Bond & Fox, 2007).

The result reported that high ability public hospitals performed better than the low ability public hospitals in terms of performing all constructs in this study. The level of inventory administration, inventory control and inventory system implementation was established according to high ability, moderate and low ability of public hospitals. Therefore, public hospitals given with higher ability, will have higher probability of success in implementing inventory administration. As a result, this finally would lead to higher implementation of inventory management performance.

Table 6.10
Value of Mean Item Logit and Probability of Success P(Θ) for Inventory Administration, Inventory Control & Inventory System towards Inventory Management Performance

Dimensions	Mean Person	Mean Item *Logit*	Probability of Success P(Θ)	Ranking influential
Inventory Administration	2.77	-0.09	94.5%	Most influential
Inventory Control	2.77	-0.10	94.6%	Second influential
Inventory System	2.77	-0.38	95.8%	Third influential

From earlier research, the meaning of drug administration from the point of view of the healthcare sector is referring to the ability of healthcare and pharmaceutical organizations to optimize the pharmaceuticals being used (Romero, 2013) and the research study by Singh & Singh (2014) indicated that proper management of inventory can enhance an organization's supply chain to run efficiently. Therefore, medicine needs to be administered efficiently in order to prevent all types of wastage including overstocking, pilferage and expiry due to wastage may influence the quality of health care provided to patients. Pharmacists cannot take the impact of inventory mismanagement simple and lightly. Improper management of pharmacy inventory (drug management) may impacts on patients' life and safety.

Next is the fourth research objective which will discuss on the direct relationship between inventory management practices and inventory management performance.

6.3.4 Discussion on Direct Relationships

This section elaborated on the results of this study for the fourth research question as stated below:

"To examine the relationship between inventory management practices and inventory management performance in Malaysian public hospitals"

Based on the earlier discussion in Chapter 1, Chapter 2 and review on findings of previous literature and careful examination of the context of the inventory management practices and inventory management performance, studies concluded that there is need for further expansion in the body of knowledge. This investigation is carried out to gain better understanding on the influence of inventory management practices on inventory management performance, as well as to resolve the gap related to inventory management as suggested by previous scholars, that there is a need for future research in inventory management to look into the performance measurement and its effects on inventory management (Eckert, 2007; Hsu-Hua Lee & & Kleiner, 2001). In addition, Rossetti (2008) had proposed inventory management implimentation in the hospital as the future research areas.

Thus, hypothesis testing was performed to investigate the direct influence of the independent variables (inventory management practices) on the dependent variable (inventory management performance. As different types of public hospitals have been found to behave differently, this study consequently recognizes and conceives that special hospitals and non-specials hospitals undertaken by public hospitals may interfere the relationship between inventory management practices and inventory management performance. As a result, two direct hypotheses were formulated and tested. Both hypotheses that were formed, were supported. These findings will be discussed in the next sections.

6.3.4.1 Practices -> Performance for special hospitals and Practices -> Performance for non-special hospitals

a) Practices -> Performance for special hospitals

This section elaborated on the results of this study for the hypothesis stated below:

H1a There is a relationship between inventory management practices and inventory management performance for Special Hospitals in Malaysia.

b) Practices -> Performance for non-special hospitals

This section elaborated on the results of this study for the hypothesis stated below:

H1b There is a relationship between inventory management practices and inventory management performance for Non- Special Hospitals in Malaysia.

Subsequently, the fourth research objective was to examine the direct relationship between inventory management practices and inventory management performance. The direct relationship between inventory management practices and inventory management performance was divided into two hypotheses, as stated above in 6.3.4.1 (a) and (b). This relationship was examined using PLS-SEM. The hypothesis H1a and H2a was tested and the result obtained demonstrates significant for both relationship between inventory management practices and inventory management performance (p-value: 0.000, t-value: 15.187 for special hospitals and p-value: 0.000, t-value: 14.153 for non-special hospitals). This is depicted in the analysis result obtained as portrayed in the section 5.7.1.3(a) (i) and 5.7.1.3(a) (ii). Thus, both hypothesis are supported and can be interpreted as special and non-special public hospitals with an inventory management practices comprising the dimensions of inventory administration, inventory control and inventory system will have better inventory management performance as compared to those public hospitals without inventory management practices. Consequently, this positive result is not in isolation as it has supported the findings of the previous scholars, where inventory management practices has been found to have significant influence on inventory management performance (Hsu-Hua Lee & & Kleiner, 2001; Ali 2012; Anil et al. 2012 & Chalotra, 2013; Ann et al., 2014).

As expected, the findings of this hypothesis is not surprising since previous researchers have found similar positive influence of inventory management practices to inventory management performance for both special and non-special hospitals. These similar findings without differences could be due to the nature of drug management practices in Malaysian public hospitals setup, as provided by The Ministry of Health. Each and every hospitals have to follow the standard procedures and practices in achieving country's aims (Jaafar et al., 2013). Right now, medical warehouse of public hospitals in Malaysia is referring and following *Garispanduan Pengurusan Stor Farmasi di Hospital & Klinik Kesihatan Kementerian Kesihatan Malaysia 2009*, Pharmacy Practice & Development QAP Indicator 2010 Manual Version1/2011, *Manual Perkhidmatan Farmasi Versi 1/2015* and Pharmacy Programme Strategic Plan 2017-2020. In addition, research finding by Susan & Ratnawati (2017) have also pointed towards hospitals needing to give more attention to the effect of the administrative procedure, especially to the procedure of medicine availability and medicine-taking. Besides, simple accessible managerial methods, simple processers and a wider view of the supply chain need to have a greater level of adoption within inventory management inventory practices and enhance impact on overall inventory performance (Stanger et al., 2012).

This result was similar to the earlier research results by Stanger et al., (2012) who have studied inventory perishable management as a contributing indicator of positional advantage in enhancing inventory management performance, have found a positive significant effect of the blood inventory management in hospitals, as an influencing factor contributing to operational inventory performance. Likewise, study done by Pillai (2013) examined on the inventory management performance, and also found similar results. The study conducted in the context of machine tools of Small and Medium Enterprises (SMEs) from India emphasized on the importance of inventory management practices among SMEs in enhancing their performance. In addition, the research findings of Ann, Victoria, & Ukpere (2014) on the impact of effective control management on organisational performance further concurred with same findings and recommended that organizations should adopt the inventory keeping method that best suit their operations.

Lee and Kleiner (2001) stated that in order to manage inventory management successfully, "retailers should understand customer needs, vendor partnerships, technology, data integrity, and performance measurements". This statement was in line with study done by (Ali, 2012), that the efficient and effective management of inventories leads to higher satisfaction level in customers. Ali (2012) stated that the efficient and effective management of inventories will lead to higher satisfaction level in customers. Thus, the use of proper practices in inventory management especially at hospital pharmacies can enhance inventory management performance of drug management. Study done by Anil et al. (2012) proposed necessary effective and efficient management of drug stores in order to make sure the performance of medicines is high. Among the ideas are efficient priority setting, purchase decision making, specific drug distribution, higher supervision of drugs, and avoidance of pilferage drug.

The above findings indicate that inventory management practices which comprises of inventory administration, inventory control and inventory system is a powerful determinant of inventory management performance across different contexts, for example different demands, different industries and different business environment that might relate to other public services, private sectors or other industries such as food retailing and frozen products (Stanger et al., 2012). Furthermore, the findings also have supported the importance of inventory management practices which comprises of inventory administration, inventory control and inventory system, in directing inventory management performance as inputs towards outputs, which has been described in the System Theory by Ludwig von Bertanlanffy, a biologist in 1940.

In view of that, the results in this study can be interpreted as, that the existence of inventory (drugs) management practices among the specials and non-special hospitals in Malaysia have a significant influence in contributing to the enhancement of inventory (drugs) management performance. Thus, special and non-special public hospitals with a inventory (drugs) management practices which comprises of inventory administration, inventory control and inventory system is expected to achieve greater inventory (drugs) performance. This outcome is not unexpected, going by the repeated studies concerning the importance of the relationship between inventory management practices and inventory management performance in various contexts.

Next, the following subsections will discuss the findings on the impact of total quality management as a moderator between inventory management practices and inventory management performance.

6.3.5 Discussion on Moderation Role of Total Quality Management

This section elaborated on the results of this study for the fifth research question as stated below:

Research Objective 5

"To test the moderating role of total quality management practice in enhancing the relationship between inventory management practices and inventory management performance among public hospitals in Malaysia"

Based on the earlier discussion in Chapter 1, Chapter 2, and based on literature, the extent of inventory management practices and its influence on inventory management performance was enhanced when total quality management practice functioned as a moderating variable. Hence, this has set to be the fifth objective of the study which is to test the moderating role of total quality management practice in enhancing the relationship between inventory management practices and inventory management performance among public hospitals in Malaysia. Review on findings of previous literature and careful examination of the context of the studies concluded that there is need for further expansion in the body of knowledge. Since 1992, the practices of TQM in public sector especially in public hospitals are very rare compared to manufacturing organizations, which have successfully incorporated TQM as strategic choice Irfan, Ijaz, Kee, & Awan, (2012) have even stated TQM practices is well accepted and serve as means for continuous improvement processes and would enhance performance of organizations included publics hospitals for internal operations (Kaluzny et al., 1992).

Thus, hypothesis was performed to test the moderating role of total quality management practice in enhancing the relationship between inventory management practices and inventory management performance among public hospitals in Malaysia, as discussed in earlier section, with an intervening influence of a third variable, namely total quality management. As the special and non-special hospitals have been found to behave differently, this study consequently recognizes and conceives that total quality management undertaken by a public hospitals moderate the relationship between inventory management practices and inventory management performance. As a result, two moderating hypothesis were formulated and tested. Among the two hypotheses formed, one was supported while one was rejected. These findings will be discussed in the next sections. Hence, this study provides support and justification on why the total quality management was found rejected towards inventory management practices and inventory management performance.

6.3.5.1 Practices*TQM->Performance for special hospitals and Practices*TQM->Performance for non-special hospitals

a) Practices*TQM->Performance for special hospitals

This section elaborated on the results of this study for the hypothesis stated below:

H2a Total Quality Management moderates the relationship between Inventory Management Practices and Inventory Management Performance for Special Hospitals in Malaysia

The hypothesized moderating effect postulates that the influence of inventory management practices on inventory management performance will be stronger with the implementation of total quality management by the special public hospitals. Referring to this relationship, total quality management was proposed to be determined by an interaction between inventory management practices and inventory management performance. Thus, it is hypothesized that there is a moderating effect of total quality management on the relationship between inventory management practices and inventory management performance for special public hospitals.

Surprisingly, there was no significant found on the moderating effect of total quality management towards inventory management practices and inventory management performance for special hospitals. This is depicted in the analysis result obtained, as portrayed in the section 5.7.3(b) (i) with path coefficient of 0.015, t-value of 0.210 and p-value of 0.417. Results obtained, however, did not moderate and have failed to support the above hypothesis. Thus the hypothesis was rejected. Correspondingly, effect size of the moderating outcome as compared to the direct effect model was calculated. The moderating model has demonstrated a substantial effect size of 0.004 (small), hence this objective was unachieved. Therefore, this finding is unable to supports the imperative moderating effect of TQM in influencing the relationship between inventory managemement practices and inventory management performance for non-special hospitals.

In view of that, it specifies that the significant positive relationship between inventory management practices and inventory management performance is not contingent on the total quality management establishment. Thus, the result suggests that total quality management does not have significant moderating effect on the positive influence of inventory management practices on inventory management performance. The result validates that inventory management practices is a perfect determinant of inventory management performance of the drugs management among public hospitals in Malaysia, irrespective of the total quality management implementation by the organizations.

In relation to this finding, first possible explanation is that the inventory management practices having consequence on inventory management performance is not dependent on drugs management for special hospitals because the value of total quality management practices by special hospitals may not be up to the standard which will enhance their drugs management impact on drugs performance. Although these special hospitals have proven to have implemented total quality management, these total quality management practised have not yet been successful in contributing greater value to the special hospitals inventory management performance. For that reason, total quality management implemented have failed to contribute to enhance inventory management performance at special public hospitals. The implementation of the TQM programme requires many changes in the organisation, of which people may be reluctant. To effectively implement TQM, the service provider should focus on the most important TQM practices and address the less important ones at a later stage. By doing so, they would gradually reduce employee resistance to change, especially if positive results are generated (Talib et al., 2011).

The findings presented in this paper support the argument that service managers need to realize that the practices should be implemented holistically rather than on a piecemeal basis to get the full potential of the identified TQM practice, and the identified TQM practices in this research will be very useful to policy-makers in service sector which may help in evaluating the effectiveness of their current TQM practices.(Talib, Rahman, & Qureshi, 2011). TQM stresses the commitment by the management to have a continuing company-wide drive towards excellence in all aspects of products and services that are important to the customer. It is uncertain whether these managers actually understand the TQM concept in full or whether they implement at least the minimum tools and techniques needed to be recognized as an organization adopting TQM (Yapa, 2015).

Hence it is clear that there is a lack of thorough understanding of TQM philosophies and techniques among the managers. In addition, according to Dewana, Gebremariam, Abdulahi, Fikadu, & Facha (2017), poor quality was observed at all health facilities, which lead to overall quality of delivery service fallen far below the recommended standards. Shortage of skilled human resource, infrastructure, drugs, supplies, equipment, infection prevention materials and means of transportation were observed in most health facilities, which have resulted in improperly-recorded and very low correct partograph recording towards the facilities.

The insignificant findings to emerge from this study is that, it is not a signal that total quality management doesn't work in special hospitals but the management employees of the medical store need to be focused on continuous improvement for better performance, rather than a blame culture (Moullin, 2004). If performance on a particular measure is below par, the emphasis needs to be on establishing what went wrong and how this issue can be addressed in future. The assimilated effort among workforces can be achieved by having operative and broad management by continuously enlightening performance (Noreen et al., 2016). However, if management responds by blaming an individual or a department, this will often be unfair and counter-productive. Therefore, there is a need for introduction of TQM-related short training courses by training department of special hospitals to the employees of medical store and another strategy may be the introduction of TQM-related courses into the BBA and MBA programmes to provide knowledge of TQM philosophies and techniques (Yapa, 2015).

Second possible explanation is, from the study findings there is no evidence to suggest that TQM successfully implemented in the special hospitals in Malaysia. It can be said that TQM has not been widely accepted and implemented in the programme. This may be that the implementation part of TQM at the health institutions has not been done in line with the best practices, hence it did not succeed. TQM failure may be as a result of different factors that include lack of top management support, resistance to change, the nature of TQM, poor communication, and lack of employee involvement among other factors. The implementation of TQM into an organization requires fundamental organizational culture change. Changing an organization's culture is a very difficult task, which often faces resistance.

The challenge of implementing TQM is due to the fact that TQM is not a slogan, nor a tool, nor a program; it is an organization paradigm thus implementing TQM might be dealing with replacing, rather than modifying, the organization's culture. It is from this that it may face resistance, as some of the employees may be content with the old culture and hence would not be committed or willing to adapt to the new TQM culture (Noreen et al., 2016). In light with the findings, the special hospitals management may have failed to get the commitment of employees to fully implement TQM, hence its failure. Yet, a study done by Brown et al (1994) put forward that the reasons for TQM failure in organisations include among other reasons, poor training, and wasted education and training, inappropriate rewards, failing to transfer true power to employees, outdated business systems and maintaining outdated management practices.

Noreen et al., (2016) who examined the implementation of TQM in the Zimbabwean public health institution and what improvement can be done on TQM concluded that, in order for TQM to be operational, it must be top-management driven and focus on maximising efficiency and effectiveness, through improving systems and processes, as well as aligning business objectives and customer requirements, combining a series of philosophies and techniques with practices in the organisation and making sure the total quality management principles are planted into everybody's mind and are run in every department's day-to-day work. Furthermore, the senior managers should first realise the significance of TQM and play a necessary role in leadership and commitment. They must personally involve themselves in the quality affairs to show their support and stimulate the formation of a company-wide quality culture. Training, communication and internal customer needs should be highlighted to increase employee involvement and the coordination of the organisation.

Finally, a potential reason for the insignificant and negative effect of TQM may be due to the assumption that existing TQM implementation has not been transformed into valuable practices in the organizations. Even though the finding is contradict with findings of a past study by Flood (Flood, 1976) as cited in (Noreen et al., 2016) who argues that TQM is a company-wide effort and hence involves everyone's effort in the organization in order to improve performance, the justification here can be discussed in the context of the practice follows the structure of specials hospitals. The post hoc test indicates that there is a significance difference in teamwork between a district and state level hospital, and between district and national level hospital (Manaf & Hazilah, 2009). The study will looked deeper into this contradictory findings with possible explanation.

Hospital Kuala Lumpur (HKL) with 2000 beds is largest hospitals in Malaysia. It is main national level hospitals and provide comprehensive range of tertiary and secondary care services. State level hospitals are also large hospitals with bed capacity ranging from 800-1200, while those with specialists may have beds ranging from 200 to 500. HKL and state levels hospitals have resident or permanent specialists. The discussion of the results by Manaf & Hazilah (2009) indicates that although the state level hospitals are smaller than the national referral centre, however, the structure of these hospitals are more similar to HKL than the district hospitals. Therefore, the size difference do not seem to make much impact on practice of quality management between the two levels of hospitals. The environment of the state hospitals however, do not differ much from HKL, as observed from the level of activity and crowd. Based on the result, this study merged HKL, state hospitals, minor specialist hospitals and special hospitals (Ministry of Health, 2011; Ministry of Health, 2015) under one group namely as special hospitals.

Larger or special hospitals face more difficult challenges in implementing quality improvement efforts due to the more bureaucratic nature that are not conducive to the progress of quality management, said Shortell et.al. (Shortell et al., 1995) as cited in (Manaf & Hazilah (2009). Thus, directors in the larger state and national level hospitals on the other hand tend to be more dissociated from the employees due to the larger number of employees and consequently the increased administrative layers between them. In addition, greater challenges are faced by larger hospitals in implementing quality management due to the more bureaucratic structure and culture of the larger hospitals in comparison to smaller hospitals, remark Shortell et.al. and Carman et al. (Shortell et al., 1995; Carman et al., 1996), as cited in (Manaf & Hazilah (2009).

The fact the Malaysian government is striving hard to promote quality management practices which have been implemented in Malaysian public hospitals since the early 1990s when a directive for implementation in the public sector was issued via Development Administration Circular No. 1/1992, entitled "Guidelines for Total Quality Management in the Public Service". Since then, quality management has been actively pursued in Ministry of Health (MOH) hospitals. However, another possible explanation for this situation is that TQM implementation in the Malaysian special hospitals context have shown to be below the expected level was due to the previous study shows that quality management practice is higher among employees of the smaller district hospitals than the larger state hospitals (Hazilah & Manaf, 2005). Thus, quality management increases in practice better in smaller hospitals, which are less bureaucratic and more suited to the employee empowerment approach to quality management.

Therefore, the total quality management practices would not create a significant impact on the inventory management performance in implementing their drugs management. As a result, any ability developed towards total quality management practices from special hospitals might not easily affect drugs management practices towards drugs management performance. Hence, based on the findings of this study, total quality management has no significant impact on the relationship between inventory management practices and inventory management performance of drugs management among public special hospitals in Malaysia. Thus, although the findings is not as proposed, yet it is explainable.

Pertinent to that, the following subsections will discuss the findings on the impact of total quality management as a moderator between inventory management practices and inventory management performance in non-special hospitals.

b) Practices*TQM->Performance for non-special hospitals

This section elaborated on the results of this study for the hypothesis stated below:

H2b Total Quality Management moderates the relationship between Inventory Management Practices and Inventory Management Performance for Non-Special Hospitals in Malaysia

Total quality management has been hypothesized to moderate the positive relationship between inventory management practices and inventory management performance for non-special hospitals. This is depicted in the analysis's result obtained as portrayed in the section 5.7.3(b) (ii) with path coefficient of 0.076, t-value of 2.495 and p-value of 0.006. Results obtained indicate that TQM demonstrates to significantly moderate this relationship for non-special hospitals. Thus the hypothesis was accepted. Correspondingly, effect size of the moderating outcome as compared to the direct effect model was calculated. The moderating model has demonstrated a substantial effect size of 0.474 (large), hence this objective was achieved. Therefore, this finding further supports the imperative moderating effect of TQM in influencing the relationship between inventory managemement practices and inventory management performance for non-special hospitals.

Conversely, TQM has failed to demonstrate significant influences towards this relationship for special hospitalsas discuss in 6.3.5.1 (a).

The above finding can be interpreted that inventory managemement practices predicts inventory management performance which is enhanced by the TQM implemented. This can be explained as the effect of inventory management practices on inventory management performance is contingent on TQM undertaken for non-special hospitals. This concludes that the implementation of TQM signified that they are dissimilar in special hospitals and non-special hospitals, and it has moderating influence on the effect of hospitals inventory management practices on inventory management performance. For that reason, TQM especially TQM in public healthcare undertaken by the non-special hospitals will enhance the influence of inventory management practices on inventory management performance.

Beholding to the significant influence of TQM on non-special hospitals inventory management practices towards inventory management performance, research finding by Manaf & Hazilah (2009) pointed out that practice of quality management was found to be significantly moderated higher in district hospitals (non-special hospitals) than in the national referral centre (special hospitals). District hospitals which operate without specialists are generally smaller in size and capacity, with beds ranging from 30 to 150 with no resident or permanent specialists that provides services, including medicine and surgery to meet the general medical and surgical needs of the community. Furthermore, previous study also suggests that the practice of quality management is higher in district hospitals as district level hospitals are smaller entities in comparison to the state and national level hospitals. Therefore, it can be interpreted that TQM enhances inventory management performance of non-special hospitals with higher inventory management practices as compared to TQM implementation in special hospitals.

First and foremost, it is important to realize the relationship between inventory management practices and inventory management performance will be potentially stronger for non-special hospitals with TQM practices. This is due to non-special hospitals being more likely to have group/developmental culture that is supportive of teamwork, empowerment and risk-taking which are important attributes for a successful implementation of quality management (Manaf & Hazilah 2009). Thus smaller hospitals are more favourable ground for the successful implementation of quality management and at the same time the district hospitals or non-special hospitals are much less crowded and busy, in comparison to HKL and state hospitals which in this study being referred to as the special hospitals. For that reason, findings established further substantiate that TQM implementation is an imperative moderating variable in enhancing the outcome of inventory management practices towards inventory management performance.

Besides that, second importance and possible reasons behind the significant result of TQM in positively moderating the relationship can be due to the indicates that there is significance difference in teamwork between district, in this study being referred to as the non-special hospitals, and state level hospital/national level hospital which this study referred to as the special hospitals (Manaf & Hazilah, 2009). The finding seems to suggest that teamwork is higher in district hospitals than in state and national level hospitals due to smaller in size that can lead to the succesfull implementation of TQM in non-special hospitals. Shortell et al. (1995) as cited in (Manaf & Hazilah (2009) had pointed out that the culture in smaller hospitals is more conducive to the development of teamwork and at the same time, smaller-sized hospitals are also less bureaucratic, an attribute that also facilitates teamwork. Previous study also added that personnel of the district hospitals probably comprise local people who know each other beyond the confines of the hospital, which can be a contributory factor in facilitating teamwork in the workplace.

Third justification that can be discussed regarding the finding is, TQM practices identified cover a wide range of activities from strategic, tactical factors to operational factors. The implementation of TQM in service organizations requires the involvement of entire organisation. It is not only the responsibility of top management but also requires the involvement of all employees, i.e. teamwork. All in all, this situation happened in non-special hospitals with the combination of responsibility of top management and a good teamwork from the employees that can contribute to the successful of TQM implementation towards drugs management practices. Management's role is important in order to establish an environment that can facilitate the processes, and encourage and involve employees in implementing TQM. In general, employees work under guidelines and directions from the management. Therefore, an effective strategic planning and quality systems can improve employees' efficiency and performance (Talib et al., 2011).

Finally, another potential reason for the significant and positive effect of TQM in moderating non-special hospitals may be due to the suggestion that most of the district hospitals do not have a post for Deputy Director. As such, Directors in the smaller district hospitals tend to be more reachable to the hospital staffs, and because of the small number of employees also, the Directors tend to be more evidently involved in quality improvement efforts in non-special hospitals. Thus, the TQM practices are much more workable among the staffs in medical store of Pharmacy Department under the monitoring and controlling by the Directors and Head of Pharmacy Officers of the non-special hospitals.

As previously discussed, while inventory management practices and inventory management performance was found to be moderated by the TQM among non-special hospitals in Malaysia, it has also been emphasized that the smaller district hospitals particularly those without resident specialists are less complicated than the larger state and national level hospitals. Because of their smaller structure, which is also less bureaucratic, these smaller hospitals therefore tend to have a developmental culture, said Shortell et al., Shortell et al., (1995) as cited in Manaf & Hazilah (2009), which is passionate about teamwork and employee empowerment – two central pillars of quality management. Accordingly, findings from this study support the earlier works, which show that smaller hospitals which is non-special hospitals are better inclined to quality management implementation than larger hospitals (Manaf & Hazilah, 2009).

It can be concluded that, based to the finding from this study, it seems to put forward that although non-special hospitals may lack the resources due to smaller in size and structure, non-special hospitals nevertheless have the precise management structure and right culture for successful implementation of TQM practices that can enhance the relationship between inventory management practices and inventory management performance (Manaf & Hazilah, 2009). The contrary findings between the types of public hospitals and the size from this study has shed light on the fact that the non-special hospitals (smaller district hospitals) should not be ignored by policy-makers in their strategic move, with respect to quality improvement efforts in the Malaysian public health care delivery system. The findings of the current study, along with the previous judgements signify that the inventory management practices, precisely the drug management in medical stores of non-special hospitals, has a significant role towards drug management performance through TQM practices. Hence, having this relationship and its effect implies that drugs management performance is enriched by drugs management practices through the moderating role of TQM implementation.

Based on the result, study can concluded that drugs management performance can improved with the implementation of TQM where TQM can lead to customer satisfaction. In the setting of health system, quality management seeks to increase patient's satisfaction with the services and improve effectiveness of treatment. This finding is consistent and supported with findings of past studies by Patel (2009), which believes that total quality management, which places importance on improved customer satisfaction, is the tool that offers better quality services in the public health.

6.4 Contributions and Implications of the Study

The importance of facilitating this research is due to various factors. Among them as mentioned by Summers (2001) is that, contribution of any research can be in the form of conceptual, empirical or methodological in nature. Therefore, a good researcher must derive a clear identification of the problem statement that related to the intended contribution, with the purpose of having a good impact towards study. This section will discuss about the implication of this study in theoretical, methodologal and managerial. The current study provides paramount theoretical, managerial and methodological contributions and implications that are beneficial for academicians, practitioners and policy-makers. The following subsections discuss the contributions and implications in more detail.

The result of this study had implicated the theoretical contribution, managerial implications and methodological contributions. For this study, the theoretical implication tries to highlight the impact of this study towards System Theory and Stakeholder Theory and how it is related towards study. Meanwhile, the managerial implication section discusses on what managerial figures should do when implementing the inventory management practices and how it strengthens previous findings in performance. Next, the policy implication under managerial implication discusses on who should play a role and how to enhance the inventory management performance. In the light of methodological contributions, Rasch Measurement Model are able to divert the previous study from using a qualitative to a quantitative approach.

6.4.1 Theoretical Implication of the Study

This study has contributed means of theory. As mentioned in Chapter 2, there are three types of theory applied with the aimed to increase the understanding on inventory management practices towards inventory management performance. Item Response Theory (IRT), a modern theory is used as the fundamental underpinning theory. This theory is incorporated with the System Theory and Stakeholder Theory.

System Theory is a theory saying that business organization is a system of interrelated parts working in conjunction with each other in order to accomplish a number of goals, both those of the organization and those of individual participants (Johnson et al., 1964). System Theory is a system of social organization, where bilateral relations and cooperation between members of inter-related functions can be interpreted as a complex system involving human elements, actions, environment and technology (Cole, 2004). This is in line with the framework of this study, where the inventory management practices, which comprises of inventory administration, inventory control and inventory system, are moderated with total quality management towards inventory management performance. This study utilizes system theory to describe the interrelated subsystems in an organization to formulate an inventory management practices towards inventory management performance process.

Stakeholder Theory is a theory that explained the internal and external stakeholders are important in modern company's performance (Freeman (1984; 2004). Therefore managers in the organization are responsible for ensuring the needs of interested parties are fullfilled, and not only in ensuring the profitability of organization. The output produced from the organization must be able to meet not only customer satisfaction, but also the stakeholders, such as the board of directors, bankers, government agencies, employees and civil society. Based on the general concepts of stakeholder theory, it is in line with this study to measure the performance of the organization from non-financial perspective towards stakeholders in public healthcare which are providers, payers, employers, employees, health insurance fund companies and patients. Therefore, the Stakeholder Theory was adopted as the underpinning theory for this study. Both theory are applied in this research to support the fourth and fifth objective of this study.

6.4.2 Managerial Implication of the Study

Apart from the theoretical contributions for academicians and researchers, several other implications can be drawn for practitioners and policy-makers as well. This section discusses the key points derived for the Ministry of Health and policy-makers based on the findings of this study. All stakeholders involved in delivering the service process inclusively; customer, owners, shareholders, peoples in organization, suppliers, partners and society need to join hands in their capabilities to grab the benefits of the outcome from this study. Particularly, people in organization especially personal incharge at Logistics Pharmacy Unit are encouraged to focus on the inventory management practices levels, in achieving inventory management performance. When organisation managed to identify the inventory management practices, then it is only relevant and practical to transcend towards inventory management performance. Therefore, through this identifying process, it would benefit the managerial perspective undertaken by practitioners and policy-makers in manners as follows:-

a) Establish a systematic framework of inventory management practices and this could be applied at any organization: public service, private service, industry or manufacturing, which have many types of inventory and with the need to manage it properly.

b) Measuring the impact of inventory management practices according to organisational capability. This study has divided public hopsitals according to two type ability level. They are high and low performer. This is based on their highest location in the variable map plotted side by side between ability and item difficulty in performing the items of inventory management practices. In order to improve the ability level, organisation need to focus on items that are difficult in order to achieve the performance goal.

c) Through Rasch Measurement Analysis, it can identify the difficult items in undertaking inventory management practices, so that action can be taken for improvement. This can be executed by identifying the difficult items that are difficult to achieve in order to decide on further improvements. Based to the study, public hospitals should focus on improving the difficult items under inventory management practices which comprises of inventory administration, inventory control, inventory system and inventory management performance. Hence, by improving on these items, it is hoped that organisation could improve their ability from the low ability level up to the high ability level, as well as improving their inventory management performance.

d) Through SEM-PLS, the study proved that there is positive relationship between inventory management practices and inventory management performance for specialist hospitals and non-specialist hospitals, therefore study proved that by properly managing the drugs at public hospitals, it will lead to better performance of inventory management.

e) The result from SEM-PLS also pointed out that the moderating effect of total quality management only strengthens the relation of inventory management practices and inventory management performance for non-specialist hospitals, but not to the specialist hospitals. Therefore, this requires serious attention from Ministry of Health to look deeper on this findings.

f) This study also provide opportunities for public hospitals to evaluate their ability in performing inventory management practices items, and can identify beforehand which items are the most difficult to perform or to achieve. By knowing the areas of weakness, it is easier to make actions and decisions for improvement. Since the pharmaceutical expenditures in Malaysia have increased over the years (Hassali, 2009) and might interrupt to the Malaysian economy, greater attention is required on the public hospitals and Ministry of Health in order to sustain services in the industry and to improve the services in order for World Health Organization (WHO) to continually recognize Malaysia as country with good practice chain in the world.

6.4.3 Methodological Implication of the Study

Apart from the theoretical and managerial contributions and implications, this study has also contributed methodologically especially via the application of a quantitative design by using Rasch Measurement Model and PLS-SEM in analysing the collected data. Considering the previous inventory management studies among public hospitals in Malaysia context, they have all employed a cross-sectional design of a study by using SPSS software, the application of the combination method, Rasch Measurement imputed in PLS-SEM design in this study is indeed a novel contribution. This theory is applied in this research to support first three objective of this study.

First of all, Rasch Measurement Model uses Item Respond Theory is seen to be the greatest suitable approach, being a psychometrical approach that can measure the ability and difficulty of the respondents (organizations) by achieving the items suggested. Furthermore, Rasch are able to profile and differentiate the respondent, thus, studied can conclude for the high and low achievers among the respondents. The application of Item Response Theory in this study is used to support the data analysis methodology through the Rasch model. It is also an alternative to the common research method. It is noted that this theory is barely used in the inventory management research. Apart of being the underpinning theory and method of analysis, the theory contributed to support the practical issue of the study, to investigate the ability of organisation in the public healthcare services in implementing inventory management practices towards inventory management performance.

Secondly, this study is able to contribute to the field of inventory management focusing on healthcare services using the quantitative approach, where so far it has been equally studied using the qualitative method research approaches, drawn heavily by in-depth interviews, case studies and observation that are descriptive in nature. Meanwhile, the Rasch analysis is probabilistic and inferential in nature and will be able to provide a pattern of item reponses that will assist in the understanding on how persons and items interact based on mutual latent trait (Irvoni & Ishar, 2012).

Next, the study contributed to the methodology via the usage of Rasch Measurement Model and PLS-SEM in analysing the collected data. Through the assessment of the measurement model, the application of Rasch Measurement Model analysis tool proved that the measurements used in this study were valid and reliable. Hence, the usage of Rasch Measurement Model and PLS-SEM in the current study supported the applicability of this statistical tool within the Malaysia context. Another methodological contribution of this study was the usage of Rasch Measurement Model that provides an exciting opportunity to advance the knowledge in Rasch

Measurement Model as proposed by Sharma (2013) to be used as data analyze on public sector non-financial performance.

6.5 Limitations of the study

Although the results from this study provided constructive insights into the dynamics of various constructs used in the study, several methodological limitations were also taken into account. While the research design was tailored to address the research objectives and focused on the critical elements of this study, this research was still not spared from its limitations. There are a few limitations involved in this study. The limitations of this research are listed as follows:

1. First of all, this study was limited in terms of the scope of the study. This study only focused on the empirical examination of the inventory management practices and inventory management performance among the Malaysian public hospitals. Since this study only involved the service aspect of Malaysian public hospitals therefore, the finding cannot be generalized to other industries such as the service industry, due to differences in the nature of business.

2. The study was only focused on the inventory management practices which comprised of dimensions of inventory administration, inventory control and inventory system towards inventory management performance, concentrating on drugs management as one part from the whole inventory managed by hospitals. Therefore, results of this research that emerged from the analysis of data in this area may not be generalized beyond this, as it is very specific.

3. This study was limited to examining the moderating role of total quality management in enhancing the inventory management practices towards inventory management performance. Due to that, the discussion was limited to this area.

6.6 *Directions for Future Studies*

Despite the limitations in attending the study, this research can be extended in a number of directions in order to further understand the implementation of actual inventory management practices. Considering the limitations that need to be taken into account, this study presents some recommendations for further research. The recommendations are listed as follows:

1. Future research efforts on the implementation of inventory management practices towards inventory management performance can be revised and replicated to suit this study by extending into other sectors such as: (1) construction, (2) other service provider, (3) private clinics, (4) private/retailing pharmacy, and (5) private hospitals.

2. Future research efforts can replicate the study in a wider scope by adding more variables or dimensions, as this study was only focusing on the inventory management practices which comprised of the dimensions of inventory administration, inventory control and inventory system towards inventory management performance. Therefore, the results of this research that have emerged from the analysis of data in this area can be extended beyond the current study.

3. In addition, future research efforts should focus on other variables that strengthen the effect between current variables. Considering the insignificant effect of total quality management in the practices and performance of inventory management relationship in this study, it is likely, for example, that there are other moderators affecting the link between the two variables. For example, the availability of resources and institutional forces may affect the relationship.

6.7 Conclusion

The importance of inventory administration, inventory control and inventory system as dimension under inventory management practices towards inventory management performance studies have gained extensive place in literature, and scholars have studied this subject matter from various viewpoints. This study and findings enhance our understanding of the important for organisation to implement a good practising of inventory in order to be competitive and sustaining in inventory management performance. Therefore, the main objective of this study is to examine inventory management practices and inventory management performance among public hospitals in Malaysia.

The motivation to conduct this study is due to inconsistency of previous research on the theoretical role of inventory management practices as independent variable and inventory management performance as dependent variable. There were also conflicting findings on the dimension applied. Furthermore there are also limited studies on the level of inventory management practices implementation mainly in the context of public hospitals in Malaysia. In view of these gaps, this study has investigated further on the inventory management practices implementation from the perspective of drugs management and its impact on inventory management performance.

The literature reviews are conducted thoroughly and this has enabled researcher in providing the foundation to construct the conceptual framework and inventory management instruments. The conceptual framework for this study translated the theoretical gaps into independent variables of inventory management practices with three dimensions: inventory administration, inventory control and inventory system. Meanwhile as for dependent variables is inventory management performance and total quality management as moderating variables. The underpinning theories applied for this study are Item Response Theory, System Theory and Stakeholder Theory. The Rasch Model and Partial Least Squared (PLS) Method, a covariance based Structural Equation Modelling (SEM) was used to analyze the data collected from the survey through online questionnaires. Subsequent to data collection, the Rasch Model analysis is applied as the research methodology, where analysis is based on probabilistic unidimensional model.

The study was concluded with enclosed findings designed in responding to the research questions and research objectives. First research objective provides evidence that the dimension of inventory administration, inventory control and inventory system are moving towards unidimensionality under inventory management practices. The second major findings was related to the individual dimension by looking into the ability and difficulty of the publics hospitals in implementing the inventory management practices. This study has found that public hospitals with high ability performed better than the low ability hospitals in terms of performing all constructs in this study. The level of inventory administration, inventory control and inventory system implementation was established according to high ability hospitals and low ability hospitals. Therefore, given with higher ability, this would provide higher chances in implementing the inventory management practices. As a result, this would finally impact the to higher inventory management performance. An important conclusion drawn for the third research objective was that inventory administration turn out to be the most influential dimension of inventory management practices that affect inventory management performance, followed by inventory control and inventory system.

Meanwhile, the findings for research objective four revealed that both independent variables: inventory management practices which includes inventory administration, inventory control and inventory system are found to be positively related to the inventory management performance. These results have highlighted the importance of inventory management practices and inventory management performance focusing in improving drugs management performance for both special and non-special hospitals in Malaysia. On the other hand, referring to the analysis performed on the role of total quality management, it was established that total quality management do moderate the relationship between inventory management practices and inventory management performance for non-special hospitals but unfortunately result for special hospitals suggests that implementation of total quality management does not have any significant moderating effect on the positive influence of inventory management practices on inventory management performance.

From the findings, this has lead to conclude that the higher the ability level of organisation to implement the inventory management practices (inventory administration, inventory control and inventory system), the higher will be the ability in performing the inventory management performance. In conclusion, with the application of the variable map from Rasch model analysis, this study has provided a means of identification on inventory management practices comprising inventory administration, inventory control and inventory system on managing the drugs among public hospitals in Malaysia.

REFERENCES

Abdul Aziz, A. (2010). Rasch Model Fundamentals : Scale Construct and Measurement Structure. Universiti Kebangsaan Malaysia.

Abrahamson, K., Ramanujam, R., & Anderson, J. G. (2013). Co-worker characteristics and nurses' safety-climate perceptions. *International Journal of Health Care Quality Assurance*, 26(5), 447–454.

Agus, A., & Haji Noor, M. S. (2012). Lean production supply chain management as driver towards enhancing product quality and business performance : A case study of manufacturing companies in Malaysia. *International Journal of Quality and Reliability Management*, 29(1), 92–121.

Al-Zu'bi, H. A., & Judeh, M. (2011). Measuring the implementation of Total Quality Management: Ibn Al-Haytham Hospital Case Study. *International Journal of Business and Management*, 6(5), 114–119.

Albatayneh, R. M. S. (2014). The Effect of corporate Sustainability Performance on The Relationship Between Corporate Efficiency Strategy and Corporate Financial Performance. Universiti Utara Malaysia.

AlHarbi, M. F. (2012). The moderating effect of organizational culture on the relationship between leadership styles and quality management practices in public hospitals in Saudi Arabia. University Utara Malaysia.

Ali, A. K. (2011). Inventory Management in Pharmacy Practice : A Review of Literature. *Archives of Pharmacy Practice*, *2*(4), 151–156.

Ali, M., Asif, M., Hassan, F., Khan, U., Khan, S., Shahzad, Q., Khan, J. (2012). Inventory Management and Its Effects on Customer Satisfaction. *Economics of Knowledge*, 4(3), 11–22.

Alijani, G. S., Mancuso, L. C., Kwun, O., & Barika, E. I. (2010). Enhancing Drugs Accesss in Normal and Critical Circumstances. *Academy Of Health Care Management Journal*, 6(2), 75–86.

Amagoh, F. (2008). Perspective on organizational change : System and complexity theories. *The Innovation Journal : The Public Sector Innovation Journal*, 13(3).

Andrich, D. (1978). A rating formulation for ordered response categories. *Psychometrika*, 43(4).

Andrich, D. (1988). Rasch model for measurement. Newbury Park: SAGE Publication Ltd.

Andrich, D. (2004). Controversy and the Rasch model : A characteristic of imcompatible paradigms? *Medical Care*, *42*(1).

Anil K, M., Aubid, M., Rashid, H., Mushtaq, A. S., & Syed, A. (2012). Analysis of Inventory of Drug and Pharmacy Department of a Tertiary care Hospital. *JIMSA*, 25(3), 183–185.

Ann, I., Victoria, O. I., & Ukpere, W. I. (2014). The Impact of Effective Inventory Control Management on Organisational Performance: A Study of 7up Bottling Company Nile Mile Enugu, Nigeria. *Mediterranean Journal of Social Sciences*, 5(10), 109–118.

Antony, J., & Kumar, M. (2012). Lean and Six Sigma Methodologies in NHS Scotland: An Empirical Study and Directions For Future Research, 17(45), 19–34.

Azrilah, A. A. (1996). Rasch Model Fundamental: Scale Construct and Measurement Structure. Perpustakaan Negara Malaysia.

Azrilah, A. A. (2010). Rasch Model Fundamental: Scale Construct and Measurement Structure. Perpustakaan Negara Malaysia.

Babbie, E. (1990). Survey research methods (Second Edit). Belmont, CA: Wadsworth.

Bahagian Perkhidmatan Farmasi, K. K. (2009). Garispanduan Pengurusan Stor Farmasi di Hospital & Klinik Kesihatan Kementerian Kesihatan Malaysia. Retrieved from Ministry of Health Malaysia.

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51(6), 1173–1182.

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology,* 51(6), 1173–1182.

Basaran, B. (2013). Effects of Operational and Structural Conditions on Inventory Management in Large Manufacturing Enterprises. *School of Business, Istanbul University*, 42, 41–60.

Battisti, F. D., Nicolini, G., & Salini, S. (2008). Methodological overview of Rasch Model and application in customer satisfaction survey data. University Degli Study, Milano.

Berenson, M. L., Levine, D. M., & Krehbiel, T. C. (2011). Basic business statistics concepts and application (12th ed.). Peorson.

Berman, S. I., Wicks, A. C., Kotha, S., & Jones, T. M. (1999). Does stakeholder orientation matter? The relationship between stakeholder management models and firm financial performance. *Academy of Management Journal*, 42(5), 488.

Bhakoo, V., Singh, P., & Amrik, S. (2012). Collaborative Management of Inventory in Australian Hospital Supply Chains: Practices and Issues. *Supply Chain Management: An International Journal*, 2(17), 217–230.

Birkett, N. J. (1986). Selecting the number of response categories for a Likert-Type scale. *McMaster University*, 488–492.

Bond, T. G., & Fox, C. M. (2007). Applying the Rasch Model: Fundamental Measurement in the Human Sciences (Second Edit). Lawrence Erlbaum Associates, Inc.

Bond, T. G., & Fox, C. M. (2015). Applying the Rasch Model: Fundamental Measurement in the Human Sciences (Third Edit). Lawrence Erlbaum Associates, Inc.

Boundless. (2016). The service economy.

Boon, H., Miller J., Lake, D. Cottrell, A. & King, D. (2012). *Recovery from disaster: Resilience, adaptability and percepations of climate change. Its effect on perceptions of climate change risk and on adaptive behaviours to prevent, prepare, and respond to future climate contingencies,* National Climate Change Adaption Research facility, Gold Coast, 467 pp.

Bowersox, D. J., Closs, D. J., & Cooper, M. B. (2002). Supply chain logistics. McGraw Hill.

Bulgacov, S., Ometto, M. P., & May, M. R. (2015). Differences in sustainability practices and stakeholder involvement. *Social Responsibility Journal*, 11(1), 149–160.

Burgess, N., & Radnor, Z. (2013). Evaluating Lean in healthcare. *International Journal of Health Care Quality Assurance*, 26(3), 220–235.

Callender, C. (2007). Barriers And Best Practices For Material Management In The Healthcare Sector. University of Missouri-Rolla.

Chalotra, V. (2013). Inventory management and small firms growth : An analytical study in supply chain. *The Journal of Business Perspective*, 17(3), 213–222.

Chen, K. (2014). A Lean and Six Sigma Approach to Analyzing Waste in Missinbg Dose Requests. University of Southern California.

Chiarini, A. (2012). Designing an environmental sustainable supply chain through ISO 14001 standard. *Management of Environmental Quality: An International Journal*, 24(1), 16–33.

Chomeya, R. (2010). Quality of Psychology Test Between Likert Scale 5 and 6 Points. *Journal of Social Sciences*, 6(3), 399–403.

Chris Alverson. (2003). Beyond Purchasing Managing Hospital Inventory. *Managed Healthcare Executive*.

Clarke, S. (2006). Safety climate in an automobile manufacturing plant: The effects of work environment, job communication and safety attitudes on accidents and unsafe behaviour. *Personnel Review*, 35(4), 413–430.

Cohen, E. (1988). Authenticity and in Tourism. *Annuals of Tourism Research*, 15, 371–386.

Conrad, K. J., Conrad, K. M., Dennis, M. L., Riley, B. B., Chan, Y., & Funk, R. (2009). Validation of the Crime and Violence Scale (CVS) to the Rasch Measurement Model , GAIN Methods Report 1. 1, 1–34.

Cooper, D. R., & Schindler, P. S. (2006). Business Research Methods (Ninth Edit). Singapore: McGraw HIll.

Curatolo, N., Lamouri, S., Huet, J.-C., & Rieutord, A. (2013). Lean in the hospital setting: Analysis of the literature from a business process improvement perspective. *5th IESM Conference, October 2013, Rabat, Morocco*, (1–7).

Czwajda, L., & Kosacka, M. (2017). The challenges of concept multi-echelon inventory management. *Research in Logistics and Production*, 7(5), 417–429.

D.R.Cooper, & P.S.Schindler. (2008). *Business Research Methods* (Tenth Edit). MacGraw Hill International.

Dannapfel, P., Poksinska, B., & Thomas, K. (2014). Dissemination strategy for lean thinking in health care. *International Journal of Health Care Quality Assurance Dissemination*, 27(5), 391–404.

Dawes, J. (2007). Do data characteristic change according to the number of scale point used? An experiment using 5-point, 7-point and 10-point of scales. *International Journal of Market Research*, 50(1), 61–77.

DeHoratius, N., & A. Raman. (2008). Inventory Record Inaccuracy: An Empirical Analysis. *Management Science*, 54, 627–641.

Deloitte. (2014). Global Human Capital Trends 2014.

Department of Environment. (2009). Guidelines on the handling and management of clinical wastes in Malaysia.

DeVellis, R. F. (2003). Scale development: Theory and applications. Thousand Oaks: Sage Publications, Inc.

Dewana, Z., Gebremariam, A., Abdulahi, M., Fikadu, T., & Facha, W. (2017). Quality of delivery service at public health facilities in arba minch district , gamo gofa quality of delivery service at public health facilities. *Journal of Gynecology and Obstetrics*, 5(2), 31–36.

Dialog bincang pengasingan dispensari. (2015). *Mingguan Malaysia*, p. 2.

Dobrzykowski, D. D., McFadden, K. L., & Vonderembse, M. A. (2016). Examining pathways to safety and financial performance in hospitals: A study of lean in professional service operations. *Journal of Operations Management*, 1–13.

Dolnicar, S., Grun, B., Leisch, F., & Rossiter, J. (2011). Three good reasons not to use five and seven point Likert items. *National Conference Tourism: Creating a Brilliant Blend.*, (March), 8–11.

Donaldson, T., & Preston, L. E. (1995). The stakeholder theory of the corporation: Concepts, evidence, and implications. *The Academy of Management Review*, 20(1), 65–91.

Eckert, S. G. (2007). Inventory management and its effects on customer satisfaction. *Journal of Business and Public Policy*, 1(3), 1–13.

Economic Planning Unit. (2015). Rancangan Malaysia Kesebelas (Eleventh Malaysia Plan). Retrieved from http://www.epu.gov.my.

Elshennawy, A. K., Bahaitham, H., & Furterer, S. (2012). Assessing sustainability of lean implementation in healthcare: A case study using the lean sustainability assessment framework (LSAF), 5(2).

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). GPOWER: A general power analysis program. *Behavior Research Methods*, *39*(2), 175–191.

Fisher, W. P. J. (2007). Rating Scale Instrument Quality Criteria. *Rasch Measurement Transactions,* 21(1), 1095. Retrieved from http://www.rasch.org/rmt/rmt211m.htm

Fowley, F. J. (2009). Survey Research Methods (Fourthth Edit). Thousand Oaks: SAGE Publication Ltd.

Freeman, R.E. (1984). StrategicManagement: A Stakeholder Approach. Pitman Books, Boston, MA.

Freeman, R. E., Wicks, A. C., & Parmar, B. (2004). Stakeholder Theory and ? The Corporate Objective Revisited? *Organization Science*, 15(3), 364–369.

Fremont, E. K., & James, E. R. (1972). General System Theory: Applications for organization and management. *Academy of Management Journal*, 15(4), 447.

Garland, R. (1991). The mid-point on a rating scale: Is it desirable? *Marketing Bulletin*, 2, 66–70.

Granger, R. C. (2008). After-school programs and academic: Implications for policy practice and research. *Education Week*, 22(3–11), 14–19.

Guidet, B., & Gonzalez-Roma, V. (2011). Climate and cultural aspects in intensive care units. *Critical Care (London, England)*, 15(6), 312.

Hair, J., Money, A. H., Samaouel, P., & Page, M. (2007). Research methods for business. England: John Wiley & Sons Ltd.

Hair, J. F., Black, W. C., Babin, B. ., & Anderson, R. E. (2010). *Multivariate data analysis*. (Seventh Edit). New Jersey: Pearson Prentice Hall.

Hambleton, R. K., & Jones, R. W. (1993). An NCME Instructional Module on comparison of Classical Test Theory and Item Response Theory and their application to Test Development. *Educational Measurement: Issues and Practice*, 12(3), 38–47.

Hani, U., Basri, M. H., & Winarso, D. (2013). Inventory Management of Medical Consumables in Public Hospital: A Case Study. *Management Journal*, 3(2), 128–133.

Harhay, M. O., Halpern, S. D., Harhay, J. S., & Olliaro, P. L. (2009). Health Care Waste Management: A Neglected and Growing Public Health Problem Worldwide. *Tropical Medicine and International Health*, 14, 1414–1417.

Hazilah, N., & Manaf, A. (2005). Quality management in Malaysian public health care. *International Journal of Health Care Quality Assurance*, 18(3), 204–2016.

Health Facts 2010. (2010). Retrieved from Ministry of Health Malaysia.

Health Facts 2015. (2015). Retrieved from Ministry of Health Malaysia.

Health Facts 2016. (2016). Retrieved from Ministry of Health Malaysia.

Heck, G. V. (2009). Inventory Management - Introducing A Framework To Assess Operational Performance. Delft University of Technology.

Heck, G. V., Berg, J. V. D., Davarynejad, M., Duin, R. V, & Roskott, B. (2010). Improving Inventory Management Performance Using a Process-Oriented Measurement Framework, 279–288.

Hillman, A. J., & Keim, G. D. (2001). Shareholder value, stakeholder management and social issues. *Strategic Management Journal*, 22(2), 125–139.

Ho, S. K. M. (2010). Integrated lean TQM model for sustainable development. *The TQM Journal*, 22(2), 143–158.

Hsu-Hua Lee &, & Kleiner, B. H. (2001). Inventory management in the women's. *Emarald Insight*, 24(3/4), 40–44.

Hussain, F., & Waveren, C. C. V. (2009). The implementation of TQM in the component supply chain : A case study in the South African motor industry. In *PICMET 2009 Proceedings*. 1659–1665.

Irfan, S. M., Ijaz, A., Kee, D. M. H., & Awan, M. (2012). Improving operational performance of public hospital in Pakistan: A TQM Based Approach. *World Applied Sciences Journal*, 19(6), 904–913.

ISO. (2009). International Organization for standardization: Managing for the sustained success of the organization - A quality management approach. *ISO 9004*. Geneva.

J.M.Woosley. (2009). Improving Healthcare Supply Chain and Decision Making in the Management of Pharmaceutical. Louisiana State University.

Jaafar, S., Noh, K. M., Muttalib, K. A., Othman, N. H., & Healy, J. (2013). *Malaysia Health System Review (Vol. 3)*. Retrieved from Ministry of Health Malaysia.

Jackson, L. A., & Barber, D. S. (2014). Ethical and sustainable healthcare tourism development: A primer. *Tourism and Hospitality Research*, 15(1), 19–26.

Jamaludin, N. H., Habidin, N. F., Shazali, N. A., Ali, N., & Khaidir, N. A. (2012). Exploring Sustainable Healthcare Service and Sustainable Healthcare Performance: Based on Malaysian Healthcare Industry. *Journal of Sustainable Development Studies*, 33(1), 3–8.

James W. Dean, J., & Sharfman, M. P. (1996). Does decision process matter? A study of strategic decision-making effectiveness. *Academy of Management Journal*, 39(2), 368–396.

Johnson, R. A., Kast, F. E., & Rosenweig, J. E. (1964). Systems Theory and management. *Management Science (Pre-1986)*, 10(2), 367.

Jonsson, P., & Mattsson, S. A. (2010). Inventory management practices and their impact on perceived planning performance. *International Journal of Production Research*, 46(7), 1787–1812.

Joseph F. H., Money, A. H., Samouel, P., & Page, M. (2007). Research Methods For Business (1st ed.). United State of America: JohnWiley & Sons Ltd.

Kagashe, G. A. B., & Massawe, T. (2012). Medicine stock out and inventory management problems in public hospitals in Tanzania: A case of Dar Es Salaam region. *International Journal of Pharmacy*, 2(2), 252–259.

Kakabadse, N. K., & Rozuel, C. (2006). Meaning of corporate social responsibility in a local French hospital: A case study. *Society and Business Review*, 1(1), 77–96.

Kaluzny, A. D., Mclaughlin, C. P., & Simpson, K. I. T. (1992). Applying total quality management concepts to public health organizations, 107(3), 257–264.

Kannan, V. R., & Choon, K. (2005). Just in time, total quality management, and supply chain management: Understanding their linkages and impact on business performance, 33, 153–162.

Kaplan, R. M., & Succuzo, D. P. (2009). Psychological testing: Principles, applications and issues (Seventh Edit). United States: Wardsworth Cengage Learning.

Kaplan, R. S., & Norton, D. P. (1992). The Balance Scorecard - Measures That Drives Performance. *Harvard Business Review*, 70(1), 71–79.

Kaplan, R. S., & Norton, D. P. (2007). Using the Balanced Scorecard as a Strategic Management system. *Harvard Business Review,* July-Sept 2007.

Kaynak, H., & Hartley, J. L. (2008). A replication and extension of quality management into the supply chain. *Journal of Operations Management*, 26(4), 468–489.

Kern, J. H. (2011). The intersection of multiple focul climates: Safety climate and service climate in a healthcare context. The Pennsylvania State University.

Keskin, B., & Aktas, A. (2013). Statistical power analysis. *The 7th International Days of Statistics and Economics*, (September 19-21), 578–587.

Kholidasari, I. (2013). The implications of judgemental interventions into an inventory system. University of Salford.

Khurana, S., Chhillar, N., Kumar, V., & Gautam, S. (2013). Inventory control techniques in medical stores of a tertiary care neuropsychiatry hospital in Delhi, 5(1), 8–13.

Koumanakos, D. P. (2008). The effect of inventory management on firm performance. *International Journal of Productivity and Performance Management*, 57(5), 355–369.

Krejcie, R. V, & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*, 310, 607–610.

Kumar, D. (2011). Research Methodology A Step-By-Step Guide For Beginners (3rd ed.). New Delhi: SAGE Publication Ltd.

Kumar, M., Talib, S. A., & Ramayah, T. (2013). Business Research Methods. Selangor: Oxford Fajar.

Laeiddee, C. (2010). Improvement of re-order pont for drug inventory management at Ramathibodi Hospital. Mahidol University.

Lee, H. W., Ramayah, T., & Zakaria, & N. (2012). External factors in Hospital Information System (HIS) Adoption Model: A case on Malaysia. *Journal of Medical Systems*, 36(4), 2129–2140.

Linacre, J. M. (2012). Winsteps help for Rasch analysis. Retrieved from http://www.winsteps.com/winman/

Lindskog, P., Vänje, A., Törnkvist, Å., & Eklund, J. (2016). Sustainable lean in psychiatry? Assessment through socio-technical principles. *International Journal of Quality and Service Sciences*, 8(1), 1–29.

Lingard, H., Cooke, T., & Blismas, N. (2011). Coworkers' response to occupational health and safety. *Engineering, Construction and Architectural Management*, 18(2), 159–175.

Longoni, A., & Cagliano, R. (2015). Cross-functional executive involvement and worker involvement in lean manufacturing and sustainability alignment. *Journal of Managerial Psychology*, 30(9), 645–658.

Mainardes, E. W., Alves, H., & Raposo, M. (2011). Stakeholder theory: Issues to resolve. *Management Decision*, 49(2), 226–252.

Ministry of Health (2015). *National Healthcare Establishment & Workforce Statistics (NHEWS)- Hospital 2012- 2013.* Retrieved from Ministry of Health Malaysia.

Malik, M. H. M. (2016). Prioritizing Lean Management Practices in Public and Private Hospitals. *Journal of Health Organization and Management*, 30(3).

Manaf, A., & Hazilah, N. (2009). Practice follows structure: QM in Malaysian public hospitals, 13(1), 23–33.

Marinkovic, V., Bekcic, S., Pejovic, G., Sibalija, T., Majstorovic, V., Marinkovic, V., Majstorovic, V. (2016). An approach to TQM evaluation in pharma business. *The TQM Journal*, 28(5), 745–759.

Mark, B. A., Hughes, L. C., Belyea, M., Chang, Y., Hofmann, D., Jones, C. B., & Bacon, C. T. (2007). Does safety climate moderate the influence of staffing adequacy and work conditions on nurse injuries? *Journal of Safety Research*, 38(4), 431–446.

Market Watch. (2012). The Healthcare Sector in Malaysia.

Mathaba, S., Dlodlo, N., Smith, A., & Adigun, M. (2011). The use of RFID and Web 2 . 0 technologies to improve inventory management in South African Enterprises. *Electronic Journal Information Systems Evaluation*, 14(2), 228–241.

Patrick, J. & Mattson, S. (2006). Inventory management practices and their impact on perceived planning performance. *International Journal of Production Research*. 46(07), 1787-1812.

Michalski, G. (2009). A value-oriented framework for inventory management. *SEE Journal*. 97-102.

Mitra, S., Pattanayak, S. K., & Bhowmik, P. (2013). Inventory control using ABC and HML analysis: A case study on a manufacturing industry. *International Journal of Mechanical and Industrial Engineering*, 3(1), 76–81.

Malaysia National Health Accounts (2014). Health expenditure Report 1997- 2012. Retrieved from Ministry of Health Malaysia.

Mohd-Tahir, N. A., Paraidathathu, T., & Li, S. C. (2015). Quality use of medicine in a developing economy: Measures to overcome challenges in the Malaysian healthcare system. *SAGE Open Medicine*, 3, 1–8.

Mohd Asaad, M. N. (2012). Hubungan amalan alatan lean terhadap prestasi organisasi dengan budaya organisasi sebagai pembolehubah moderator. University Utara Malaysia.

Mohd Assad, M. N., Saad, R., & Yusoff, R. Z. (2015). 5s , Kaizen and organization performance: examining the relationship and level of implementation using Rasch Model in Malaysian Automotive Company. *International Academic Research Journal of Business and Technology*, 1(2), 214–226.

Mohd Ishar, N. I., & Masodi, M. S. (2012). Students' perception towards quality library service using Rasch Measurement Model. *2012 International Conference of Innovation, Management and Technology Research (ICIMTR2012)*, 668–672.

Monsurat Olusola Mosaku, Mohamed Najib Abdul Ghafar, A. R. H., & Khan, A. (2014). Rasch psychometric analysis of composite achievement and social goal orientation instrument. *Research Journal of Applied Sciences*, 9(9), 590–596.

Moullin, M. (2004). Guest editorial eight essentials of performance measurement. *International Journal of Health Care Quality Assurance*, 17(3), 110–112.

Ali Al-Balushi, S. M. & Rahman Khan, M. F. (2017). Factors influencing the preference of private hospitals to public hospitals in Oman. *International Journal of Management, Innovation & Entrepreneurial Research*, 3(2), 67–77.

M. Muller, Essentials of Inventory Management, American Management Association, New York, 2003.

Murdock, A. (2004). Stakeholder theory, partnerships and alliances in the healthcare sector of the UK and Scotland. *International Public Management Review*, 5(1), 21–40.

Namagembe, S., J.C.Munene, Muhwezi, M., & Eyaa, S. (2012). Information Sharing Inventory Management and Customer Satisfaction: The Case of Manufacturing Firms in Kampala. *International Jurnal of Economics and Management Sciences*, 1(6), 35–44.

National Treasury, Republic of South Africa. Budget Review 2012. http://www.treasury.gov.za/documents/national%20budget/2012/review/Prelims %202012.pdf (accessed 22 January 2014).

Nerminathan, V., Adlan, W. N. A. B. W. F., & Nerminathan, A. A. (2014). Hospital at home: Sustainable healthcare in developing countries through reducing average length of stay in hospitals. *International Journal of Management and Sustainability*, 3(2), 51–61.

Neuman W.L. (2006). Social Research Methods Qualitative and Quantitative Approaches (Sixth Edit). Boston: Pearson.

Noreen, G. S., Kudakwashe, S., & Kudzanayi, G. (2016). The effectiveness of total quality management in service quality of ministry of health and child care." *IOSR Journal of Humanities and Social Science*, 21(9), 95–98.

Norlin, J. M., & Chess, W. A. (1997). Human behavior and the social environment : Social Systems Theory (Third Edit). Boston.

Nunally, J. C., & Bernstein, I. H. (1994). Psychometric Theory (Third Edit). McGraw Hill Inc.

Bakar, A. N. B. (2011). Financial Management Accountability Index (FMAI) in the Malaysian public sector: A way forward. *International Review of Administrative Sciences*, 77(1), 159–190.

Othman, A. A. (2012). Hubungan strategi rantaian bekalan dengan prestasi rantaian bekalan di dalam industri automotif di Malaysia. University Utara Malaysia.

Patel, G. (2009). Total Quality Management in Healthcare, *The Midas Journal*. 1–4.

Pearse, N. (2011). Deciding on the scale granularity of response categories of likert type scales: The case of a 21-point scale. *Electronic Journal of Business Research Methods*, 9(2), 159–171.

Pillai, R. N. (2013). Inventory management performance in machine tool SMEs: What factors do influence them ?. 3(3), 542–560.

Plytiuk, C. F., Gouvea, S. E., & De Lima, E. P. (2013). Practices and performance gains of lean healthcare : An analysis of empirical papers. *Proceedings of the 2013 Industrial and Systems Engineering Research Conference*, (651–660).

Preece, P. F. W. (2002). Equal-interval measurement: The foundation of quantitative education research. *Research Papers in Education*, 17(4), 363.

Rachmania, I. N., & Basri, M. H. (2013). Pharmaceutical inventory management issues in hospital supply chains. *Journal of Management*, 3(1), 1–5.

Rad, A. M. M. (2005). A survey of total quality management in Iran: Barriers to successful implementation in health care organizations. *Journal of Leadership in Health Services*, 18(3), 7–34.

Rajeev, N. (2008). Inventory management in small and medium enterprises: A study of machine tool enterprises in Bangalore. *Management Research News*, 31(9), 659–669.

Rajwinder, S., Sandhu, H. S., Metri, B. A., & Kaur, R. (2010). Relating retail supply chain management practices, competitive advantage and organisational performance. *The Journal of Business Perspective*, 14(3), 173–190.

Robbins, D. (2009). Understanding Research Methods: A Guide for The Public and Nonprofit Manager. United Stated of America: CRC Press Taylor & Francis Group.

Rohini, R., & Mahadevappa, B. (2010). Social responsibility of hospitals: An Indian context. *Social Responsibility Journal*, 6(2), 268–285.

Romero, A. (2013). Managing Medicines in the Hospital Pharmacy: Logistics Inefficiencies. *Proceedings of the World Congress on Engineering and Computer Science*, (2), 23–25.

Rossetti, M. D. (2008). Inventory Management Issues in Health Care Supply Chains. University of Arkansas.

Russell, R. S & Taylor, B. W. (2010). *Operations management (7th ed.)*. Asia: John Wiley & Sons (Asia) Pte Ltd.

Saad, R. & Saifudin, A. Y. (2015). Computer competency will enhance statistical literacy. *GSE E - Journal of Education*. (3), 23–33.

Saad, R. (2012). Application of rasch measurement model in examining the implementation of ISO 9000 and organizational performance in Malaysia. University Utara Malaysia.

in Table 6.9 above and items on inventory management performance which relate to any problems with regard to inventories being open, it can enhance the probalibility of success of Main Medical Store to practice better inventory system in Pharmacy Department towards inventory management performance.

Pertinent to second research question, the following research question will discuss the findings on the most influential dimension of inventory management practices that affect inventory management performance.

6.3.3 Discussion on the Most Influential Dimension of Inventory Management Practices Comprises Dimension of Inventory Administration, Inventory Control and Inventory System That Affect Inventory Management Performance

Research Objective 3

"To investigate the most influential dimension of inventory management practices comprises dimension of inventory administration, inventory control and inventory system that affect inventory management performance"

The third objective of this study is to investigate the most influential dimension of inventory management practices comprising the dimension of inventory administration, inventory control and inventory system that affect inventory management performance. Table 6.10 below shows the mean item *logit* according to the dimensions in public hospitals. Findings reported that the mean item *logit* for each dimension as inventory administration (-0.09 logit), inventory control (-0.10 logit), and inventory control (-0.38 logit), as taken from Figure 5.9. The mean item for inventory administration, inventory control and inventory system are reported as a negative logit, which indicates that most of the items can easily be performed.

Saad, R., & Asaad, M. N. M. (2015). Does organizational culture moderate the relationship between iso 9000 soft factors and organizational performance? *The Journal of Developing Areas*, 49(3), 379–394.

Saad, R., Yusuff, R. Z., Abas, Z., Aziz, A. A., & Saidfudin, M. (2011). Validating the ISO 9000 construct of measurement instrument through application of Rasch Model. *The Asian Journal of Technology Management*, 4(1), 28–39.

Salzberger, T. (1999). How the Rasch Model may shift our perspective of measurement in marketing research. *1999 Australia and New Zealand Marketing Academy Conference (ANZMAC),* 1–9.

Santhi, G., & Karthikeyan, K. (2016). Recent review article on Pharmaceutical Inventory Models. *International Journal of Pharm Tech Research*, 9(5), 435–443.

Saraph, J. V., Benson, P. G., & Schroeder, R. G. (1989). An instrument for measuring the critical factors of quality. *Decision Sciences*, 20(4), 810–829.

Saraste, S. (2013). A Framework for Evaluating Inventory Management in Healthcare Case: HUS Logistics. Aalto University.

Saunders, M., Lewis, P., & Thornhill, A. (2007). Research Methods for Business Students (Fourth Edit). Spain: Prentice Hall.

Sekaran, U. (2003). Research Methods for Business : A Skill Building Approach. New York: John Willley.

Sekaran, U., & Bougie, R. (2013). Research Methods for Business; A Skill-Building Approach (Sixth Edit). United Stated of America: John Wiley & Sons, Inc.

Shams-ur, R., & Tritos, L. (2008). Quality management practices in logistics services. *International Journal Intergrated Supply Management*, 4(1), 49–58.

Schellhorn, C. & Sharma, R. (2013). Using the Rasch model to rank firms by managerial ability. *Managerial Finance*, 39(3), 306–319.

Shazali, N., Habidin, N., & Ali, N. (2013). Lean healthcare practice and healthcare performance in Malaysian healthcare industry. *International Journal of Scientific and Research Publications*, 3(1), 1–5.

Shim, E. D. (2014). Sustainability, stakeholder perspective and corporate success : A paradigm shift. *International Journal of Business, Humanities and Technology*, 4(5), 64–67.

Singels, J., Ruel, G., & Water, H. V. (2001). ISO 9000 Series - certification and performance. *International Journal of Quality and Reliability Management*, 18(1), 62–75.

Singh, & Singh, R. (2014). Inventory management delivering profits through stock management. *International Journal of Research*, 1(10), 751–757.

Smith, A. D., & Flanegin, F. R. (2004). E-procurement and automatic identification: Enhancing supply chain management in the healthcare industry. *International Journal of Electronic Healthcare*, 1(2), 176–198.

Srinivas, R. (2013). Supply chain management in Indian firms: The road ahead. *International Journal of Logistics & Supply Chain Management Perspectives*, 2(1), 100–109.

Srinivasan, S., Ikuma, L. H., Shakouri, M., Nahmens, I., & Harvey, C. (2016). 5S impact on safety climate of manufacturing workers. *Journal of Manufacturing Technology Management*, 27(3), 364–378.

Stanger, S. H. W. (2013). Vendor managed inventory in the blood supply chain in Germany. *Strategic Outsourcing: An International Journal*, 6(1), 25–47.

Stanger, S. H. W., Wilding, R., Yates, N., & Cotton, S. (2012). What drives perishable inventory management performance? Lessons learnt from the UK blood supply chain. *Supply Chain Management: An International Journal*, 17(2), 107–123.

Steven Nahmias. (1982). Perishable inventory theory : A review. *Operations Research*, 30(4), 680–708.

Stevens, S. S. (1946). On the theory of scales of measurement. *Science, New Series*, 103(2684), 677–680.

Stumpf, S. A. (1978). A note on handling missing data. *Journal of Management*, 4(1), 65–73.

Subedi, B. P. (2016). Using likert type data in social science research : Confusion, issues and challenges. *International Journal of Contemporary Applied Sciences*, 3(2), 36–49.

Summers, J. O. (2001). Guidelines for conducting research and publishing in marketing: From conceptualization through the review process. *Journal of the Academy of Marketing Science*, 29(4), 405-415.

Susan, M., & Ratnawati, H. (2017). Health care service quality of public hospitals in Bandung as part of public services. *Review of Integrative Business and Economics Research*, 6(1), 215–223.

Talafha, H. (2006). Assessment of pharmacy and inventory control in Ministry of Health Hospitals in Jordan. The Partners for Health Reformplus Project, Abt Associates Inc.

Talib, F., Rahman, Z., & Qureshi, M. N. (2011). Prioritising the practices of total quality management: An analytic hierarchy process analysis for the service industries, 22(12), 1331–1351.

Talib, F., Rahman, Z., & Qureshi, M. N. (2012). Total quality management in service sector: A literature review. *International Journal of Business Innovation and Research*, 6(3), 259–301.

Tang, R., Shaw, W. M., & Vevea, J. L. (1999). Towards the Identification of the Optimal Number of Relevance Categories, *50*(3), 254–264.

Tangen, S. (2004). Performance measurement from philosophy to practice. *International Journal of Productivity and Performance Management*, 53(8), 726–737.

Theptong, J. (2010). Drug Inventory Control Case: Thai International Hospital Mahasarakham. Tampereen Ammattikorkeakoulu University of Applied Sciences.

Thurstone, L. L. (1927). A law of comparative judgement. *Psychological Review*, 34(4), 273–286.

Tony Wild. (2002). Best practice in inventory management (Second Edit). Wuborn MA: Elsevier Science Limited.

Tor, G. H. (2009). Measuring youth civic development in Malaysia: Conceptualization, instrument development using Rasch measurement model and substantive outcomes. Murdoch University.

Tsang, K. K. (2012). The use of midpoint on likert scale: The implications for educational research. *Hong Kong Teachers' Centre Journal*, (11), 121–130.

Virtue, A., Chaussalet, T., & Kelly, J. (2013). Healthcare planning and its potential role increasing operational efficiency in the health sector: A viewpoint. *Journal of Enterprise Information Management*, 26(1), 8–20.

Waller, M. A., Nachtmann, H., & Hunter, J. (2007). Measuring the impact of inaccurate inventory information on a retail outlet. *The International Journal of Logistics Management,* 17(3), 355-376

Weerakoon, T. S. (1996). Organizational Performance - a stakeholder concept. *International Research Conference on Quality Management Proceeding.*

Wiedenmayer, K., Summers, R. S., Mackie, C. A., Gous. G. S, A., Everard, M., & Tromp, D. (2006). Developing pharmacy practice: A focus on patient care (2006th Edit). World Health Organization and International Pharmaceutical Federation.

Woodward-Hagg, H., Workman-gernmann, J., Bar-On, I., Munshi, I., Taylor, K. T., Bidassie, B., & Johnson, S. (2013). Large System transformation within healthcare organizations utilizing lean deployment strategies. Proceedings of the 31st International Conference of the System Dynamics Society, Multiple, 458–468.

Wright, B. D. (1977). Solving measurement problems with the Rasch model. *Journal of Educational Measurement*, 14(2), 97–116.

Wright, B. (1997a). Fundamental measurement for outcome evaluation. Physical Medicine and Rehabilitation: *State of the Art Reviews,* 11, 261–288.

Yahya, N. (2016). Fundamentals of Operational Logistics. Oxford University Press.

Yapa, S. (2015). Total quality management in Sri Lankan service organizations. *The TQM Journal*, 24(6), 505–517.

Yu, C. H. (2013). A simple guide to Item Response Theory (IRT) and Rasch Modelling, Creative wisdom. (1-30). Retrieved from http://www.creative-wisdom.com/.

Zainal Abidin, S. (2014). Innovation process, innovation outcome and firm's performance in the malaysian electrical and electronic industry. University

Utara Malaysia.

Zikmund, W. G. (2003). Business research methods (Seventh Edit). Thomson, South-Western Ohio.

Zikmund W.G. (2003). Exploring Marketing Research (Eighth Edit). Thomson, New York

Zsolnai, L. (2006). Extended stakeholder theory. *Society and Business Review*, 1(1), 37–44.

APPENDIX A

Cover Letter (English)

LETTER TO THE RESPECTIVE AUTHORITIES AT MALAYSIAN PUBLIC HOSPITALS

Dear Director/Head of Pharmacists of MalaysianPublic Hospitals,

I am a lecturer from SeberangPerai Polytechnic (PSP), Pulau Pinang who is currently persuing a doctoral programme at Universiti Utara Malaysia (UUM) under the School of Technology, Operation & Logistics Management (STML), College of Business (COB). One part of this programme, requires me to conduct a research study, which I have chosen to be on **"Examining The Ability Of Public Hospitals In Performing Inventory Management Practices Towards Inventory Management Performance Moderated By Total Quality Management Practices Using Rasch Model"**. The purpose of this study is to investigate the moderating effect of Total Quality Management (TQM) Practices on the relationship between inventory management practices and inventory management performance among the public hospitals in Malaysia.

We have identified your institution as having the characteristics which are compatible to participate in this research study. Therefore, I would very much appreciate your contribution and cooperation to complete these questionnaires by spending your time to answer a list of enclosed questions and upon completion to return these questionnaires. Your responses to the questionnaires are very important to the success of this research study and I will ensure that all the information obtained would be treated as strictly confidential and for academic purposes alone.

If you have any questions about the survey, please feel free to contact me at: 019-4112944. A summary report will be provided to the participants of this survey upon request.

I would like to thanks you in advance for your assistance and cooperation. I hope this study will be yield meaningful results which can provide a significant contribution to the healthcare sector.

Yours sincerely,
Fariza binti Ahmad Mahyadin@Mahidin
PhD Candidate
Email: 1974fariza@gmail.com
Supervisor I : Dr. Rohaizah binti Saad
Supervisor II : Dr. Hj. Mohd. Norhasni bin Mohd Assad
Supervisor III : Prof. Dr. Rushami Zein bin Yusoff

APPENDIX B

Cover Letter (Bahasa Malaysia)

SURAT KEPADA PIHAK BERKUASA YANG BERKENAAN
DI HOSPITAL AWAM MALAYSIA

Yang dihormati Pengarah/Ketua Pegawai Farmasi Hospital Awam Malaysia,
Saya adalah pensyarah dari Politeknik Seberang Perai (PSP), Pulau Pinang yang kini sedang melanjutkan pelajaran dalam program Doktor Falsafah di Universiti Utara Malaysia (UUM), *School of Technology, Operation & Logistics Management* (STML), *College of Business* (COB). Sebahagian dari program ini memerlukan saya untuk mengendalikan kajian penyelidikan, oleh itu kajian yang dipilih bertajuk **"Penilaian Ke Atas Keupayaan Hospital Awam Dalam Amalan Pengurusan Inventori Terhadap Prestasi Pengurusan Inventori Dimoderasikan oleh Amalan Pengurusan Kualiti Secara Menyeluruh Menggunakan Model *Rasch*"**. Matlamat kajian ini adalah untuk mengenalpasti kesan moderasi oleh Amalan Pengurusan Kualiti Secara Menyeluruh ke atas hubungan di antara amalan pengurusan inventori dan prestasi pengurusan inventori dalam kalangan hospital awam di Malaysia.

Kami telah mengenalpasti institusi tuan/puan mempunyai ciri-ciri yang bersesuaian untuk terlibat dalam kajian penyelidikan ini. Oleh itu, saya sangat menghargai sumbangan dan kerjasama dari pihak Tuan untuk melengkapkan borang soalselidik dengan meluangkan masa tuan/puan menjawab soalan-soalan yang dikemukakan dan dikembalikan sebaik sahaja lengkap kepada penyelidik. Maklumbalas ke atas borang soalselidik ini sangat penting untuk kejayaan kajian penyelidikan ini dan saya akan memastikan bahawa segala maklumat yang diperolehi akan dikendalikan dengan penuh kerahsiaan dan bagi tujuan kegunaan akademik semata-mata. Jika pihak tuan/puan mempunyai sebarang kemusykilan berkaitan dengan kajian ini, sila hubungi saya di talian: 019-4112944. Ringkasan laporan hasil kajian akan disediakan kepada pihak yang terlibat dalam kajian ini atas permintaan.

Terlebih dahulu, saya ingin mengucapkan terima kasih kepada pihak tuan/puan atas bantuan dan kerjasama yang dihulurkan. Saya amat mengharapkan kajian ini menghasilkan dapatan yang sangat bermakna dan memberikan sumbangan yang berkesan kepada sektor penjagaan kesihatan di Malaysia.

Yang benar,
Fariza binti Ahmad Mahyadin@Mahidin
Pelajar PhD
Email: 1974fariza@gmail.com
Penyelia I: Dr. Rohaizah binti Saad
Penyelia II: Dr. Hj. Mohd. Norhasni bin Mohd Assad
Penyelia III: Prof. Dr. Rushami Zein bin Yusoff

APPENDIX C

Questionnaire

LETTER TO THE RESPECTIVE AUTHORITIES AT MALAYSIAN PUBLIC HOSPITALS

Dear Director/Head of Pharmacists of MalaysianPublic Hospitals,

I am a lecturer from SeberangPerai Polytechnic (PSP), Pulau Pinang who is currently persuing a doctoral programme atUniversiti Utara Malaysia (UUM) under the School of Technology, Operation & Logistics Management (STML), College of Business (COB). One part of this programme, requires me to conduct a research study, which I have chosen to be on **"Examining The Ability Of Public Hospitals In Performing Inventory Management Practices Towards Inventory Management Performance Moderated By Total Quality Management Practices Using Rasch Model"**. The purpose of this study is to investigate the moderating effect of Total Quality Management (TQM) Practices on the relationship between inventory management practices and inventory management performance among the public hospitals in Malaysia.

We have identified your institution as having the characteristics which are compatible to participate in this research study. Therefore, I would very much appreciate your contribution and cooperation to complete these questionnaires by spending your time to answer a list of enclosed questions and upon completion to return these questionnaires. Your responses to the questionnaires are very important to the success of this research study and I will ensure that all the information obtained would be treated as strictly confidential and for academic purposes alone.

If you have any questions about the survey, please feel free to contact me at : 019-4112944. A summary report will be provided to the participants of this survey upon request.

I would like to thanks you in advance for your assistance and cooperation. I hope this study will be yield meaningful results which can provide a significant contribution to the healthcare sector.

Yours sincerely,
Fariza binti Ahmad Mahyadin@Mahidin
PhD Candidate
Email: 1974fariza@gmail.com
Supervisor I : Dr. Rohaizah binti Saad
Supervisor II : Dr. Hj. Mohd. Norhasni bin Mohd Assad
Supervisor III : Prof. Dr. Rushami Zein bin Yusoff

SECTION A: Personal and Organizational Details

1. Name of hospital, please state ;

____

2. State, please tick (√)

PR	i.	Perlis		NS	ix.	Negeri Sembilan	
KD	ii.	Kedah		PH	x.	Pahang	
PP	iii.	Pulau Pinang		JH	xi.	Johor	
PK	iv.	Perak		SB	xii.	Sabah	
SR	v.	Selangor		SR	xiii.	Sarawak	
KT	vi	Kelantan		PJ	xiv.	Putrajaya	
TR	vii.	Terengganu		KL	xv.	Kuala Lumpur	
MK	viii.	Melaka		LB	xvi.	Labuan	

3. What is your current position in this organization? Please tick (√)

D	i.	Hospital Director		P	iii.	Pharmacy Officer	
HP	ii.	Head of Pharmacy Officer		RP	iv.	Provisionally Registered Pharmacist	

4. How many years have you worked in this current position ?

____

5. How long has this Main Medical Store (MMS) been in operation in this hospital?

____

6. Total no. of pharmacists involved in store management :

____

7. Total no. of store administrative assistant :

____

SECTION B: INVENTORY ADMINISTRATION

Instruction: Using the scale of 1 – 6, please circle the appropriate number that best corresponds between the test items and your answer in order to describe the level of **Inventory Administration** practiced in public hospitals related to drug management planning, perspective of personnel and supplier relationship.

LIST OF ABBREVIATIONS

MMS Main Medical Store SOP Standard of Procedure
HPD Head of Hospital Pharmacy Department
MOH Ministry of Health

Item no.	Label	Test Items	Extent					
		Inventory Administration (A)	EL (1)	VL (2)	L (3)	H (4)	VH (5)	EH (6)
		(1) Managing Planning						
1.	A1.1	To what extent is the utilization of humans effective in managing the stock of drug	1	2	3	4	5	6
2.	A1.2	To what extent is the utilization of equipment effective in managing the stock of drug	1	2	3	4	5	6
3.	A1.3	To what extent does the drug supply mechanism effect store customer efficiencies	1	2	3	4	5	6
4.	A1.4	To what extent does drug purchase planning improves the service level	1	2	3	4	5	6
5.	A1.5	To what extent does drug planning and	1	2	3	4	5	6

		management reduces storage problems						
6.	A1.6	To what extent does the sufficient drug supply built maximize service performance	1	2	3	4	5	6
7.	A1.7	To what extent does the adoption of innovative service is enhancing the management of drugs	1	2	3	4	5	6
8.	A1.8	To what extent does the Standard of Procedure (SOP) communicated to the staff responsible for drug management	1	2	3	4	5	6
9.	A1.9	To what extent does the management review and follow up reports of drug turnover, ageing, and drug adjustments benefit the organization	1	2	3	4	5	6
10.	A1.10	To what extent does rack labeling of drug placed in storage area important	1	2	3	4	5	6
Itemno	**Label**	**Test Items**	**Extent**					
		Inventory Administration (A)	Extremely low (1)	Very low (2)	Low (3)	High (4)	Very high (5)	Extremely high (6)
11.	A1.11	To what extent does SOP for stocktaking practiced	1	2	3	4	5	6
12.	A1.12	To what extent does SOP take immediate provision in case of short expiry, slow moving and expired drug	1	2	3	4	5	6
13.	A1.13	To what extent does the MMS procures the drug immediately if its shortage delays or compromises patient's health	1	2	3	4	5	6
	A1.14	To what extent does the	1	2	3	4	5	6

14.		Head of Hospital Pharmacy Department (HPD) has the organization structure documents of department and shares its annual budget						
		(2) Managing employee						
15.	A2.1	To what extent are MMS personnel qualified and well-trained	1	2	3	4	5	6
16.	A2.2	To what extent do the MMS personnel have adequate skills for cross-functional team	1	2	3	4	5	6
17.	A2.3	To what extent does the MMS provides a formal training on drug management to the personnel	1	2	3	4	5	6
18.	A2.4	To what extent are the skills and knowledge about drug management practices among the personnel	1	2	3	4	5	6
19.	A2.5	To what extent does the MMS have sufficient numbers of personnel	1	2	3	4	5	6
20.	A2.6	To what extent does the MMS have sufficient categories of personnel	1	2	3	4	5	6
21.	A2.7	To what extent does the MMS have written policies of listed jobs to cover all functions and responsibilities of the personnel	1	2	3	4	5	6
22.	A2.8	To what extent do all the pharmacy personnel use the forms and inventory records and documents assigned by the Ministry of Health (MOH)	1	2	3	4	5	6

Item no.	Label	Test Items	Extent					
		Inventory Administration (A)	Extremely low (1)	Very low (2)	Low (3)	High (4)	Very high (5)	Extremely high (6)
		(3) Managing supplier						
23.	A3.1	To what extent does the managing supplier ensures a continuous flow of drugs	1	2	3	4	5	6
24.	A3.2	To what extent does the management supplier assist the department in maintaining an adequate supply of drugs	1	2	3	4	5	6
25.	A3.3	To what extent does the regular supply of drugs promotes long-term relationship of members	1	2	3	4	5	6
26.	A3.4	To what extent does the collaborative approach with the supplier in managing drugs useful to the MMS	1	2	3	4	5	6
27.	A3.5	To what extent does the managing supplier influence drug management performance	1	2	3	4	5	6

Instruction: Using the scale of 1 – 6, please circle the appropriate number that best corresponds between the test items and your answer in order to describe the level of **Inventory Control** practiced in public hospitals that made medical services available timely and continuously for efficient patient care function.

LIST OF ABBREVIATIONS

MMS	**Main Medical Store**	**SOP**	**Standard of Procedure**
HPD	**Head of Hospital Pharmacy Department**		
MOH	**Ministry of Health**		

Item no.	**Label**	**Test Items**	**Extent**					
		Inventory Control (C)	Extremely low (1)	Very low (2)	Low (3)	High (4)	Very high (5)	Extremely high (6)
		(1) **Qualitative Indicator Description**						
28.	C1.1	To what extent does the MMS maintains sufficient stocks of medications to cover the monthly needs in addition to emergency stocks	1	2	3	4	5	6
Item no.	**Label**	**Test Items**	**Extent**					
		Inventory Control (C)	Extremely low (1)	Very low (2)	Low (3)	High (4)	Very high (5)	Extremely high (6)
29.	C1.2	To what extent does the usage of emergency stock is the responsibility requiring the approval of the hospital director/head of HPD	1	2	3	4	5	6
30.	C1.3	To what extent are the drugs stored in a manner to protect their identity and integrity	1	2	3	4	5	6

31.	C1.4	To what extent are the drugs stored at proper temperatures	1	2	3	4	5	6
32.	C1.5	To what extent does the MMS have a system to monitor out of date medications or recently expired drugs	1	2	3	4	5	6
33.	C1.6	To what extent do recalled or expired medications removed from stock	1	2	3	4	5	6
34.	C1.7	To what extent during dispensing, has the MMS given priority to medications with shorter shelf life	1	2	3	4	5	6
35.	C1.8	To what extent are the expirations or shortages of drugs due to improper estimation of needs	1	2	3	4	5	6
		(2) **Pharmacy Records and Documents**						
36.	C2.1	To what extent are all medications recorded in the assigned supply ledgers	1	2	3	4	5	6
37.	C2.2	To what extent are all procurement invoices and supply vouchers kept in special files	1	2	3	4	5	6
38.	C2.3	To what extent are all forms used designed centrally by MOH	1	2	3	4	5	6
39.	C2.4	To what extent, if any, is a request raised to MOH when a form need to be added, amended or deleted	1	2	3	4	5	6

40.	C2.5	To what extent are forms ordered in enough quantities to cover the needs	1	2	3	4	5	6
41.	C2.6	To what extent are pharmacy documents maintained in folders to avoid mix-up	1	2	3	4	5	6

Item no.	**Label**	**Test Items**	**Extent**					
		Inventory Control (C)	Extre mely low (1)	Ver y low (2)	Low (3)	Hig h (4)	Ver y hig h (5)	Extre mely high (6)
		(1) **Supply process**						
42.	C3.1	To what extent is the drug supply order to the MMS managed at regular programmes	1	2	3	4	5	6
43.	C3.2	To what extent are the drugs dispensed from MMS in a negotiable manner according to procedures	1	2	3	4	5	6
44.	C3.3	To what extent does the hospital provide speciallyneeded transportation for drugs	1	2	3	4	5	6
45.	C3.4	To what extent are the drugs dispensed to the sub medical store by the support staff	1	2	3	4	5	6
46.	C3.5	To what extent does dispensing of dangerous drug from MMS done according to MOH guidelines	1	2	3	4	5	6
47.	C3.6	To what extent does the MMS checks and match	1	2	3	4	5	6

		medication and supplies with their vouchers						
48.	C3.7	To what extent does the medication distribution to satellite pharmacies done by open-negotiable quantities order form	1	2	3	4	5	6
49.	C3.8	To what extent does the MMS have a contingency planning strategy in cases of drug shortages	1	2	3	4	5	6
50.	C3.9	To what extent is the MOH informed regarding medication shortages	1	2	3	4	5	6
51.	C3.10	To what extent does the hospital director have the authority to procure medication within a limited budget if there are shortages of medication	1	2	3	4	5	6
52.	C3.11	To what extent are all stocks inspected regularly to ensure the absence of outdated, unusable or mislabeled products	1	2	3	4	5	6
53.	C3.12	To what extent are investigational drugs stored under the supervision of the head of HPD	1	2	3	4	5	6

Instruction: Using the scale of 1 – 6, please circle the appropriate number that best corresponds between the test items and your answer in order to describe the level of **Inventory System** practiced in public hospitals that will help to improve informed decisions, save time and save cost by using a proper system.

LIST OF ABBREVIATIONS

MMS	**Main Medical Store**	**SOP**	**Standard of Procedure**
HPD	**Head of Hospital Pharmacy Department**		
MOH	**Ministry of Health**		

Item no.	Label	Test Items	Extent					
		Inventory System (S)	Extremely low (1)	Very low (2)	Low (3)	High (4)	Very high (5)	Extremely high (6)
54.	S1	To what extent is the organization using information technology in managing inventory	1	2	3	4	5	6
55.	S2	To what extent are electronic tracking systems used to manage stock level	1	2	3	4	5	6
56.	S3	To what extent is constantly evolving technology a major barrier for implementing inventory management practices in the organization	1	2	3	4	5	6
57.	S4	To what extent is the MMS system able to monitor supply of medications	1	2	3	4	5	6
58.	S5	To what extent is using enough technology can control the drug inventory system in a medical store	1	2	3	4	5	6
59.	S6	To what extent does shared technology with supply chain members in the organization	1	2	3	4	5	6

		improves the inventory system						
60.	S7	To what extent does the system support the identification of expired drugs	1	2	3	4	5	6

SECTION C: TOTAL QUALITY MANAGEMENT (TQM) PRACTICES

Instruction: Using the scale of 1 – 6, please circle the appropriate number that best corresponds between the test items and your answer in order to describe the level of **Total Quality Management (TQM) Practices** practiced in public hospitals that would reflect high quality patient care for greater service quality.

Item no.	Label	Test Items	Extent					
		Total Quality Management Practices (Q)	Extremely low (1)	Very low (2)	Low (3)	High (4)	Very high (5)	Extremely high (6)
		(1) Higher management commitment						
61.	Q1.1	To what extent does the top management communicate on quality goals to the organization	1	2	3	4	5	6
62.	Q1.2	To what extent does the top management supports long-term quality improvement process	1	2	3	4	5	6
63.	Q1.3	To what extent is the degree of participation by major heads in the quality improvement process	1	2	3	4	5	6
64.	Q1.4	To what extent is the comprehensiveness of the goal setting process for quality within the division	1	2	3	4	5	6
65.	Q1.5	To what extent does the top management encourage employee participation in quality management and continuous improvement	1	2	3	4	5	6

		activities						
		(2) Continuous improvement						
66.	Q2.1	To what extent does the department have a clear job instructions	1	2	3	4	5	6
67.	Q2.2	To what extent does the department evaluates and improves its store operational processes continuously	1	2	3	4	5	6
68.	Q2.3	To what extent does the department have a programme to continuously eliminate errors in store operations	1	2	3	4	5	6
Item no.	**Label**	**Test Items**	**Extent**					
		Inventory Management Practices (Q)	Extre mely low (1)	Ver y low (2)	Low (3)	Hig h (4)	Ver y high (5)	Extre mely high (6)
69.	Q2.4	To what extent does the department have a programme to find a wasted item in all store processes	1	2	3	4	5	6
70.	Q2.5	To what extent having an effective system that focuses on process improved the store operations	1	2	3	4	5	6
		(3) Customer focus						
71.	Q3.1	To what extent is the department totally committed to create satisfied customers and interested parties.	1	2	3	4	5	6
72.	Q3.2	To what extent do the customers give us feedback on quality and delivery performance	1	2	3	4	5	6
73.	Q3.3	To what extent does the	1	2	3	4	5	6

		department actively seeks ways to improve service in order to achieve greater customer satisfaction						
74.	Q3.4	To what extent are customer satisfaction surveys used in determining customer's requirements and measure the satisfaction level.	1	2	3	4	5	6
75.	Q3.5	To what extent does the department solves problems related to customer complaints.	1	2	3	4	5	6
		(4) Benchmarking						
76.	Q4.1	To what extent is the department highly involved in benchmarking activities with other public hospital store departments	1	2	3	4	5	6
77.	Q4.2	To what extend is the department directly involved in benchmarking activites with public or industries' store departments	1	2	3	4	5	6
78.	Q4.3	To what extent do benchmarking activities have already improved our store department's reputation	1	2	3	4	5	6
Item no.	**Label**	**Test Items**	**Extent**					
		Inventory Management Practices (Q)	Extremely low (1)	Very low (2)	Low (3)	High (4)	Very high (5)	Extremely high (6)
		(5) Employee involvement						
79.	Q5.1	To what extent are quality circle or employee	1	2	3	4	5	6

		involvement type programmes implemented in the division						
80.	Q5.2	To what extent are empowerment of employees applied to correct quality problems	1	2	3	4	5	6
81.	Q5.3	To what extent do continual enhancement of quality awareness implemented among employees	1	2	3	4	5	6
82.	Q5.4	To what extent is feedback provided to employees on their quality performance	1	2	3	4	5	6
83.	Q5.5	To what extent are effectiveness of implemented quality-related employee involvement programmes evaluated	1	2	3	4	5	6
		(6) Education and training						
84.	Q6.1	To what extent are the specific work-skills training given to hourly employees in the department	1	2	3	4	5	6
85.	Q6.2	To what extent is the commitment of top management to employee training	1	2	3	4	5	6
86.	Q6.3	To what extent is the availability of resources for employee training in the department	1	2	3	4	5	6
87.	Q6.4	To what extent does the department provide sufficient on-the-job training on inventory management	1	2	3	4	5	6

88.	Q6.5	To what extent does quality-related training given to hourly employees throughout the organization.	1	2	3	4	5	6
Item no.	**Label**	**Test Items**	**Extent**					
		Inventory Management Practices (Q)	Extre mely low (1)	Ver y low (2)	Low (3)	Hig h (4)	Ver y high (5)	Extre mely high (6)
		(7) Reward and recognition						
89.	Q7.1	To what extent do reward and recognition activities effectively stimulate employee commitment to quality improvement	1	2	3	4	5	6
90.	Q7.2	To what extent does the department give rewards and recognize employee participation in quality improvement	1	2	3	4	5	6
91.	Q7.3	To what extent does the departments improve working conditions in order to recognize employee quality improvement efforts	1	2	3	4	5	6

SECTION D : INVENTORY MANAGEMENT PERFORMANCE

Instruction: Using the scale of 1 – 6, please circle the appropriate number that best corresponds between the test items and your answer in order to describe the level of **Inventory Management Performance** practiced in public hospitals that reflect the effectiveness in offering excellent care against the lowest cost.

ABBREVIATION

MMS **Main Medical Store**

Item no.	Label	Test Items	Extent					
		Inventory Management Performance (P)	Extremely low (1)	Very low (2)	Low (3)	High (4)	Very high (5)	Extremely high (6)
		(1) Operation Performance						
92.	P1.1	To what extent can the complete supply of drugs supplied by Main Medical Store (MMS) can be accepted by sub-store	1	2	3	4	5	6
93.	P1.2	To what extent can the correct supply and quantity of indented drugs influence the credibility of MMS	1	2	3	4	5	6
94.	P1.3	To what extent has the nil in stock which disrupted the service happened at MMS	1	2	3	4	5	6
Item no.	**Label**	**Test Items**	**Extent**					
		Inventory Management Performance (P)	Extremely low (1)	Very low (2)	Low (3)	High (4)	Very high (5)	Extremely high (6)
95.	P1.4	To what extent do the losses incurred had led to immediate action taken by MMS to solve the problem	1	2	3	4	5	6
96.	P1.5	To what extent does the	1	2	3	4	5	6

		accuracy and timeliness of drugs supplied is practiced to beat the demand of sub-store						
97.	P1.6	To what extent are the efficiencies of MMS achieved in reducing shortage, wastage, short expiry and excess of drugs	1	2	3	4	5	6
98.	P1.7	To what extent does a sub-store return the drugs due to bad quality	1	2	3	4	5	6
99.	P1.8	To what extent does a sub-store complainthad led to an immediate action taken by MMS to solve the problem	1	2	3	4	5	6
		(2) Problem Solving Performance						
100.	P2.1	To what extent does the MMS swiftly figure out the problems about inventories	1	2	3	4	5	6
101.	P2.2	To what extent does the person or unit that causes an inventory problem accept the responsibility immediately	1	2	3	4	5	6
102.	P2.3	To what extent are problems that happen relating to inventories being hidden	1	2	3	4	5	6
103.	P2.4	To what extent does solving inventory related problems brings damages to the MMS	1	2	3	4	5	6
104.	P2.5	To what extent are inventory related problems solved faster	1	2	3	4	5	6
		(3) Decision Making Process Performance						
105.	P3.1	To what extent are delivery related decisions made	1	2	3	4	5	6

		faster						
106.	P3.2	To what extent are procedures reasonable to make inventory related decisions	1	2	3	4	5	6
Item no.	**Label**	**Test Items**	**Extent**					
		Inventory Management Performance (P)	Extremely low (1)	Very low (2)	Low (3)	High (4)	Very high (5)	Extremely high (6)
107.	P3.3	To what extent are scientific techniques used to make inventory related decisions	1	2	3	4	5	6
108.	P3.4	To what extent are the inventory related with other department decisions not in conflict	1	2	3	4	5	6
109.	P3.5	To what extent are the MMS and sub store informed about inventory related decisions	1	2	3	4	5	6

Proper inventory management practices can lead to better inventory management performance among public hospitals in Malaysia. **YES** or **NO**.

© THANK YOU FOR YOUR COORPERATION ©

APPENDIX D (1)

Cover Letter of Submission Protocol for Ethical Clearance (NIH)

National Institute of Health
Ministry of Health Malaysia
Malaysia Research Ethics Committee
59000 Kuala Lumpur

22 June 2015

Sir/Madam.

Protocol Submission for Ethical Clearence

With regards to the above mentioned, we would like to inform that we are already submitting all the particulars needed which are covering letter, research proposal and research survey form. Hopefully it will fulfill the requirement for the purpose of ethical clearance.

Thank you,

Yours truly,

FARIZA AHMAD MAHYADIN
Pensyarah
Jabatan Perdagangan
Politeknik Seberang Perai
Pulau Pinang

(FARIZA AHMAD MAHYADIN@MAHIDIN)
Principle Investigator

APPENDIX D (2)

Submission Protocol Form for Ethical Clearance (NIH)

Ver 3.0 September 2014 NMRR/FORM/IAHODIA

INVESTIGATOR'S AGREEMENT, HEAD OF DEPARTMENT AND ORGANISATIONAL / INSTITUTIONAL APPROVAL
PERSETUJUAN PENYELIDIK DAN KEBENARAN KETUA JABATAN DAN PENGARAH ORGANISASI/INSTITUSI

This document is intended for online submission for formal research registration. It is issued as the Investigator's Agreement to participate in the research as well as the investigator's **Head of Department and Director's Approval**. Please upload this document in the required section in NMRR upon completion.
**Note: This form is NOT to be used for obtaining permission to conduct the research at the named / selected study site(s).

Dokumen ini adalah untuk penghantaran 'online' mengikut prosedur rasmi pendaftaran penyelidikan. Borang ini dikeluarkan sebagai pengakuan penyelidik untuk menjalankan penyelidikan dan persetujuan serta kebenaran daripada ***Ketua Jabatan dan Pengarah masing-masing****. Sila lengkapkan borang ini dan memuat naik ke dalam sistem NMRR di seksyen yang telah ditetapkan.*
***Nota : Borang ini BUKAN digunakan untuk tujuan mendapatkan keizinan untuk menjalankan penyelidikan di lokasi kajian yang dipilih.*

Research Title *[Tajuk Penyelidikan]*	EXAMINING THE ABILITY OF PUBLIC HOSPITALS IN PERFORMING INVENTORY MANAGEMENT PRACTICES TOWARDS INVENTORY MANAGEMENT PERFORMANCE MODERATED BY TOTAL QUALITY MANAGEMENT PRACTICES USING RASCH MODEL		
Research ID *[Nombor Pendaftaran]*	26146	**Protocol Number (if available)** *[Nombor Protokol (jika ada)]*	

INVESTIGATOR'S AGREEMENT ***[PERSETUJUAN PENYELIDIK]***

I have understood the above mentioned proposed research and I agree to participate as an investigator and being responsible to conduct the research.
Saya faham atas cadangan penyelidikan di atas dan bersetuju untuk mengambil bahagian serta bertanggungjawab untuk melaksanakan penyelidikan tersebut

Name *[Nama]*	fariza ahmad mahyadin@mahidin
IC number *[Nombor K/P]*	740325025518
Institute *[Institusi]*	UNIVERSITI UTARA MALAYSIA (UUM)
Signature and Official stamp *[Tandatangan dan Cop Rasmi]*	FARIZA AHMAD MAHYADIN *Pensyarah* Jabatan Perdagangan Politeknik Seberang Perai Pulau Pinang
Date *[Tarikh]* 15/6/2015	

HEAD OF DEPARTMENT AGREEMENT ***[PERSETUJUAN KETUA JABATAN]***

I agree to allow the above named investigator to conduct the above titled research.
Saya bersetuju dan membenarkan pegawai seperti bernama di atas untuk menjadi penyelidik di dalam projek penyelidikan tersebut di atas.

Name of Head : *[Nama Ketua Jabatan]*	
Signature and Official stamp *[Tandatangan dan Cop Rasmi]*	DR. ROHAIZAH SAAD Senior Lecturer School of Technology Management and Logistics College of Business Universiti Utara Malaysia
Date *[Tarikh]* 16/6/2015	

ORGANISATIONAL / INSTITUTIONAL APPROVAL ***[KEBENARAN ORGANISASI / INSTITUSI]***

I acknowledge and approve the named officer to conduct the above titled research.
Saya mengesahkan dan mengambil maklum penglibatan pegawai ini di dalam penyelidikan tersebut

Name of Director *[Nama Pengarah]*	
Signature and Official stamp *[Tandatangan dan Cop Rasmi]*	PROF. DR. RUSHAMI ZIEN YUSOFF Penolong Naib Canselor UUM Kolej Perniagaan Universiti Utara Malaysia
Date *[Tarikh]* 16/6/2015	

This is computer generated. Borang ini adalah cetakan komputer. [26146/35406/100066]

APPENDIX E (1)

Letter of Approval to Conduct a Research (MREC)

JAWATANKUASA ETIKA & PENYELIDIKAN PERUBATAN
(Medical Research & Ethics Committee)
KEMENTERIAN KESIHATAN MALAYSIA
d/a Institut Pengurusan Kesihatan — Tel. : 03 2282 9082/03 2282 9085
Jalan Rumah Sakit, Bangsar — 03 2287 4032/03 2282 0491
59000 Kuala Lumpur — Faks: 03 22828072/03 2282 0015

Ruj. Kami: (5) KKM/NIHSEC/P15-1019
Tarikh: 13 August 2015

FARIZA AHMAD MAHYADIN@MAHIDIN
UNIVERSITI UTARA MALAYSIA (UUM)

Tuan/Puan

NMRR-15-839-26146 (IIR)
EXAMINING THE ABILITY OF PUBLIC HOSPITALS IN PERFORMING INVENTORY MANAGEMENT PRACTICES TOWARDS INVENTORY MANAGEMENT PERFORMANCE MODERATED BY TOTAL QUALITY MANAGEMENT PRACTICES USING RASCH MODEL

Lokasi Kajian: Universiti Utara Malaysia (UUM)

Dengan hormatnya perkara di atas adalah dirujuk.

2. Jawatankuasa Etika & Penyelidikan Perubatan (JEPP), Kementerian Kesihatan Malaysia (KKM) tiada halangan, dari segi etika, ke atas pelaksanaan kajian tersebut. JEPP mengambil maklum bahawa kajian tersebut tidak mempunyai intervensi klinikal ke atas subjek dan hanya melibatkan borang kaji selidik sahaja.

3. Segala rekod dan data adalah **SULIT** dan hanya digunakan untuk tujuan kajian ini dan semua isu serta prosedur mengenai ***data confidentiality*** mesti dipatuhi. Kebenaran daripada Pegawai Kesihatan Daerah/Pengarah Hospital dan Ketua-Ketua Jabatan atau pegawai yang bertanggung jawab disetiap lokasi kajian di mana kajian akan dijalankan mesti diperolehi sebelum kajian dijalankan. Tuan/Puan perlu akur dan mematuhi keputusan tersebut.

4. Tuan/Puan perlu menghantar dokumen-dokumen seperi berikut selepas mendapat kelulusan etika . Borang-borang berkaitan boleh dimuat turun daripada laman web MREC (http://www.nih.gov.my/mrec).

I. Laporan tamat kajian pada penghujung kajian.
II. Laporan mengenai *"All adverse events, both serious and unexpected"/Protocol Deviation* atau *Violation* kepada Jawatankuasa Etika & Penyelidikan Perubatan, KKM jika berkenaan.
III. Memaklumkan jika terdapat pindaan keatas sebarang dokumen kajian

5. Sila ambil maklum bahawa sebarang urusan surat-menyurat berkaitan dengan penyelidikan ini haruslah dinyatakan nombor rujukan surat ini untuk melicinkan urusan yang berkaitan.

Sekian terima kasih.

BERKHIDMAT UNTUK NEGARA

Saya yang menurut perintah,

DATO' DR CHANG KIAN MENG
Pengerusi
Jawatankuasa Etika & Penyelidikan Perubatan
Kementerian Kesihatan Malaysia

APPENDIX E (2)

Letter of Approval (Renewal) to Conduct a Research (MREC)

JAWATANKUASA ETIKA & PENYELIDIKAN PERUBATAN
(Medical Research & Ethics Committee)
KEMENTERIAN KESIHATAN MALAYSIA
d/a Institut Pengurusan Kesihatan
Jalan Rumah Sakit, Bangsar
59000 KUALA LUMPUR

Tel: 03-2287 4032/2282 0491/2282 9085
03-2282 9082/2282 1402/2282 1449
Faks: 03-2282 0015

Ref : (7)dlm.KKM/NIHSEC/ P15-1019
Date: 19 July 2016

FARIZA AHMAD MAHYADIN@MAHIDIN
UNIVERSITI UTARA MALAYSIA (UUM)

Annual Ethical Renewal for 2016

NMRR-15-839-26146 (IIR)
EXAMINING THE ABILITY OF PUBLIC HOSPITALS IN PERFORMING INVENTORY MANAGEMENT PRACTICES TOWARDS INVENTORY MANAGEMENT PERFORMANCE MODERATED BY TOTAL QUALITY MANAGEMENT PRACTICES USING RASCH MODEL

With reference to the 'Continuing Review Form' submitted 15 July 2016, we are pleased to inform that the conduct of the above study has been granted approval (via Exempt Review) for a year by the Medical Research & Ethics Comittee, Ministry of Health Malaysia. Please note that the approval is valid until the end of the study. If there are any significant changes in the study documents resulting in an increased risk to the subjects, please inform MREC about it at mreciir@nih.gov.my.

The MREC, Ministry of Health Malaysia operates in accordance to the International Harmonization Good Clinical Practice Guidelines.

Thank you.

"BERKHIDMAT UNTUK NEGARA"

Yours sincerely,

(DATO' DR CHANG KIAN MENG)
Chairman
Medical Research & Ethics Committee
Ministry of Health Malaysia

APPENDIX F

Letter for Data Collection and Research Work

OTHMAN YEOP ABDULLAH
GRADUATE SCHOOL OF BUSINESS
Universiti Utara Malaysia
06010 UUM SINTOK
KEDAH DARUL AMAN
MALAYSIA

UUM
Universiti Utara Malaysia

Tel: 604-928 7118/7119/7130
Faks (fax): 604-928 7160
Laman Web (Web): www.oyagsb.uum.edu.my

KEDAH AMAN MAKMUR • BERSAMA MEMACU TRANSFORMASI

UUM/OYAGSB/K-14
04 February 2015

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

LETTER FOR DATA COLLECTION AND RESEARCH WORK

This is to certify that **Fariza Ahmad Mahyadin @ Mahidin (Matric No: 95916)** is a bonafied student of Doctor of Philosophy (PhD), Othman Yeop Abdullah Graduate School of Business, Universiti Utara Malaysia. She is conducting a research entitled ***"Examining The Level Of Inventory Management Practices Towards Inventory Management Performance Moderated by Total Quality Management Using Rasch Model Among Public Hospital In Malaysia"*** under the supervision of Dr. Rohaizah Binti Saad.

In this regard, I hope that you could kindly provide assistance and cooperation for her to successfully complete the research. All the information gathered will be strictly used for academic purposes only.

Your cooperation and assistance is very much appreciated.

Thank you.

"SCHOLARSHIP, VIRTUE, SERVICE"

Yours faithfully

ROZITA BINTI RAMLI
Assistant Registrar
for Dean
Othman Yeop Abdullah Graduate School of Business

c.c - Supervisor
- Student's File (95916)

Universiti Di Rimba Hijau - *The University in A Green Forest*

APPENDIX G

Example Letter of Request to Conduct a Research to Public Hospitals

Pengarah
Hospital Jitra
Jalan Changlun, 06000
Jitra, Kedah Darulaman

Yang dihormati Tuan/Puan,

PERMOHONAN MENJALANKAN KAJIAN PENYELIDIKAN DI UNIT FARMASI HOSPITAL JITRA, KEDAH DARULAMAN.

Merujuk kepada perkara di atas, saya Fariza binti Ahmad Mahyadin@Mahidin (NMRR-15-839-26146 (IIR)) , pelajar PhD dari UUM, ingin memohon kebenaran dari pihak tuan untuk menjalankan kajian penyelidikan ke atas Ketua Farmasi di Unit Farmasi hospital tuan/puan bagi melengkapkan matlamat kajian ini iaitu untuk mengenalpasti kesan moderasi oleh Amalan Pengurusan Kualiti (TQM) secara menyeluruh ke atas hubungan di antara Amalan Pengurusan Inventori (Pengurusan Ubat-ubatan) dengan Prestasi Pengurusan Inventori dalam kalangan hospital awam di Malaysia.

Hospital tuan/puan telah dikenalpasti mempunyai ciri-ciri yang bersesuaian untuk terlibat dalam kajian penyelidikan ini. Maklumbalas dari borang soalselidik yang diedarkan kepada Ketua Farmasi adalah sangat penting untuk kejayaan kajian penyelidikan ini dan diharapkan dapat memberi sumbangan yang berkesan kepada pihak hospital awam dan Kementerian Kesihatan di Malaysia.

Saya ingin merakamkan ucapan terima kasih kepada pihak tuan/puan atas bantuan dan kerjasama yang diberikan.

Yang benar,

____
Fariza binti Ahmad Mahyadin@Mahidin
NMRR-15-839-26146 (IIR)
Tarikh:

Lampiran:
1. Surat pengesahan menjalankan kerja penyelidikan dan kutipan data dari UUM
2. Surat kepada pihak berkuasa yang berkenaan di hospital awam Malaysia
3. Surat kelulusan Jawatankuasa Etika & Penyelidikan Perubatan, KKM

APPENDIX H

Example of Letter of Approval to Conduct a Research

HOSPITAL PUTRAJAYA (HPJ)
PUSAT PENTADBIRAN KERAJAAN PERSEKUTUAN
PRESINT 7
62250 PUTRAJAYA
Tel.: 03-8312 4200 Faks: 03-8888 0137
Laman Sesawang: http://www.hpj.gov.my

HOSPITAL PUTRAJAYA

Ruj. Tuan :
Ruj. Kami : [illegible]
Tarikh : 05 Januari 2016

Fariza binti Ahmad Mahyadin@Mahdin
School of Technology, Management and Logistics
College of Business
Universiti Utara Malaysia
06010 UUM Sintok
KEDAH DARUL AMAN

Puan,

KELULUSAN MENJALANKAN KAJIAN DI HOSPITAL PUTRAJAYA

Dengan segala hormatnya saya diarah merujuk perkara di atas.

2. Sukacita dimaklumkan bahawa pihak hospital telah meneliti dan meluluskan cadangan penyelidikan yang dikemukakan oleh puan kepada Unit Penyelidikan Klinikal, Hospital Putrajaya tertakluk kepada syarat-syarat seperti berikut:

(a) Penyelidikan ini hendaklah didaftarkan dan mendapat kelulusan Jawatankuasa Etika Perubatan Kementerian Kesihatan Malaysia (KKM) melalui laman web www.nmrr.gov.my *(National Medical Research Register)* selaras dengan kehendak Surat Pekeliling **KKM Bil. 9/2007**;

(b) Hasil laporan penyelidikan hendaklah dikemukakan kepada pihak Hospital Putrajaya sebelum pembentangan dibuat;

(c) Penyelidik bertanggungjawab mengedarkan dan mengutip borang soal selidik dan menjawab apa-apa pertanyaan daripada pihak responden; dan

(d) Semua maklumat penyelidikan adalah **SULIT**.

ACCREDITED HOSPITAL

3. Sehubungan dengan itu, penyelidik boleh berhubung terus dengan Jabatan Farmasi, Hospital Putrajaya bagi urusan penyelidikan.

Perhatian dan kerjasama puan amatlah dihargai.

Sekian, terima kasih.

"BERKHIDMAT UNTUK NEGARA"
"KAMI SEDIA MEMBANTU"

Saya yang menurut perintah,

(DR. MOHD ANIS BIN HARON @ HARUN)
(No. MPM: 30067)
b.p. Pengarah
Hospital Putrajaya

s.k. Ketua Jabatan Farmasi
Hospital Putrajaya

Ketua Unit Penyelidikan Klinikal (UPK)
Hospital Putrajaya

Fail

APPENDIX I

Sampling Frame MOH Hospitals by types for RMK-10 (2011-2015)

SPECIALIST HOSPITAL & INSTITUTIONS				Non-Specialists Hospitals		
HKL + States Hos	Major Specialists Hos	Minor Specialists Hos	Special Hospitals/Institutions			
14	26	27	11	66		
Kuala Lumpur Kangar Alor Setar Pulau Pinang Ipoh Klang Seremban Melaka Johor Bahru Kuantan Terengganu Kota Bharu Kuching K Kinabalu	Putrajaya Kulim Sungai Petani Seberang Jaya Taiping, Teluk Intan Ampang, Kajang, Selayang, Serdang, ***Shah Alam*, Sg. Buloh Kuala Pilah Batu Pahat, Muar, Pandan, Segamat, Temerloh Kemaman Kuala Krai Tanah Merah Bintulu Miri Sibu Sandakan Tawau	Labuan Langkawi Bukit Mertajam, Kepala Batas Sri Manjung, Slim River, Grik, Kuala Kangsar Banting Port Dickson, Tampin Kluang, Kota Tinggi Bentong, Kuala Lipis, Pekan Gua Musang, Dungun Mukah, Kapit, Limbang, Sarikei, Sri Aman, Keningau, Lahad Datu, Beaufort, Kota Marudu	IPR *PDN ****PKKN Bahagia Permai Mesra Sentosa Women and Children Hospital, Likas ***Rehabilitation Hospital, Cheras* ** **National Cancer Institute, Putrajaya* ****Women and Children Hospital, Kuala Lumpur*	*Kedah* Baling Jitra Kuala Nerang Sik Yan *PPinang* Balik Pulau Sungai Bakap *Perak* Batu Gajah Ckt Melintang Kampar Parit Bunar Selama Sungai Siput-Tapah *Selangor* K. Kubu Baru Tj. Karang S. Bernam *NSembilan* Jempol Jelebu	*Melaka* Alor Gajah Jasin *Johor* Pontian Kulai Tangkak Mersing *Pahang* Cameron Highl Raub Jerantut Muadzam Shah Jengka ***Rompin* ****Bera* *Terengganu* H. Terengganu Setiu Besut *Kelantan* Tumpat Pasir Mas Pasir Puteh Jeli Machang	*Sarawak* Bau Betong Dalat Daro Kanowit Lawas Lundu Marudi Saratok Serian Simunjan RCBM *Sabah* Beluran Kinabatangan Kota Belud Papar Kuala Peny Kudat Kunak Pitas Ranau Sempoma Sipitang Tambunan Tenom ****Tuaran*
Up to 45 resident specialties/ sub-specialties	Up to 20 resident specialties/ sub-specialties	Up to 10 resident specialties	Specific resident specialties	Visiting specialist services		

** Pusat Darah Negara, unlike other hospitals or institutions, has no hospital bed, ** New Hospitals currently under construction, *** New Hospitals currently being planned for construction, **** PKKN, although not yet officially degazetted as a leprosarium, has been amalgamated into Hospital Sungai Buluh for administrative matters*