Pharmacies and medication information system in Jeddah City, Saudi Arabia

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PHARMACIES AND MEDICATION INFORMATION SYSTEM IN JEDDAH CITY, SAUDI ARABIA

by

Mowafag S. Kh. Allaf

A Doctoral Thesis

Submitted in partial fulfilment of the requirements for the award of

Doctor of Philosophy of Loughborough University

March 2009

Department of Information Science

Loughborough University

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ABSTRACT

It is acknowledged that the introduction of Health Information Systems (HIS) have contributed to the reorganization of the methods used in health services for Health Information Management. Managers in the health services benefit from Health Information Systems provision both strategically and operationally, for example in the planning of new services and more routinely in assisting health professionals in making informed medical decisions. Health services in developed countries already have Health Information Systems (HIS) in place but their adoption in developing countries has been less widespread. In Jeddah, KSA there is a lack of a unified HIS. Health service provision in Jeddah is spread between a wide range of governmental and private health services. The lack of unification of these services and a bespoke HIS has led to problems for both patients and healthcare professionals. This research focuses on the methods of prescribing medication, provision of supplies and the dispensing of medication within pharmacies. The study employed a mixed methods approach which included a questionnaire survey and unstructured interviews. 1005 questionnaires were distributed to physicians and pharmacists in the governmental, private health sector and the general public, also 15 unstructured interviews were held at the MOH and Medication Companies in Jeddah and Riyadh. Action Research in the form of the Soft System Method (SSM) was used in this study to examine data collected via questionnaires and interviews to obtain a rich picture about the major issues in the Health Information System (HIS) within the Saudi Health System. The SSM identified and analysed the roots of the problem elements. This research found that health professionals and patients in Jeddah emphasized the problems and disadvantages of the regular use of traditional non-computerised methods of prescribing medication, highlighting defective medication services. In addition, this research found that the health sector lacked the necessary information technology and communication systems required to maintain medical stocks. Due to the lack of an efficient Health Information System the Ministry of Health (MOH), pharmaceutical companies and suppliers have been unable to develop medication services. The results of the study supported the hypothesis that a lack of information technology use in the health sector has affected health services. It indicated a limited use of ICT within the health sector generally and among suppliers who deal within the health sector. The findings presented difficulties with handwritten prescriptions and the inefficiency of the systematization of the supply system for prescriptions at pharmacies. In addition, it concluded that all respondents indicated that they used a basic means of communication in
their daily work, as well as a limited use of ICT, such as the Internet. Furthermore, respondents wanted to increase their co-operation and co-ordination with the Ministry of Health to overcome the difficulties they face which pointed to the importance of establishing an information system to make links easier among health sectors. As part of a strategic health plan within the future vision of the HIS, the researcher recommended some internal and external changes within the Ministry of Health and other governmental and private health sectors in the planning and developing of the infrastructure, ICT use, training and performance.

**Keywords:** Kingdom of Saudi Arabia (KSA) Development Plan, Saudi Health System, The Ministry of Health (MOH) Plans, Health Information System (HIS), HIS in the UK, the Health System in the UK, Soft System Methodology SSM and Health, E-Prescriptions, E-Health Systems, Mixed-Methods or Multi-Methods and Health Systems, Future Health Vision, Health Strategic Planning, Information Communication Technology (ICT) and Health Services.
Dedication

To the loving memory of my mother.

And
To the ones I love so deeply,

My father

My wife Samah

And my sons Saleh, Faris and to my daughters Maryam and Hanen

I am saying for them: thank you
Acknowledgments

In the name of Allah, the Most Gracious, Most Merciful

My special praise and thanks go to the almighty Allah, who has given me in his infinite wisdom, the grace, strength, health, endurance and foresight to be able to complete this research to the satisfaction of Loughborough University.

I express my huge thanks to the Saudi government, represented by the King Abdulaziz University, for offering me a scholarship to do the PhD in Information Science, Health Informatics at Loughborough University, UK. May Allah help me to repay and serve my country Saudi Arabia and assist in its development.

Most important, I would like to thank Dr. Janet Harrison, Dr. Fytton Rowland and Mr. Ian Murray, my supervisors, for their encouragement, support, invaluable suggestions, criticism and guidance, advice and their continued friendship. Their patience and understanding helped me to enjoy and complete my research study. My sincere gratitude is extended to Professor Anne Morris, my current Research Director and Professor Ron Summers, the previous Research Director, for their constructive advice, support and encouragement.

I am indebted to all staff members of the Department of Information Science for their assistance and support. My thanks to my colleagues and to all members of staff in the Department of Information Science at Loughborough University for their encouragement and support.

My sincere thanks and gratitude go to my father, family, relatives and friends everywhere, whom I owe a great deal for their hospitality, encouragement and moral support.

Finally, I am greatly indebted to my wife Samah, firstly, for agreeing to accompany me to the UK and for her understanding when things were below expectation. Her great support and encouragement are the benchmarks for the success achieved in my life. My love expands to my lovely sons Saleh, Faris and my lovely daughters Maryam and Hanen. May Allah bless them all. Amen.
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<td>Application Programming Interface</td>
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<td>BHC</td>
<td>Balsam Healthcare Corp</td>
</tr>
<tr>
<td>BMMS</td>
<td>Better Medication Management System</td>
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<tr>
<td>CATWOE</td>
<td>The Elements of Root Definition Formulated by Checkland, 2005</td>
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<tr>
<td>CBAM</td>
<td>Computer-Based Antimicrobial-Monitoring</td>
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<td>CM</td>
<td>Conceptual Model</td>
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<td>CMD</td>
<td>Community Medicine Department</td>
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<td>CPD</td>
<td>Continuing Professional Development</td>
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<td>CPOE</td>
<td>Computerized Physician Order Entry</td>
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<td>CPR</td>
<td>Computer-based Patient Records</td>
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<td>DEA</td>
<td>Drug Enforcement Administration</td>
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<td>DF</td>
<td>The degrees of freedom</td>
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<td>DfEE</td>
<td>Department for Education and Employment's</td>
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<td>Directorate of Health Affairs</td>
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<td>DSL</td>
<td>Digital Subscriber Line</td>
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<td>DUR</td>
<td>Drug Utilization Review</td>
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<td>ECDL</td>
<td>European Computer Driving Licence</td>
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<td>Electronic Medical Record Systems</td>
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<tr>
<td>EPI5</td>
<td>Epidemiology Programme with Epi Info and a personal computer, epidemiologists and other public health and medical professionals can rapidly develop a questionnaire or form, customize the data entry process and enter and analyze data. Epidemiologic statistics, tables, graphs and maps are produced with simple commands such as READ, FREQ, LIST, TABLES, GRAPH and MAP. Epi Map displays geographic maps with data from Epi Info</td>
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<td>EPSEM</td>
<td>Equal Probability Sampling Method</td>
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ERP  Enterprise Resource Planning
ETD  Education, Training and Development
ETP  Electronic Transmission of Prescriptions
FDA  United States Food and Drug Administration
GAMS  General Administration of Medicinal Supplying in Riyadh City
GOSI  General Organization for Social Insurance
GPs  General Practitioners
GPS  Global Positioning System
GPYW  General Presidency of Youth Welfare
H₀  Null Hypothesis
H₁  Alternative Hypothesis
HCFCMRP  Hospital das Clínicas da Faculdade de Medicina de Ribeirão Preto (Brazil)
HIS  Health Information System
HIV  Human Immunodeficiency Virus
HRBS  Hospital Rules-Based System
HSM  Hard System Methodology
ICT  Information Communication Technology
IM&T  Information Management and Technology
INRUD  International Network for Rational Use of Drugs
IOM  Institute of Medicine
IPIS  Integrated Pharmaceutical Information System
IS  Information Systems
ISD  Information System Development
ISR  Information Systems Research
IT  Information Technology
ITSs  Information Technology Systems
JCAHO  Joint Commission on the Accreditation of Healthcare Organizations
KACST  King Abdulaziz City for Science and Technology
KEIA  Social Insurance Institution of Finland
KSA  Kingdom of Saudi Arabia
LAN  Local Area Network
LDAP  Lightweight Directory Access Protocol
MARS  Medication Administration Records
MCH  Maternity and Children's Hospital
MCO  Managed Care Organization
MM   Mixed Method
MR   Medical Record
MOH  Ministry of Health
MSWord Microsoft Word
NATCOM National Computer System Company
NHS  National Health Services
NPFIT National Programme for Information Technology
NSFs National Service Frameworks
OTC  Over The Counter
P-Care Pharmaceutical Care
PCT  Primary Care Trust
PDF  Portable Document Format
PHC  Primary Health Care
PhD  Philosophy Degree
PKI  Public Key Infrastructure
PPA  Prescription Pricing Authority
PPR  Paper-based Patient Records
PRODESP Company de Processamento de Dados do Estado de Sao Paulo
PUID Prescription Unique Identifier
RAND RAND Corporation is a nonprofit research organization providing objective analysis and effective solutions that address the challenges facing the public and private sectors around the world.
RFA  Requirements For Accreditation
ROHTO A programme for Rational Prescribing
RP   Rich Picture
Rx   American English the Written Abbreviation of Prescription
SAHI Saudi Association for Health Informatics
SAP  Stands for Systems Applications and Products in Data Processing
SCHI Sowerby Centre for Health Informatics
SFDA Saudi Food and Drug Authority
SGH  Secretariat General of Health
SHIS Saudi Health Information System
SHS  Saudi Health System
SIS  Soft Information System
<table>
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<th>Acronym</th>
<th>Full Form</th>
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<tr>
<td>SISTeM</td>
<td>Soft Information Systems and Technologies Methodology</td>
</tr>
<tr>
<td>SPIMACO</td>
<td>Saudi Pharmaceutical Industries &amp; Medical Appliances Corporation</td>
</tr>
<tr>
<td>SPS</td>
<td>Saudi Pharmaceutical Society</td>
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<td>SPSS</td>
<td>Statistical Package for Social Science</td>
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<td>Soft System Methodology</td>
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<td>South West Information for Clinical Effectiveness - Rural</td>
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<tr>
<td>TMUWFH</td>
<td>Taipei Medical University Wanfang Hospital</td>
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<tr>
<td>TQM</td>
<td>Total Quality Management</td>
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<td>United Arab Emirates</td>
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<td>UK</td>
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<td>Veterans Affairs</td>
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<td>Victorian Hospitals Electronic Prescribing and Decision Support Group</td>
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<td>Verified Internet Pharmacy Practice Sites</td>
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<td>World Health Organization</td>
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<td>WWW</td>
<td>World Wide Web</td>
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Chapter-1

Introduction

1. Introduction

1.1 Introduction:

Since the Ministry of Health was established in 1950 the beginning of the health services in Saudi has became a reality. These services were provided through a number of Saudi government agencies and the private sector and were seen as a tangible development within all health utilities, buildings and medical activities. The development covered all the infrastructure, locations, medications, training and education. As with any services in any country of the world there are successes and difficulties facing new development. In the health services in Saudi Arabia there are frequently development plans which have realized success, but there are still problems and difficulties which stand in the way of completing the services as expected. One of these health problems is the developing of the method of prescription prescribing and the method of improving it. This study aimed to highlight the issues of this difficulty affecting the health service and aimed to deliver some recommendations for an improvement.

Errors in the health service are not the same as errors in other professions. The possibilities of error corrections are acceptable in most businesses and professions, but the errors which are associated with human life are not acceptable. Medication errors, whether they be with prescribing, monitoring or administering medicines, are inadmissible. For these reasons, Information Technology (IT) has been introduced into the health services to reduce the errors and to make the medical services safer.

A medication error is any preventable event occurring within the medication-use process, including prescribing, transcribing, dispensing, using and monitoring, that results in inappropriate medication use or patient harm. While most consumers and healthcare providers do not often associate poor health outcomes with adverse drug events – frequently the result of medication errors – the human and financial costs of the problem are staggering. For the year 2000, experts estimated the overall cost of drug-related morbidity and mortality to be in excess of $177.4 billion. That amount greatly exceeded the $120.8 billion spent on prescription drugs during that year. In terms of patient harm from medication errors, the Institute of Medicine (IOM) estimated that at least 1.5 million Americans are sickened, injured or killed each year by medication errors. This amount was significantly greater than the amount actually spent on prescription drugs during the same year. Perhaps the most concerning aspect of these errors
was that the tremendous human and financial costs were not the result of some serious disease, but rather, well-intentioned attempts to treat or prevent illness (Medication Errors Panel, 2007, pp. v - 1).

Medication errors have been identified as a major type of medical error. The Council of Europe and the British Department of Health defined medication errors as "any preventable event that may cause or lead to inappropriate medication use or patient harm ..." The Institute of Medicine reports that a hospital patient can expect on average to be subjected to more than one medication error per day. Medication errors can lead to adverse drug events (ADEs) that are defined as "any response to a drug that is noxious and unintended ...." A report from the Institute of Medicine that was published in 1999 stated that annually in the US 7,000 deaths can be associated with medication errors (Ammenwerth, 2008, p. 585).

Smith (2004, p.59) illustrated that prescribing errors may arise in the decision making process or in prescription writing. Errors in decision making may be due to lack of knowledge about the patient, drug or both; monitoring of treatment may be inadequate or lacking. Errors in prescription writing may be due to poor communication, inaccurate transcription, or unsigned or illegible prescriptions. Errors may be due to person or systems' factors or a combination of both (see Figure 1.1).

**Figure 1.1 The Persons' and Systems' Approaches to Medication Error**

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The Medication Errors Panel (2007, pp.2-3) defined the type of medication errors in the community setting as three general types that can occur: those related to the prescribing process; those that occur when the medication is dispensed at the pharmacy; those related to the consumer's use of the medication.

Prescribing Errors: the first step in obtaining a prescription medication occurs when a consumer visits a physician or other health care professional with prescribing authority and receives a prescription. In order to avoid selecting a drug that could be inappropriate or harmful to a patient, it is important for the prescriber to have access to the patient's complete health information record at the time the patient is being seen. The patient information should include all medicines the patient is taking, lab test results, other physicians the patient has seen and any past hospitalizations or drug allergies.

Dispensing Errors: dispensing errors occur when a patient is given a medication other than the one intended by the prescriber. These types of errors are often the result of sounds like or look like drugs, the dispensing of the "right drug" to the "wrong person," often the result of similar names shared by several members of a family, many of whom may speak limited English.

Administration/Medication Use Errors: a key characteristic of the community setting that contributes to medication errors is that medication is administered by persons who are not trained health care professionals. This is in sharp contrast to inpatient hospital settings where prescribers write orders for medication on patients' medical charts and drugs are subsequently administered by health care professionals. In hospitals, patients are often passive and rely on others for their treatment. In community settings the opposite is true and medication use is almost completely dependent upon consumer knowledge and motivation which can often be lacking. In fact, it has been estimated that people who are prescribed self-administered medication typically take less than half the prescribed doses. Many consumers simply do not understand what medication they are taking, their importance, their contradictions, or proper usage. In addition, consumers may not be asked by their health care professionals which non-prescription medication or supplements they are taking and may not know the importance of volunteering this information to avoid problems such as therapeutic duplications or interactions. As the majority of medication errors in community settings are made by consumers, it is clear that real progress will require significant efforts to improve consumers'
knowledge, skills and motivation to use their medication correctly. Health care professionals and others involved with prescribing, dispensing, administering and monitoring medication use in community settings can all help to achieve these goals.

The Americans Society of Health-System Pharmacists has described common causes of drug administration errors as shown below:

- Ambiguity in the way the strength appears on labels or in packaging.
- Drug product nomenclature (looks alike or sounds like other names, use of lettered or numbered prefixes and suffixes in drug names).
- Equipment failure or malfunction.
- Illegible handwriting.
- Improper transcription.
- Inaccurate dosage calculation.
- Inadequately trained personnel.
- Inappropriate abbreviations used in prescribing.
- Labelling errors.
- Excessive workload.
- Lapses in individual performance.
- Unavailable medication (Smith, 2004, p.59).

Cousins and Heath, (2008, pp. 5 - 6) identified the types of Medication Errors (MR) such as prescribing error, improper dose/quantity, omission error, unauthorized/ wrong drug, wrong patient, extra dose, wrong time, drug prepared incorrectly, wrong route, and wrong administration technique. They also identified the common causes of MR such as performance deficit, procedure/protocol not followed, documentation, communication, knowledge deficit, transcription inaccurate/omitted, written order, calculation error, abbreviations, verbal orders, computerized prescriber order entry, computer entry, dispensing device involved, contraindicated, drug allergy, system safeguard(s), and monitoring inadequate/ lacking.

About 1.8 million prescriptions are written by general practitioners in the UK every day and an estimated 0.5 million in hospitals. The standard of prescribing is generally high but patients are too frequently harmed through avoidable errors. Prescribing errors occur for a variety of reasons, including inadequate knowledge of the patient and their clinical condition, inadequate knowledge of the drug, calculation errors, illegible handwriting (see Figure 1.2) drug name confusion and poor history taking. Personal and environmental factors, such as fatigue and
workload, are also important contributory factors. Prescribing errors are potentially the most serious of all types of medication error as, unless detected, they may be repeated systematically for a prolonged period. It is important that all prescribers, whether doctors or, increasingly, nurses, pharmacists and other health professionals are aware of the principles of safe prescribing and of potential risks (Smith, 2004, p.32).

**Figure 1.2 Printing and Illegible Handwriting on Prescriptions**

![Image of illegible handwriting on a prescription]

In the UK, 406 claims were made against community pharmacist members of the National Pharmaceutical Association (NPA) in 2001 as a result of dispensing errors. NPA membership comprises the owners of around 11,000 pharmacies in the UK dispensing more than 600 million prescriptions each year. Claims data does not provide reliable estimates of the frequency of dispensing errors that occur in community pharmacies as these incidents are only reported when a professional indemnity claim is made against the pharmacist. In 1996, a one-week audit in four community pharmacies in Glasgow reported that 50 dispensing errors occurred on 5,004 prescriptions (0.99%). Most of the errors involved supplying the wrong strength (36%), wrong drug (36%), or incorrect labelling of the product (14%). More recently, an eight-week study in four community pharmacies in Hull and East Riding found that 39 dispensing errors...
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(0.08%) and 247 near misses (0.48%) were reported from 51,357 dispensed items (56 incidents per 10,000 items dispensed). The most common types of incidents recorded were incorrect strength of medication (23.1%), incorrect drug (19.2%), incorrect quantity (17.3%), incorrect dosage form (16.4%) and incorrect label 15.7% (Ashcroft, et al., 2005, p. 5).

Halvorson (2007, pp.40 - 43) reported how care linkage deficiencies occur in American healthcare. A patient with two diseases will often have two doctors. Since two doctors writing two prescriptions generally do not interact and also have two separate paper files for their care, site medical records, the first prescription that was written for the patient is too often totally unknown to the second doctor who writes the second prescription. Adverse drug events (ADEs) are the most common cause of medical errors in hospitalized patients. Roughly 5% of patients' experience a medication error. Although not all medication errors cause harm, many do—and in addition to the human costs, they can add 20% to the cost of the hospital stay.

Doctors who use paper medical records have no way of preventing ADEs unless the patient can recall his own prescription history. Each year, more than 700,000 people are treated for adverse drug events in emergency rooms in the United States; unintentional overdoses are the most common problem. Halvorson added that we could give doctors interactive electronic tools to help remind each physician of potential dangerous drug interactions at the critically important point in time when prescriptions are written. Computer programmes could also advise the doctor about lab test findings and their potential significance, and even remind physicians of the best current science for a particular condition. The computer could also very easily and consistently trigger specific reminders for doctors about which care steps are needed next for a particular condition for a particular patient. If we want to create better, more consistent care that information needs to be easily available to doctors in ways that can be achieved only by a computer (see Figure 1.3).

The British Department of Health recommends the wider use of electronic prescribing to reduce the risk of medication errors. Electronic prescribing is supported by Computerized Physician Order Entry (CPOE) systems. The term CPOE refers to a variety of computer-based systems for ordering medications, which share the common features of automating the medication ordering process. The CPOE systems can range from systems that only provide a list of possible medications that the physician can choose from, to systems providing varying levels of decision support, including checks of drug-drug interactions, drug-allergy contraindications, or checks of prescriptions concerning the patient’s recent laboratory results.
All those checks can lead to alerts and reminders given to the ordering physician in case problems are detected (Ammenwerth, 2008, pp. 585 - 590).

**Figure 1.3 Access Information from Case Notes**

The United States already has considerable experience with electronic prescribing and robotic drug management systems and there is now increasing evidence from a small but growing number of developments in the UK that appropriate application of Information Management and Technology (IM&T) can reduce error. These include electronic prescribing, computerised decision support, robotic pharmacy dispensing machines, bar-coding and computerised medication administration records (see Figure 1.4). The key benefit to the computerizing, prescribing, dispensing and administration of drugs is that information about the patient and the drug is centralised and available to anybody who has to make decisions about these complex processes (see Figure 1.5). Crucially, data about the patient and the drug being prescribed are linked, enabling cross checks to be made and problems, such as contraindications and dosing errors, to be identified and resolved (Smith, 2004, p.121).
Figure 1.4 Electronic Patient File Improved Treatment Quality


Figure 1.5 Traditional Patient Folders and the Patient Detail Screen

Source: Smart Dentist. www.smart-dentist.com/images/PatientScreen.GIF

Electronic prescribing offers the additional benefit of releasing pharmacy staff from routine prescription checking. Currently, prescribing errors are identified retrospectively - ideally before the patient receives the drug – and the pharmacist then has to contact the prescriber to review the prescription. Electronic Systems have the potential to check automatically for dose errors, drug-drug and drug-disease interactions and to provide immediate alerts. Time can then be allocated from prescription checking to providing wider medicine management services and
advice on the more complex issues of drug selection (see Figure 1.6), drug administration and monitoring of responses to treatment.

Computerized prescription entry in the US has been shown to reduce the rate of serious medication errors by 55% and the rate of all errors by 83%. However, caution needs to be exercised in translating this apparent dramatic improvement in prescribing quality into UK hospitals, as traditional US practices involve extensive transcribing from case notes. To date, electronic prescribing has been implemented in only a small number of NHS hospitals ([ibid, 2004, p.124].

**Figure 1.6 Tablet PCs and other forms of Mobile Computing Used in the Healthcare Industry**

Bar-code technology is familiar through its widespread use in the retail sector, but this technology also has the potential to improve patient safety by scanning codes on the drug, prescription and patient at the time of administration, thus reducing the risk of incorrect drug errors. Pharmacy and ward stock management could be improved by use of this system which would reduce the risk of drugs being out of stock - one cause of omission error. As shown in Figure 1.7 Patients are Given a Paper Prescription with a Barcode and Serial Number on It, Scanning the Barcode in the Participating Pharmacy Allows the Computer to Download Details of Prescribed Items from a Central Computer.
Bar-coding is widely used in the US to manage medication in hospitals. In fact, the Department of Veterans’ Affairs (VA) has implemented a system in all 172 of its healthcare institutions. The US Food and Drug Administration (FDA) had given notice of a proposal for mandatory bar-coding of all drugs and biological products with the principal aim of reducing medication errors. Medication Administration Records (MARs) in hospitals are prescription sheets on which details of each dose given were also recorded. In most UK hospitals these were handwritten. Ambiguous, incomplete or illegible records are a frequent cause of medication errors and feature prominently in error inquiries (ibid, p125).

Figure 1.7 Bar-Code Technology

In Jeddah, the health sector have restricted information technology systems to administration and booking appointments. Patient records that include medical history, diagnostic tests, x-rays, CT scans, laboratory treatments and ultra-sounds, are still kept in traditional paper folders. Health professionals consider this an inefficient method when they are required to make treatment decisions; most of them still prescribe medication using handwritten scripts. Pharmacies, medicine distributors, suppliers and pharmaceutical companies are working in markets without information transferring systems such as “Electronic Mail or World Wide Web
WWW" and are thus still marketing medicines by visiting customers, offering samples or contributing gifts or donations.

Moreover, when pharmacies need to carry out inventories of remaining stocks of medication it is necessary to do this by traditional methods; in fact, even though a sizeable number of commercial establishments use barcode labels the medication trade sectors have not achieved this. The key point observed from this system is the lack of medication prescribed which is not available at the time required and which could take two to three hours to locate in other branches.

Other factors have to be considered when dealing with the problem of prescription errors. For example, do the annual statistics of the Ministry of Health really reflect the reality of the health care provided and do they take prescription error into account?

1.2 Statement of the Problem:

A group of observations by the researcher framed the idea for this study. The majority of government and private health providers in Jeddah are still unable to use information technology systems for their patient records; it has also been noted that there are difficulties facing the health services with regard to decreasing medical errors. The inefficiencies of the manual medical records systems in use in the health services led to the following problems:

- Delays in providing the correct information to doctors for consultation to review patient history.
- Delays in creation and completion of Medical Record (M.R) patient folders and delays in the treatment decision making process.
- Incorrect names of patients are often entered into the medical record system. Many names are similar and/or resemble each other. Where this occurs documents are often put in the wrong medical records.
- There is no linked internal medical record system between different departments e.g.: laboratories and radiology. Therefore, patient data is lost between departments.
- Illegible handwritten prescriptions are entered in the manual system and this may lead to medication errors.
- Physicians have little up-to-date knowledge or access to medication literature. They are still using manual references to check the side effects of medication, allergies and/or their
substitutes, as well as a lack of knowledge of whether the drug is available at pharmacies or suppliers within the market.

- Decision makers i.e. Ministry of Health (MOH), national and international pharmaceutical companies have difficulty in obtaining statistical details which reflect the reality of the health services, such as medication, prescribing and consumption. These statistics are not collected or recorded via a direct computerised system with all departments.

1.3 Aim of the Research:

The main aims were to:

- Gain an understanding of the problems which physicians, pharmacists and the general public face regarding the method of prescribing medication in Jeddah, Saudi Arabia and to clarify the ways of systematization of the dispensing and supplying of medication for prescriptions at pharmacies as well as to highlight the impact of these methods on the health services.

- To realize the current situation of the role of the use of Information Communication Technology (ICT) and the information systems to improve this part of health services at the governmental and private health sectors, the Ministry of Health (MOH), the local pharmaceutical companies and suppliers.

1.4 Objectives:

The objectives of the research were to:

1) Evaluate the proportion of the used methods by the physician to prescribe medication and illustrate how physicians receive information to update their practice.

2) Define the used system at the pharmacies to receive the prescriptions from the health sectors and the current situation of the systematization of dispensing and supplying of medication.

3) Investigate the problems, which the patients face with the current method of medication prescribing.

4) Clarify the role of the Ministry of Health (MOH) in developing a pharmacy system and a medication prescribing method.

5) Clarify the role of local pharmaceutical companies, providers and distributors in medication supplies and the information systems they use to supply the health sectors.
6) Highlight the optimal information systems, which ensure the methodology of pharmacies and medication information systems, in developing health service sectors.

1.5 The Hypotheses of the Research:

A. The health sectors in Jeddah City lack information technology and communication systems to update knowledge and availability of medication.

B. In Jeddah City regular use of the traditional methods of prescribing medication leads to defective medication services.

C. Health professionals and patients in Jeddah City emphasise the problems and disadvantages of the current method of medication prescribing and prescriptions.

D. The Ministry of Health, pharmaceutical companies and suppliers have been unable to develop medication services; as a result they require an information system to provide real statistics about the size of medication prescribing and consumption.

1.6 Significance of the Study:

The significance of the study is given as follows:

1. According to the literature review of health informatics, this research is the first study in this field in Saudi Arabia.

2. The local pharmaceutical companies, suppliers, pharmacies and auxiliary groups embody the main medical services; this research will study the environment of the information system and the systematization of these sectors and will discuss the concept of establishing information systems to manage the supplying of medication and the operating of pharmacies.

3. Jeddah is the second largest city in Saudi Arabia; it has a large number of health professionals that will help the researcher to apply his research. The outcome of this research and the recommendations will help the health services in Jeddah to develop. It is expected that this study will be adopted generalize the system in used as a model to the government and private health sectors in Saudi Arabia.

4. This research is consistent with the new KSA government policy to establish E-Government. It is anticipated that the information system that will be suggested by this research will be designed as a future support system for the government and private health
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sectors which will help in decision-making.

5. It is anticipated that the outcome of this research will be useful for future Ministry of Health planning in the area of medication strategy. In addition, the recommendations will serve as a reference for other researchers in the health informatics field.

1.7 Definition of Research Title:

To understand the research terms, the researcher defines the research title as follows:

1.7.1 Pharmacies:

These include organisations responsible for the systematization, the supplying and the style of prescription and medication prescribing in the government and private health sectors in Jeddah. Commonly, these pharmacies prescribe initial medication by prescription at no cost or by sale. Repeat medication is accessible to patients, who do not have to visit the physician or meet other prescription requirements. Usually, the location of the pharmacy of government and private hospitals is inside the building or near the entrance. Most community pharmacies were not established and designed to be pharmacies. The Ministry of Health and the municipality have regulated the size of pharmacies to a minimum size; however, there is no maximum limit which is ultimately left to the responsibility of the owner. 30% to 40% of the space of the pharmacy should contain medication and the remainder should be devoted to health materials and medical equipment, as well as to beauty products. With regard to working hours, pharmacies should remain open between sixteen to twenty four hours 7 days a week.

1.7.2 Medication:

Pharmaceutical items which have been authorized by the Ministry of Health for circulation and which have diverse sources, such as local companies that either produce or import from various countries such as the United States, the United Kingdom, Germany or Canada via local suppliers and importers. Ministry of Health regulations prohibit the selling of medication without prescriptions; however, there are no controls or checks.

1.7.3 Information System:

Computer programmes are used daily at pharmacies, physicians’ clinics (surgeries), pharmaceutical companies, suppliers and at the Ministry of Health. This system was created to systematise the archiving of records as well as medication services. The system is also linked to a database which is able to send electronic prescriptions from physicians’ clinics (surgeries)
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directly to the pharmacies or to any place connected with the health service.

1.8 Organisation of the Thesis:

The thesis is organised into nine chapters. The scheme of these chapters is illustrated in Figure 1.8. A brief description of each chapter is included here to serve as a summary of the thesis.

In Chapter 1, an introduction to the thesis subject is presented with extended detail. It highlights the need for this research, its aims, objectives and its significance.

In Chapter 2, a background to the study presents the health system in Saudi Arabia; in addition statistics detailing about the governmental and private health sectors and their services are given.

Chapter 3 presents a review of relevant literature on the research subject. It provides a definition of the development of the medication and pharmacies’ information technology systems (ITs) and its services in developed countries, in developing countries and in Saudi Arabia.

In Chapter 4, a general review about research methods is presented; the research methods employed in the study and a discussion of the appropriateness of the selected methodology for this research is discussed. Furthermore, the questionnaire and interview design are considered, also Soft Systems Methodology are presented.

In Chapters 5 and 6, the results of the survey data which was collected from the empirical data collection is described and analysed. Chapter 5 presents and discusses the data and an analysis of the interviews is presented in Chapter 6.

Chapter 7, focuses on the systems intervention and the implementation, the different stages of the Soft Systems Methodology to illustrate the 'problem situation' which was identified by and employed by the outcomes of the data collection in Chapters 5 & 6. All seven stages of the Soft System Methodology (SSM) are identified and a number of ways to improve the 'problem situation' follow from the three root definitions established. Output from the Soft Systems Methodology to investigate organisational change is also considered in the form of organisational models.

In Chapter 8, an overall summary and discussion of the results of the system intervention is presented. The elements of effectiveness in the issues of this study are discussed. The contributions to knowledge as a result of the research study are outlined.

Chapter 9 presents the conclusions of the main findings and recommendations regarding the implementations of Pharmacies and the Medication Information System, (PMIS) which refers to
the aims and objectives of the thesis. In addition, suggestions for future work and research, for
the future changes are made.

**Figure 1.8 Research Structure**
Chapter-2

2. Background to the Study

2.1 Background:

Jeddah is located in the western region of Saudi Arabia and on the eastern coast of the Red Sea. The geographical position is 29.21N, 39.07E and the area of Jeddah represents 3.3% of the total area of Saudi Arabia. It has a paved coastline which stretches for about a hundred kilometres longitudinally from north to south; its population is 12.3% of the total census of Saudi Arabia. (see Table 2.1).

Table 2.1 The Proportion of the Census and the Geographical Area of Saudi Arabia and Jeddah, 2004

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<th>The Census &amp; The Proportion</th>
<th>The Geographical Area &amp; The Proportion</th>
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<td>2,250,000 km²</td>
</tr>
<tr>
<td></td>
<td>87.7%</td>
<td>96.7%</td>
</tr>
<tr>
<td>Jeddah</td>
<td>2801481</td>
<td>74762 km²</td>
</tr>
<tr>
<td></td>
<td>12.3%</td>
<td>3.3%</td>
</tr>
</tbody>
</table>

Note: Based on Population and Housing Census 2004.
Source: Central Department of Statistics & Information Ministry of Economy and Planning.

Figure 2.1 Saudi Arabia Map

Source: Google earth 06 December 2009
2.2 Health System in Saudi Arabia:

According to the Eighth Development Plan (2005 -2009) which was issued by the Ministry of Economy and Planning, health services have achieved remarkable progress in record time in all respects, including preventive and curative care, as well as maternal and child care. This is reflected in improvements in health indicators. Over the past two decades, the mortality of children below 5 years of age has declined from 85 to 22 deaths per 1000 live births, while infant mortality has dropped from 65 to 18 deaths per 1000 live births whereas life expectancy rose from 61 to 71.9 years in 2003. In fact, health development indicators are now well ahead of those of the middle-income group of nations, as well as of most Arab states.

The Eighth Development Plan (2005 -2009) emphasised that, notwithstanding the remarkable achievements made, health services faced several challenges that included the need to raise further efficiency of the services provided, secured funding for the improvement of essential services and to ensure universal sustainable access. Overcoming these challenges will help the Kingdom keep pace with countries that have an advanced level of human development. The
progress of health services, both quantitatively and qualitatively, under the Seventh Plan led to marked improvement of health development indicators. In 2003, there were 338 hospitals with 48,761 beds, 33,340 physicians and 69,273 nursing staff. In addition, the Ministry of Health (MOH) provided primary healthcare to the population through 1804 primary healthcare centres. Health Services provided by MOH covering all urban and rural areas. In the same year, the private health sector consisted of 105 hospitals with a total of 9,337 beds, 1,059 dispensaries, 795 clinics, 59 medical laboratories, 12 physiotherapy centres, 3,228 pharmacies and 286 drug stores; and its manpower comprised 9,929 physicians, 13,848 nurses and 6,578 health technicians. While the share of the private sector in health infrastructure remained unchanged, it made a relative improvement in the volume of the health services it provides, with its share in total patient visits to hospitals and health centres increasing from 16.9% in 1999 to 18.6% in 2001 and its share in the total number of in-patients increasing from 25.6% to 26.4%.

The Eighth Development Plan (2005-2009) clarifies that, the MOH is the major government agency entrusted with providing preventive, curative and rehabilitative healthcare for the population. In addition, King Faisal Specialist Hospital and Research Centre admits cases that require advanced specialist treatment and conducts research in health. Through colleges of medicine, Saudi universities also contribute to the provision of specialist curative services, conduct medical education and training programmes as well as carry out health research, in collaboration with other research centres. Furthermore, the Saudi Red Crescent Society provides emergency medical services to the population, as well as to pilgrims and Umrah performers. Whereas the military and security agencies provide medical services to their staff and to segments of the general public, while school health units provide primary healthcare to students. Health facilities of the General Organization for Social Insurance and the General Presidency of Youth Welfare provide health services for certain categories of the population. The Royal Commission for Jubail and Yanbu provides health facilities for employees at the twin industrial cities. Furthermore, the private sector provides health services through health facilities around the country.

The Eighth Development Plan (2005-2009) mentioned that, under the Seventh Plan, significant steps were taken to develop the health system; key among these were the creation of the Health Insurance Council and the issuance of the relevant bylaws and regulations on 8/6/2002. Under these regulations, Health Insurance Law will be applied in three phases over a period of three years. In the first phase, the law will apply to companies and establishments with a workforce of more than 500 persons. The next phase will include companies employing more than 100
workers, while the third phase will extend the application of the law to all businesses and individuals covered by it. As actual enforcement of the law has not yet started, action will be taken to speed up completion of all the requirements of the preliminary phase, so that enforcement can be initiated as soon as possible. In a later development, the Council of Ministers Resolution have approved the structure of the new integrated health system aimed at ensuring provision of comprehensive and integrated healthcare to the entire population. Moreover, steps have been taken towards applying the system, such as the creation of the Health Services Council.

The plan points to the Saudi Food And Drug Authority (SFDA) which was created in 2003. It is established under the Council of Ministers resolution as an independent body corporate that directly reports to the Premier. The Authority objective is to ensure safety of food and drugs for Human and animal consumption, safety of biological and chemical substances as well as electronic products from harmful effects on public health; and accurate calibration and safety of medical and diagnostic equipment. The authority is also mandated to formulate clear policies for foods and pharmaceuticals; conduct applied research and studies in related fields; monitor regulations and procedures pertinent to licensing of food, pharmaceutical and medical equipment manufacturers as well as exchange of information and creation of a food and medicines database. The authority will operate on a commercial basis and will undertake its functions in two phases. In the first phase, which will last 5 years from the date of the Resolution, the authority will undertake the standardization, control and supervisory tasks necessary for proceeding to the second phase, in which it will embark upon specific implementation tasks to achieve the objectives set in its mandate. Under the Eighth Plan, the Commission will initiate work to create a database, build a main research centre, a central reference laboratory branch, laboratories and an administration building for the authority.

The main purpose of the SFDA establishment is to regulate, oversee, and control food, drug, medical devices, as well as to set mandatory standard specifications thereof, whether they are imported or locally manufactured. The control and/or testing activities can be conducted in the SFDA or other agency's laboratories. Moreover, the SFDA is in charge of consumer awareness on all matters related to food, drug and medical devices and all other products and supplies. The main objectives of SFDA can be outlined as follows:

- Observe the safety, security, and effectiveness of food and drug for human and animal consumption.
Chapter-2

Background

- Observe the safety of complementary biological and chemical substances, cosmetics and pesticides.
- Observe the safety of medical devices and its impact on public health.
- Ensure accuracy and safety of medical and diagnostic devices.
- Launch clear policies and procedures for food and drugs, as well as plan to achieve and implement these policies.
- Conduct research and applied studies to identify health problems, their causes, determine their impact on the public, with the consideration of methods for research / studies evaluation. The authority shall establish scientific bases for awareness and consulting services and executive programs in the fields of food and drugs. This can be accomplished through the recruitment of experts & specialists or through the partnership with research bodies such as King Abdulaziz City for Science and Technology (KACST) and/or universities research centres.
- Control and supervise licenses, procedures for food, drugs and medical device manufacturers.
- Disseminate and exchange information with local and international scientific and legal agencies, as well as set up a database for food and drugs.

The Eighth Development Plan (2005-2009) highlighted that, the manpower employed in MOH increased from 94,669 in 1999 to 104,540 workers in 2004, with the share of Saudi manpower increasing from 59.5% to 66.6%. In that period, the share of Saudi nationals in the total number of physicians rose from 19.5% to 21.8%, their share in the total number of nursing staff increased from 26.9% to 31.1% and their share in the total number of ancillary medical workers went up from 56.3% to 61.4%; as compared to the targets set by the Seventh Plan of 25%, 45% and 65% respectively. Saudization of manpower is an important national issue for the health and all other economic and social sectors. However, the relatively low numbers of Saudi medical and nursing staff has special significance, since efficient delivery of health services requires familiarity with the language, social and cultural values and traditions of the country to ensure effective communication between health workers and service recipients. Therefore, efforts should be made to increase numbers of Saudi medical and nursing staff, through the setting up of medical education facilities; increasing the absorptive capacity of colleges of medicine, nursing and health sciences; increasing scholarships; maximizing private sector contribution to medical education; application of modern distance education technologies, particularly in training and continuing education.

The Eighth Development Plan (2005-2009) indicated that, under the Seventh Development Plan, actual financial expenditure of health sector development Programmes (MOH, Saudi Red...
Crescent Society, King Faisal Specialist Hospital and Research Centre) totaled some SR80.1 billion, amounting to 98.4% of the Seventh Development Plan target. Notwithstanding the continued progress of health services, developments raise several issues and challenges that should be dealt with under the Eighth Development Plan.

The Eighth Development Plan (2005-2009) also emphasized that, demand for health services is increasing steadily, driven by several demographic, economic and social factors; key among these are the relatively high population growth rate, growing awareness by the community of the importance of healthcare, particularly preventive healthcare; changes in disease patterns, with increasing incidence of non-communicable diseases, such as cardiac diseases, diabetes, cancer and geriatric illnesses; and the high rate of traffic-accident injuries. Moreover, these diseases and injuries require high-cost treatments and there is, in addition, the need for continuous acquisition of advanced medical equipment. Emphasis should therefore be placed on meeting the increasing demand for health services, through increased provision of services, improving the efficiency with which existing facilities are utilized and transferring some government hospitals to the private sector. In addition, the Eighth Development Plan points to the role of the private sector that should be strengthened, particularly in view of the targeted universal application of health insurance law. The state would then focus on ensuring availability of highly efficient health services in all parts of the country to all segments of society, along with regulating services and monitoring their performance and quality.

Furthermore, the Eighth Development Plan highlighted that government health facilities are currently running through a centralized financial and administrative system that fails to provide the indicators necessary for measuring performance. The plan emphasized that, it is important to centralize planning and coordination tasks at the national level, efficient implementation of health services requires giving wider powers and responsibilities to regional and major units, such as hospitals. Thus, the plan highlighted that, as much power and responsibility as possible should be given to local units, with hospitals and healthcare centers becoming independent cost centers, governed by an accounting and evaluation system based on well-defined investment, operational and quality standards. In this way, productivity can be improved and efficiency and quality of service can be further developed. In addition, further development of service efficiency, requires monitoring performance of medical and nursing staff and establishing clear definitions of the tasks and responsibilities of medical service providers.

Notwithstanding the development and expansion of healthcare services, disparities among regions and between urban and rural areas pose a challenge to universal healthcare coverage.
Standard service indicators, measured in terms of input/population ratios, may not be sufficient to identify demand for health services, particularly in rural areas with low population densities. As a result, consideration should also be given to population diffusion and geographic dimensions to ensure that services are available within a reasonable geographical distance. Furthermore, the plan indicated that attempts should be made to ensure that all basic health services, notably maternity and childcare, promotion of health awareness, protective healthcare services, etc. are available in health centres located in rural areas. Since such areas are not attractive to the private sector compared to urban centres, the plan clarifies that, they should be given priority in programmes of the government health services sector.

Demand for MOH-provided health services under the Eighth Development Plan (2005-2009) has been estimated on the basis of general service standards approved by the MOH and the specific needs of each region, taking into account geographical distance, population dispersion and health conditions, effective health service planning, coordination and monitoring require a comprehensive integrated database of all relevant variables, as well as efficiency and performance indicators covering central and regional agencies. In addition, a country-wide health information system linking all health sector agencies and units should be developed. Such a system would provide up-to-date comprehensive data and contribute to e-Government through automation of various procedures and processes.

Population forecasts indicate that up to 2024, the Saudi population will continue to grow at a high rate, as a result of higher fertility and lower mortality. This increase will require additional health facilities and manpower to meet growing population needs and maintain service provision rates. Estimates also indicate that the proportion of the Saudi population in the 60-years-and-above age group in the total population will increase by 2020, with life expectancy increasing from 71.9 to 77 years. In addition, features of the health situation and rates of incidence of various diseases will continue to change. Prevention and health awareness programmes, implemented as part of primary healthcare activities, will continue to affect further reductions in the incidence of communicable diseases. In contrast, the incidence of non-communicable diseases and accident injuries will have a rising trend due to urbanization, industrial development, increased population density and change of life style. The resulting changes in the demand for health services necessitate expanding particular types of provision. In addition, more segments of the population will be provided with healthcare services under the umbrella of the cooperative health insurance system. As a result the development strategy for the health sector aims to bring
healthcare services as fast as possible to the same quality and level of countries having high human development standards.

Objectives:

- Continuing to provide preventive, curative and rehabilitative healthcare and facilitating access by the entire population.
- Developing and upgrading the efficiency of healthcare services.
- Improving the qualifications and Saudization of health manpower.
- Promoting the role of the private sector in providing healthcare services.
- Providing highly efficient emergency medical services.

Policies:

The following policies will form the basis for achieving the key objectives of the health sector:

- Providing and developing primary healthcare programmes.
- Developing maternity and child healthcare services.
- Controlling communicable diseases and reducing their incidence.
- Providing and upgrading efficiency of curative care.
- Increasing the scope of health service decentralization to ensure that powers are commensurate with responsibilities.
- Developing adequate regulations for operating hospitals on commercial principles.
- Developing mechanisms and procedures for the quality assurance of services.
- Implementing a cooperative health insurance system.
- Linking health centres with relevant referral to general hospitals.
- Increasing the absorptive capacity of health education and training.
- Enhancing the scholarship programme.
- Transferring ownership of some MOH hospitals to the private sector.
- Expanding the coverage of emergency medical services.

Targets:

- Opening 300 and constructing 1,250 primary healthcare centres in all regions.
- Achieving maternity and childcare indicator levels.
- Reducing the incidence of communicable diseases targeted for immunization to the levels.
- Opening 54 new hospitals with a total bed capacity of 6,200 and launching the construction of 42 hospitals with a total bed capacity of 9,200, in line with regional distribution.
Reviewing current administrative and management structure and approving new ones.

Implementing adequate regulations for operating government hospitals on economic principles.

Reviewing service quality assurance mechanisms and procedures currently in place.

Expanding the application of the health insurance system.

Achieving full linkage between health centres and general hospitals.

Opening 8 and constructing 22 health sciences colleges in all regions, as per the distribution to help achieve a Saudization level of 50% of total health staff, as envisaged by the Plan.

Setting a target number of government hospitals to be transferred to the private sector.

Completing the development of the information technology network.

Applying the smart card system and tele-medicine.

Opening 150 and constructing 90 emergency centres and purchasing 750 ambulance vehicles to be distributed to regions and centres; making increased use of digital and wireless equipment to help reduce response time; and constructing landing pads for air ambulance services at 5 sites.

A total of SR98 billion is earmarked in financial allocations during the Eighth Development Plan for the health sector (MOH, the Saudi Red Crescent Society, King Faisal Specialist Hospital and Research Centre). These allocations are earmarked to finance expansion in the construction of health facilities, support for primary healthcare, as well as protective and curative healthcare programmes.

According to the Ministry of Planning, the latest Saudi Seventh Development Plan, (2000-2004) (see Tables 2.2, 2.3 and 2.4) shows the increase between 1998 and 1994 in the number of hospitals, beds and professionals in the Kingdom’s health sectors.

Table 2.2 Hospitals in the Government and Private Health Sectors between 1998 and 1994

<table>
<thead>
<tr>
<th>Hospitals</th>
<th>1998</th>
<th>1994</th>
<th>Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>No</td>
<td>%</td>
</tr>
<tr>
<td>Ministry of Health</td>
<td>173</td>
<td>182</td>
<td>9</td>
</tr>
<tr>
<td>Other Government Agencies</td>
<td>34</td>
<td>39</td>
<td>5</td>
</tr>
<tr>
<td>Private Sector</td>
<td>72</td>
<td>87</td>
<td>15</td>
</tr>
<tr>
<td>Total</td>
<td>279</td>
<td>308</td>
<td>29</td>
</tr>
</tbody>
</table>
Table 2.3 Hospital beds in the Government and Private Health Sectors between 1998 and 1994

<table>
<thead>
<tr>
<th>Hospitals Beds</th>
<th>1998</th>
<th>1994</th>
<th>Increase</th>
<th>No</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Health</td>
<td>26878</td>
<td>27428</td>
<td>550</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Other Government Agencies</td>
<td>8357</td>
<td>9119</td>
<td>762</td>
<td>9.1</td>
<td></td>
</tr>
<tr>
<td>Private Sector</td>
<td>6592</td>
<td>8485</td>
<td>1893</td>
<td>28.7</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>41827</td>
<td>45032</td>
<td>3205</td>
<td>7.7</td>
<td></td>
</tr>
</tbody>
</table>

Table 2.4 Health Professionals in the Government and Private Health Sectors between 1998 and 1994

<table>
<thead>
<tr>
<th>Health professionals</th>
<th>1998</th>
<th>1994</th>
<th>Increase</th>
<th>No</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physicians</td>
<td>29227</td>
<td>30281</td>
<td>1054</td>
<td>3.6</td>
<td></td>
</tr>
<tr>
<td>Nursing Staff</td>
<td>61246</td>
<td>64790</td>
<td>3544</td>
<td>5.8</td>
<td></td>
</tr>
<tr>
<td>Health Technicians</td>
<td>32167</td>
<td>38730</td>
<td>6563</td>
<td>20.4</td>
<td></td>
</tr>
</tbody>
</table>

The United States Saudi Arabian Business Council, (2004, p 1-2) reported that the health sector budget was $6.48 billion and the total bed capacity was 47,339. More statistics about the government and private health sectors in Saudi Arabia in 2003 can be seen in (Tables 2.5, 2.6 and 2.7) below.

Table 2.5 Saudi Health Sector Statistics (2003)

<table>
<thead>
<tr>
<th>Health Sectors</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospitals</td>
<td>333</td>
</tr>
<tr>
<td>Public Health Care Centres</td>
<td>1,791</td>
</tr>
<tr>
<td>Public Dental Clinics</td>
<td>1,315</td>
</tr>
<tr>
<td>Private Dispensaries</td>
<td>708</td>
</tr>
<tr>
<td>Private Clinics</td>
<td>793</td>
</tr>
<tr>
<td>Private Laboratories</td>
<td>59</td>
</tr>
<tr>
<td>Private Pharmacies</td>
<td>3,228</td>
</tr>
</tbody>
</table>

Table 2.6 Ministry of Health Educational Sectors (2003)

<table>
<thead>
<tr>
<th>The Governmental Health Educational Sectors</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health Institutes</td>
<td>25</td>
</tr>
<tr>
<td>Health Colleges</td>
<td>13</td>
</tr>
</tbody>
</table>
Table 2.7 Professionals in the Saudi Health Sectors (2003)

<table>
<thead>
<tr>
<th>The Professionals</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Governmental and Private Doctors</td>
<td>33,719</td>
</tr>
<tr>
<td>Ministry of Health Doctors</td>
<td>15,602</td>
</tr>
<tr>
<td>Nurses</td>
<td>69,942</td>
</tr>
</tbody>
</table>

2.3 Health Services in Saudi Arabia and Jeddah:

According to the Health Statistical Year Book (2006) which was issued by the Ministry of Health Budget Appropriations for the MOH in relation to Government (by S.R 1.000) 2003 – 2007:

- In 2003 the Government Budget was 209,000,000 and the Ministry of Health Budget was 13,857,430 (6.6%).
- In 2004 the Government Budget was 230,000,000 and the Ministry of Health Budget was 14,756,350 (6.4%).
- In 2005 the Government Budget was 280,000,000 and the Ministry of Health Budget was 16,870,750 (6.0%).
- In 2006 the Government Budget was 335,000,000 and the Ministry of Health Budget was 19,683,700 (5.9%).
- In 2007 the Government Budget was 380,000,000 and the Ministry of Health Budget was 22,808,200 (6.0%).

The number of hospitals and beds in the MOH in (2006):

- The number of hospitals was 220 with an increase of 2 hospitals in comparison with the hospitals number in (2005).
- The number of beds is 31,877. The rate of beds to people is 13.5 beds/ 10,000 people (one bed for 743 people).
- The number of primary health care centres from 2003 to 2006 is 1925 in (2006) with an increase of 20 centres (1%) in comparison with the same number in (2005), each centre provides, on average, health services to 12300 people.

According to the Health Statistical Year Book (2006) which was issued by the Ministry of Health, the private health sectors such as hospitals, dispensaries, beds and other medical facilities in Jeddah in 2006 were as follows:

- Hospitals: 33
Dispensaries: 189
Private Clinics: 113
Company Clinics: 65
Polyclinics: 175
Physiotherapy Centres: 15
Beds: 3101
Laboratories: 29
Pharmacies: 871
Drug Stores: 87

(Tables 2.8, 2.9 and 2.10) clarify the statistics on health sectors and services and medication consumption in Jeddah, which were accumulated by the researcher.

Table 2.8 The Governmental and Private Health Sectors in Jeddah 2004

<table>
<thead>
<tr>
<th>The sector</th>
<th>No Governmental</th>
<th>%</th>
<th>No Private</th>
<th>%</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospitals</td>
<td>12</td>
<td>28.5%</td>
<td>30</td>
<td>71.5%</td>
<td>42</td>
</tr>
<tr>
<td>Dispensaries</td>
<td>72</td>
<td>36%</td>
<td>128</td>
<td>64%</td>
<td>200</td>
</tr>
<tr>
<td>Clinics</td>
<td>---</td>
<td>---</td>
<td>227</td>
<td>100%</td>
<td>227</td>
</tr>
<tr>
<td>Hospital Pharmacy</td>
<td>12</td>
<td>28.5%</td>
<td>30</td>
<td>71.5%</td>
<td>42</td>
</tr>
<tr>
<td>Private Pharmacies</td>
<td>---</td>
<td>---</td>
<td>871</td>
<td>100%</td>
<td>871</td>
</tr>
<tr>
<td>Drugstores and Pharmaceutical Warehouses</td>
<td>---</td>
<td>---</td>
<td>23</td>
<td>100%</td>
<td>23</td>
</tr>
</tbody>
</table>

According to the Health Statistical Year Book (2006) which was issued by the Ministry of Health the Professionals at the Ministry of Health (physicians and pharmacists):

- The total number of physicians (including dentists) was 21265.
- The total number of Saudi physicians (including Saudi dentists) was 4098 (19.3% of the total number of physicians in the MOH).
- The total number of dentists is 2028. The number of Saudi dentists was 627 (30.9% of total).
- The total number of pharmacists was 1023. The number of Saudi pharmacists was 714 (69.8% of total).
- The rate of physicians was 9/10,000 (one physician for 1113 people).
- The rate of dentists was 0.8 dentist/10,000 people (one dentist for 11676 people).
- The rate of pharmacists was 0.4 pharmacists/10,000 (one pharmacist for 23146 people).
Table 2.9 The Professionals in Governmental and Private Health Sectors in Jeddah 2004

<table>
<thead>
<tr>
<th>The Professionals</th>
<th>No Governmental</th>
<th>%</th>
<th>No Private</th>
<th>%</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospitals Physicians</td>
<td>1316</td>
<td>48.5%</td>
<td>1397</td>
<td>51.5%</td>
<td>2713</td>
</tr>
<tr>
<td>Hospitals Nurses</td>
<td>2557</td>
<td>42.7%</td>
<td>3435</td>
<td>57.3%</td>
<td>5992</td>
</tr>
<tr>
<td>Hospitals Pharmacists and Pharmacists Assistants</td>
<td>183</td>
<td>52.5%</td>
<td>165</td>
<td>47.5%</td>
<td>348</td>
</tr>
<tr>
<td>Dispensaries Physicians</td>
<td>---</td>
<td>---</td>
<td>1190</td>
<td>---</td>
<td>1190</td>
</tr>
<tr>
<td>Dispensaries Nurses</td>
<td>---</td>
<td>---</td>
<td>905</td>
<td>---</td>
<td>905</td>
</tr>
<tr>
<td>Dispensaries Pharmacist</td>
<td>---</td>
<td>---</td>
<td>17</td>
<td>---</td>
<td>17</td>
</tr>
<tr>
<td>Pharmacists at Private Pharmacies</td>
<td>---</td>
<td>---</td>
<td>2100</td>
<td>---</td>
<td>2100</td>
</tr>
</tbody>
</table>

Table 2.10 Beds, Patients Visiting, Emergency Cases, Medicine Consumption in the Governmental and Private Health Sectors in Jeddah 2004

<table>
<thead>
<tr>
<th>Health Services</th>
<th>No Governmental</th>
<th>%</th>
<th>No Private</th>
<th>%</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospitals Beds</td>
<td>2996</td>
<td>51.4%</td>
<td>2836</td>
<td>48.6%</td>
<td>5832</td>
</tr>
<tr>
<td>Patients Visits to the External Clinics</td>
<td>706030</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Medicine Consumption at the External Clinics</td>
<td>29924969</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Medicine Consumption at the Internal Clinics</td>
<td>20391698</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Emergency Cases</td>
<td>560793</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

According to the Health Statistical Year Book (2006), which was issued by the Ministry of Health, the health facilities and the related manpower in other governmental sectors were as follows:

- The number of hospital beds in other governmental sectors was 10257.
- The total number of physicians (including dentists) in other governmental health sectors was 10233, 4756 of those physicians were Saudi (46.5% of the total).
The total number of dentists in this sector was 772, 488 dentists (63.2%) of them are Saudi.

The total number of pharmacists in this sector was 1250, 696 pharmacists (55.7%) of them were Saudi.

The different health facilities in the private sector:

- The total number of private hospitals in (2006) was 127.
- The total number of beds in this sector was 12590.
- The highest percentages (33 hospitals, 26.0%) of private hospitals at present are in Jeddah. Jeddah is followed by Riyadh where 22.0% of the hospitals are private. In Riyadh there are 3892 beds (30.9% of the total number of beds in the private sector and this is considered the highest rate). In Jeddah, there are 24.6% of the beds in the private sector.
- The total number of private dispensaries is 1057, 373 dispensaries (35.3 %) are present in Riyadh and 189 dispensaries (17.9%) are present in Jeddah. This means that about 53.2% of the total numbers of dispensaries in the Kingdom are present in these two regions.
- The total number of private clinics is 416, 197 clinics (47.4%) are present in Riyadh while 113 clinics (27.2%) are present in Jeddah. 74.5% of the private clinics in the Kingdom are present in Riyadh and Jeddah.
- The total number of polyclinics is 586, 253 polyclinics (43.2% of the total number of the polyclinics) are present in Riyadh while 175 polyclinics (29.9%) are present in Jeddah. There are also 324 company clinics.
- On average, there are 3 physicians in each polyclinic and one physician in each private clinic and 2 physicians in the company clinics. Therefore, the estimated total number of physicians in the private clinics, company clinics and polyclinics is about 2822.
- The total number of private pharmacies is 4747 with a rate of one-pharmacy/ 4988 people.
- The total number of physicians working in private hospitals and dispensaries is 14091.
- The number of physicians in private clinics, polyclinics and company clinics is 2822.
- Therefore the total number of physicians (including dentists) is 16913.
- The number of dentists working in private dispensaries and hospitals is 2606, 102 dentists are working in private clinics. Therefore the total number of dentists in the private sector is 2708.
- The total number of pharmacists working in private dispensaries and hospitals is 1526 while 4747 pharmacists are working in private pharmacies (sometimes, there are more than
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one pharmacist in the pharmacy). Therefore, the total number of pharmacists in the private sector is 6273.

2.4 The Pharmaceutical Industry:

The key point of this research is the pharmacies’ and medication information system. Therefore, it is essential to detail the pharmaceutical companies, pharmacies and levels of drugs dispensed in Saudi Arabia. The United States Saudi Arabian Business Council, (2004, p3 - 4) has reported that the pharmaceuticals and medicine market in Saudi Arabia is worth $1.2 billion over the whole pharmaceutical market; they have 3,000 pharmacies and deal in more than 4,600 registered drugs, both generic and patented.

Saudi Arabia is the largest consumer of pharmaceuticals in the Gulf Region. Despite recent government efforts to bolster the domestic pharmaceutical industry, the Saudi market is still heavily reliant on imports, which are exempt from customs’ duties. According to the Central Department of Statistics, the Kingdom imported $1 billion worth of pharmaceuticals in 2002, representing a 14 percent increase since 2000. U.S. companies such as Eli Lilly, Pfizer, Bristol-Myers Squibb, Cyanamid, Merck, Upjohn, Cilag and Syntex are very active in this market.

In Saudi Arabia, the government plays a prominent role in the purchase of all pharmaceuticals. With the aim of providing consistency and low prices to the consumer, the government negotiates with major pharmaceutical manufacturers to obtain large quantities of medication with a set supply schedule. Prices are set at the beginning of each year. The two principal buyers of pharmaceuticals for Saudi Arabia are the Ministry of Health and the Secretariat General of Health (SGH) for the Gulf Cooperation Council. The SGH, which has headquarters in Riyadh, invites public tenders for pharmaceuticals, hospital disposable products, medical laboratory items, blood banks, orthopedic and implants and chemicals on a yearly basis, for allocation to the various hospitals in the Gulf region. The value of the SGH tender varies annually, but on average, it represents approximately $300 million. In order to compete for distributing contracts within the Kingdom, manufacturing companies and their products must first be registered with the Ministry of Health. More than 200 local pharmaceutical companies are currently registered with the Ministry of Health, but only 20 of these local companies control close to 70 percent of the market. The Saudi public sector represents 40 percent of the demand for pharmaceuticals, while private hospitals and households account for the balance.

According to the United States Saudi Arabian Business Council, (2004, p3 - 4) the U.S. Commercial Service indicated that U.S. firms could find their best opportunities in joint
ventures with local partners or licensing arrangements, as well as supplying raw materials to the Kingdom’s pharmaceutical industry. To promote domestic products, the Ministry of Health has introduced a 10 percent subsidy to local manufacturers to enable them to sell their products at a competitive price. In addition, in recent years the government has been purchasing local pharmaceuticals in bulk. In an effort to allay concerns about pirated pharmaceuticals, the Saudi Government established the Supreme Authority for Food and Drug Control in March 2003, which is responsible for the licensing of pharmaceutical products and manufacturing facilities.

The United States Saudi Arabian Business Council, (2004, p3 – 4) illustrated that the Banaja Saudi Import Company is the market leader in both the manufacturing and distribution of pharmaceuticals. In regards to distribution, Banaja has established partnerships with 12 leading international companies, such as GlaxoSmithKline and H. La Roche. Banaja is also a local manufacturer of pharmaceuticals, with a 51% ownership of Glaxo Saudi Arabia Ltd.; this was the first joint venture between a Saudi investor and a foreign pharmaceutical company in Saudi Arabia. In May 2004, Banaja strengthened its regional distribution network when it established a 50:50 joint venture firm with Belhoul Corporate Office of Dubai called PharmaWorld, which will have a new distribution facility in the Jebel Ali Free Trade Zone.

The Saudi Pharmaceutical Industries & the Medical Appliances Corporation (SPIMACO) control 6 percent of the total pharmaceutical sales to the private sector in Saudi Arabia. Equipped with state-of-the-art FDA-approved manufacturing facilities, SPIMACO currently produces anti-rheumatics, antibiotics, antimicrobials, anti-tuberculosis, anti-hypertensive, anti-diabetics, antihistamines, anti-allergic, cough sedatives, expectorants and topical corticosteroid.

Saudi Arabia’s Over-The-Counter (OTC) pharmaceutical industry was valued at $320 million in 2002, an increase of 5.6 percent over the previous year. According to Euromonitor, the most important channels for retail of OTC products were pharmacies, which accounted for approximately 88 percent of total sales. While Saudi Arabia’s pharmaceuticals are comparatively cheaper than in other regional countries such as the United Arab Emirates, the costs of running a pharmacy are relatively high in the Kingdom. Saudi law permits only pharmacies to sell pharmaceuticals, including most OTC products, directly to the consumer. Exceptions to this rule include mild analgesics, various germicides, pharyngeal remedies and some medicated skin care products. Saudi Arabia’s regulations also prohibit the advertising of pharmaceuticals or medicines in non-medical media and on television or radio.
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In Figure 2.3 Saudi Pharmaceutical Industries & Medical Appliances Corporation (SPIMACO) 2007 illustrate the pharmaceutical market developments in Saudi Arabia in the local pharmaceutical market:

- Total sales of the market are SR 5,792 Millions with a growth of +8.6%.
- Top ten manufacturers constitute 45.2% of Saudi Pharma (Private) Market.
- Spimaco growth is 2.6% with 2nd position in Saudi Pharma (Private) Market.

**Figure 2.3 SPIMACO Sales Report – Q3 (2007) Saudi Pharma Market (Private)**

<table>
<thead>
<tr>
<th>Rank</th>
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<td>173</td>
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</tbody>
</table>


2.5 Summary:

This chapter has focused on the detailed background of the Saudi health system and health services. In addition, the tables have reflected the statistical figures of the health sectors and the manpower at those sectors in Saudi Arabia and in Jeddah city. Moreover, in this chapter The Eighth Development Plan has indicated the future health plan at the Ministry of Health as well as presented, the Pharmaceutical Industry in Saudi Arabia. The next chapter will present the literature review of the study.
3. Literature Review

3.1 Introduction:
The hypotheses of this study considered key issues when the researcher reviewed the literature resources. The main issues concerned the regular use of traditional methods of prescribing medication, which leads to defective medication services as well as the emphasis from health professionals and the general public as to the problems they face and the disadvantages of using the current method of medication prescribing. Other issues considered concerned the lack of information technology and communication systems at the health sectors in Jeddah City in order to update their knowledge and availability of medication. Moreover, the inability from the Ministry of Health, pharmaceutical companies and suppliers to develop medication services as a result of a lack in the information system to provide real statistics about the size of medication prescribing and consumption.

The researcher collected direct and indirect Saudi literatures resources, which were relevant to the study such as medication prescribing and pharmacy issues in Saudi Arabia. Furthermore, the researcher reviewed international reports and studies which focused on electronic prescribing, electronic medication management and health information systems, as well as the handwritten prescription problems, the prescribing methods of medication, electronic prescriptions and their relationship to patients' medical records, developments in Information Technology Systems (ITs) as well as the role of some implementations of improvement projects in developed and developing countries.

3.2 The Key Issues of the Study in Saudi Literature:

Saudi literature has produced several studies, which apply to medication and pharmacies issues. Moreover, it has also broached prescription dispensing. Al-Faris & Al Taweel, (1999, p. 317) noted that in Saudi Arabia the prescription of drugs was one of the most important factors in the rising cost of health services. A lack of proven benefits and the definite costs and side effects of many prescriptions have been found in many studies. The aim of their study was to assess the prescribing patterns of primary health care (PHC) and physicians in the capital of Saudi Arabia, Riyadh City.

Another study reported on the economic assessment of the extent of medication use and wastage among families in Saudi Arabia and the Arabian Gulf Countries. Abou-Auda, (2003, pp. 1277 -
1290) stated that the national cost of providing health care and medication, in particular, has dramatically increased over the past few decades. In Saudi Arabia budget allocations for medication and drug products have increased sharply over recent years, with a greater percentage of health care costs devoted to providing medication. In Saudi Arabia, payment for drug products and pharmaceuticals has constituted 17% of the total health care costs. With a current population of 20.4 million, the 2001 fiscal year health care budget allocation for Saudi Arabia was $5.84 billion (US $). Nearly $1 billion was spent on medicine alone and this amount is expected to increase at a rate of 3% per annum, roughly equivalent to the rate of the population growth. Many nations, including Saudi Arabia, are seeking ways to reduce the costs associated with providing medication for their citizens.

The results of Abou-Auda's study corroborate the current study in regards to what it was focused on. Abou-Auda's study shed light on the significance of the information system to provide real statistics about the size of medication prescribing and consumption. It indicated two contributing factors to the increased costs of medicines, which were the marketing costs for pharmaceutical firms and the expenses incurred in the development of new drug products. However, another important factor that contributed to the crisis of escalating health care costs was medication wastage. Medication wastage is defined as any drug product, either dispensed by prescription or purchased over the counter (OTC) that is never fully consumed. Medication wastage may be due to poor compliance of patients, excessive and irrational prescribing or the lack of control of the sales of prescription medication in the community pharmacy. The problem of wastage was universal among developed countries.

Medication wastage was defined as any medication that had been dispensed by a prescription or purchased OTC but had not been fully consumed. Most of the residents of Saudi Arabia (and the Gulf region in general) receive health care free of charge. This includes the provision of prescription medication from government hospitals and primary health care clinics. Households in these countries supplement their medication requirements through purchases of drug products from community pharmacies. In Saudi Arabia alone, there were over 3000 community pharmacies. The largest concentrations of these pharmacies were in the regions of Riyadh and Jeddah. Saudi Arabia, like many other countries, had turned its public focus onto the national health care system, with medication costs and the issue of medication wastage drawing particular attention. The number of drug products stored in households in Saudi Arabia and other Gulf States was an indication of the level of drug prescribing that exists in these countries. However,
the alarming percentage of expired, unused, or deteriorated drug products (25.8% for Saudi Arabia and 41.3% for other Gulf countries) was indicative of the problem of non-compliance that is prevalent among the residents of these countries.

Another study highlights the method of purchasing and inventory control in community pharmacies in Riyadh. The study of Asiri, (2004, pp. 96 - 97) emphasised the importance of the information technology and communication systems at the health sectors. The study of Asiri focused on inventory control methods and their education regarding this issue, tested how they perform inventory control in their community pharmacies and assessed their understanding of different inventory control methods. In a randomly selected 151 community pharmacies in Riyadh in Saudi Arabia only 37.1% of community pharmacies surveyed used computerized systems. The average pharmacy age was 11.6 + 6.2 years with an average area of 67.4 + 42.6 m2.

The medication sold with prescriptions accounted for 35.1 % ± 22.7% of the total sales. In addition, the mean value of daily sales was 4602.4 ± 544.3 Saudi riyals (US$ 1.0 = 3.75 Saudi riyals). Around 60% of respondents reported that pharmacy sales were appropriate to its size and location. Furthermore, 62.9% of respondents surveyed reported that items available in the pharmacy were enough to cover all consumer needs. Moreover, around 70% of pharmacies' income depended on medication sales. The majority of respondents (76.2%) received the pharmaceuticals through a group purchasing arrangement. Furthermore, about 32% of the respondents stored quantities of medication that cover a 1 month-period, whereas, 33.8% and 23.2% of respondents stored medication that covers 2 months and 3 to 4 months, respectively. Almost 61% of the respondents had a limited budget to buy their medication and goods, whereas, 39.1% of the respondents had an open budget and used it as needed. Moreover, the perpetual (computer) method was the most used known method by the respondents (31.2%) and the economic ordering quantity (EOQ) method was the least used method (28%) utilised by the respondents, respectively. Best control and management of inventory through modern techniques and continuing education are essential. The overstock of medicines in the pharmacy may tie up capital. Health education for the public is a prerequisite for proper self-medication.

Another study shows the needs of using information technology to communicate with the health sectors in case patients need to ask specialists about their private issues or medication. Bawazir, (2004, p. 83) mentioned consumer attitudes towards the community pharmacy and their preferences for the introduction of new services. A self-completion questionnaire was used which 1,144 consumers in 55 community pharmacies were invited to complete. The questionnaire
covered consumers' choice of pharmacy; their perceptions of and actual interactions with, community pharmacists; advice from pharmacists about general health and prescribed medicines and privacy in the pharmacy. The conclusion of this study showed that most pharmacy customers felt comfortable seeking advice from their pharmacist. Although many pharmacists were reported to show sensitivity to a possible lack of privacy in the pharmacy, few respondents reported that their pharmacy had a private area for discussion. Customers' views on possible new services were generally positive, with the exception of patient medication records.

Another study focused on the role of information technology needs in providing the health services. Mohamed and Al-Dogaither, (2004, p. 35) elaborated their study on patient satisfaction with pharmaceutical services at teaching hospitals in Riyadh, Saudi Arabia. They illustrated that patient satisfaction was a key indicator of the quality of health services, including pharmaceutical services. The study aimed at exploring the relationship between patient satisfaction and the level of pharmaceutical care services received. The sample consisted of 270 patients selected systematically from King Khalid University (KKU) hospital. The overall mean satisfaction with pharmaceutical services was 2.19 points out of a maximum of 4 points. The delay for dispensing prescriptions was due to overload, lack of technicians, inadequate privacy for counselling and pharmacists' lack of direct access to patients' physicians. Time taken to receive prescriptions and the language barrier between pharmacist and patient were the two most prominent factors associated with dissatisfaction. The results of log-linear analysis indicated that pharmacists needed to educate and increase patient awareness about their roles and responsibilities. Prescription delay could be reduced by introducing computer-based prescription writing and by providing each pharmacy with trained technicians.

As the researcher mentioned in this study, the availability of information technology (IT) at the health sectors will improve the professional's work. Al-Ahdal et al., (2003, p. 118) focused in their study on the need for documentation of pharmacist's intervention in Riyadh hospitals. Of 550 pharmacists in 16 hospitals 301 (97.7%) pharmacists believed that they should document their interventions but, only 114 (36.9%) of them actually did so. Five major documentation-related barriers were identified. These included no time to document (59.3%). Al-Ahdal et al emphasised that there was no existing system (50.3%) that there was no access to patient files (26.7%), also this was not permitted per policy (22.1%) as well as no need to document (3.6%). The results of the study were important for the future of the pharmacy profession in Saudi Arabia. The pharmacists' beliefs, educational and pharmacy management systems were possible reasons for
the low documentation rate. Recommendations to improve the documentation rate of pharmacists' interventions were also discussed.

In an indirect study, which clarified concerning medication information resources, Abuelsoud and Alnaim (2005, p. 120) focused in their study on drug information sources. The study evaluated two different drug information sources. This was achieved by comparing the time required to find an answer to a drug information question in addition to the ease of use, comprehensiveness, breadth of information and cost of two different media, namely a CD-ROM database DRUGDEX® and the internet search engine "ALTAVISTA". The study was conducted at the Drug Information Centre (DIC) of the College of Pharmacy, King Saud University, Riyadh, Saudi Arabia. One hundred questions were answered using both sources and the results for each question were determined.

Furthermore, in his thesis Alyemeni, (2003) discussed the use of information technology (IT) in Saudi national policy on healthcare delivery through the use of the World Wide Web. In addition, his study sought to develop a report on the status of the availability of healthcare information to healthcare professionals in Saudi Arabia when utilizing the web. It also showed how healthcare professionals in Saudi Arabia envisioned the status of the availability of healthcare information to healthcare professionals in Saudi Arabia 10 years from 2003 when utilizing the web.

On the other hand another study highlighted the role of the co-operation and co-ordination via the use of information technology (IT). Al-Zahrani, (2001) aimed in his study to investigate the provision of a computer network system to link Saudi University Hospitals electronically in order to exchange medical information. The study used a sample of 900 clinicians and computer staff from three university hospitals. The results of the study illustrated that there was a lack of a steering group charged with responsibilities for planning, monitoring and co-ordinating the required activities among Saudi Universities. Further findings of this study showed that clinicians and computer staff already possessed the basic competences and skills required to adopt computer-based technology. Saudi Universities were working independently to establish their own computer network system, thus not taking advantage of the synergies that co-operation could bring.

An indirect study which discussed an important side of implementing information technology (IT) in the health information system between three major hospitals in Saudi Arabia: King Faisal Specialist Hospital, King Fahad National Guard Hospital and King Khalid University Hospital. Maghazi, (2004) focused in his study on the role of the Computer-Based Patient Records (CPR)
and the Paper-based Patient Records (PPR). The Computer-Based Patient Records (CPR) were needed to assist healthcare providers in giving clinical care as effectively and efficiently as possible. Data security was the one aspect that could retard the use of CPR, as both healthcare providers and patients have expressed concerns regarding security of sensitive patient information when comparing the CPR system to the Paper-based Patient Records (PPR) in terms of confidentiality, integrity and availability of information.

The results of the study indicated that employees in hospitals tended to believe that patient information in the PPR system was more confidential than patient information in the CPR. On the other hand, they also tended to believe that CPR provided more data integrity for patient information than PPR. However, they considered that patient information in the CPR was more available than patient information in the PPR. Confidentiality of patient information was the major concern of the participants. The main recommendations of this study were: firstly to implement more efficient data access control to ensure that only authorized users have necessary access to systems. Secondly, hospitals should have a full-time data security officer who is responsible for developing, implementing and monitoring a consistent data security programme. Thirdly, all hospitals must have a written and operationally tested contingency plan in order to protect the integrity and ensure the availability of patient information in a CPR system. Finally, it is important for data security and confidentiality that policies are created, implemented and enforced.

3.3 The Key Issues of the Study in International Literature:

International literature has produced in depth studies and reports on the subject of this study which apply to both medication and pharmacy issues, some of which have concerned medication error issues as to problems of handwriting as well as provided solutions used to solve these problems. On the other hand some studies have presented the implementation of information systems in health care and medical records (MR) in addition to pharmacy electronic systems. The RAND Corporation, (2005, p. 1) reported on medication errors. Such errors, including dispensing of a medication whose name sounds similar to the correct one or dispensing the correct medication in the wrong dose, are all too common. For that, the use of new technology known as electronic prescribing has the potential to substantially reduce medication errors and improve the efficiency of health care. Electronic prescribing involves doctors using computers containing extensive drug information to help choose and order the appropriate medication for specific conditions.
The RAND Corporation indicated that, the electronic prescribing systems (EPS) are one form of a relatively new technology known as a computerized physician order entry (CPOE), which was part of a new trend in health care towards the adoption of electronic medical record systems (EMRS), i.e. computerized versions of patients' paper health records. Although a number of electronic prescribing systems are in operation around the world, no attempt has been made to standardize how they work or to ensure that they fulfill their promise to minimize the risk of medication errors, maximize patient safety and help consumers to manage their drug costs as shown in Table 3.1.

The RAND Corporation mentioned the Medicare Modernization Act, which enacted a prescription drug benefit for Medicare recipients, as well as mandated that safety standards and other operational guidelines be developed for electronic prescribing systems. Anticipating the need for such standards, RAND Health researchers convened an expert panel that created a set of 60 recommendations for electronic prescribing systems. The researchers then used these guidelines to assess how well some of the existing systems ensure patient safety. Their findings were as follows:

- Electronic prescribing systems may greatly reduce medication errors, thereby maximizing patient safety and health.

- Menus that aid in selecting appropriate medication doses and other specific features are important for achieving these goals.

- Currently used electronic prescribing systems vary widely in their features and capabilities and may not produce the best results for patient safety and health, RAND added that it should be possible to implement about two-thirds of the guidelines in the next years.
### Table 3.1 Problems That Electronic Prescribing Can Solve and Create

<table>
<thead>
<tr>
<th>Problems with Traditional Prescribing</th>
<th>Corrective Features of EMR-Based Electronic Prescribing Systems</th>
<th>Problems Electronic Prescribing May Introduce</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnosis and Prescribing Wrong chart or incomplete/ illegible history in chart, i.e., missing allergies, other meds, other conditions</td>
<td>Patient identity checks Complete history at hand Safety alerts triggered Complete current medications list /medication history Instant access to MEDLINE, PDR.</td>
<td>Wrong patient name may be selected from list; patient ID information may not be displayed on each new screen. Wrong diagnosis may be selected. Alerts may be inactivated or ignored. History or alerts may not be up-to-date or records of other prescribers may not be accessible.</td>
</tr>
<tr>
<td>Lack of information on Rx coverage</td>
<td>EMR includes coverage info/formulary.</td>
<td>Coverage or formulary may not be updated.</td>
</tr>
<tr>
<td>Rare diagnosis or diagnosis for which off-label Rx are being tried</td>
<td>System can recommend drugs.</td>
<td>May be unable to Rx off-label. If diagnosis entry required and inaccurate diagnosis entered, could affect future care.</td>
</tr>
<tr>
<td>Writing and Transmitting Incorrect dose calculated and written</td>
<td>Menus decrease wrong-dose errors.</td>
<td>Some menu designs can increase wrong dose choices.</td>
</tr>
<tr>
<td>Rx or dose misread by office staff</td>
<td>Electronic record of prescription accessible to pharmacies or transmissible via email.</td>
<td>Some office and pharmacy computer systems are incompatible. Delayed transmission of prescription.</td>
</tr>
<tr>
<td>Dispensing Patient must go to pharmacy to obtain medication</td>
<td>May support automated in-office dispensing.</td>
<td>In-office dispensary may detect fewer prescribing errors than a pharmacist would.</td>
</tr>
<tr>
<td>Pharmacist or tech may misread medication or dose</td>
<td>Electronic record of prescription is sent.</td>
<td>Pharmacist may check less carefully for errors.</td>
</tr>
<tr>
<td>Providing Patient Education Prescriber may provide no information about how drug should work, possible side-effects, correct route and timing of administration, resulting in administration errors</td>
<td>Can produce educational materials; may facilitate MD, RN and pharmacist collaboration. Can help schedule and track administration.</td>
<td>Poorly designed materials could result in inconsistent instructions, misunderstandings, which could increase errors.</td>
</tr>
<tr>
<td>Monitoring and Follow-Up Patient may fail to fill or refill Rx</td>
<td>Systems could notify prescribers when patients fail to fill Rx.</td>
<td>Time-consuming, but could save time in the long run.</td>
</tr>
<tr>
<td>Patient may not think to notify prescriber of adverse reactions</td>
<td>Systems could produce questionnaires to track adverse reactions.</td>
<td></td>
</tr>
<tr>
<td>Prescriber may not schedule or notify patient of required or recommended monitoring tests</td>
<td>Systems could automatically trigger prescriber reminder or patient notification.</td>
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</table>

In the United Kingdom Kossendey, (2002, pp. 3 - 5) indicated that the Electronic Transmission of Prescriptions (ETP) enables prescriptions to be sent electronically to a pharmacy directly from the General Practitioner (GP). These prescriptions can then be electronically sent to the Prescription Pricing Authority (PPA), which pays pharmacists for the medication. The Electronic Transfer of Prescriptions (ETP) between General Practitioners (GPs), pharmacies and the Prescription Pricing Authority (PPA) is one of the key elements of 'Pharmacy in the Future'.

Kossendey added assuming that professional standards and patient safety are guaranteed, the UK government welcomes the idea that medicines should be sold or dispensed electronically. Purchasing over the counter medicines (OTC) electronically and having private prescriptions electronically dispensed are services that already exist in the UK. The government is of the opinion that this choice should be available to people within the National Health Service, (NHS). Both General Practitioners and pharmacy interest groups have, in principle, agreed to co-operate in the ETP pilots run by the NHS.

Kossendey clarified in his study that over 70 organisations expressed an interest in running an ETP pilot, 16 submitted preliminary proposals for consideration out of which the Department of Health finally commissioned three. Proposals were judged against a set of published criteria, of which certain were absolute and others were to be judged on a scale.

Kossendey mentioned certain benefits, which will be expected from the results of the three ETP pilots as:

• Greater prescription accuracy resulting in greater patient safety. Pharmacists should spend less time checking illegible or incomplete prescriptions.

• Increased patient convenience. Patients should obtain the correct medicine from the pharmacy of their choice and should no longer need to go to their GP for a repeat prescription.

• Better medicine management. Potential for better medicine management should be reached by recording additional information on patients' prescribed and dispensed medication history.

• Reduction of prescription fraud. Potential to reduce current prescription fraud occurring through patients' incorrectly claiming that they are unemployed or on social welfare schemes in order to not have to pay for the prescriptions.
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- Timesaving. Data entry time saving for issuing prescriptions would most likely be realised within the pharmacy and the PPA. This should allow pharmacists to spend more time providing additional high quality services to patients. Due to the fact that the majority of GPs currently issue computer-generated prescriptions, it is not expected that time saving would show as a major benefit.

Moreover, in the United Kingdom a study of Mundy and Chadwick, (2003, pp. 2 – 7) indicated that the benefits of implementing a system for the Electronic Transmission of Prescriptions (ETP) within the UK National Health Service (NHS) will be as follows:

**Fewer Medication and Transcription Errors:** It is believed that the eradication of handwritten prescription forms will result in fewer medication and transcription errors. Medication errors often occur because of illegible handwriting, confusing drug names and dosage mistakes. Transcription errors occur, in the present system, when prescriptions are re-input from their paper format into the pharmacists and the Prescription Pricing Authority's (PPA) computer systems. It is believed that receiving prescriptions direct will reduce transcription errors. Both problems are significant issues within the present system. A misread prescription in a pharmacy can lead to the wrong drug being dispensed to the patient and thus the pharmacist could be subject to a malpractice court case. Transcription errors at a pharmacy could also lead to the wrong drug being dispensed to the patient. Errors in transcription at the PPA could lead to administrative and payment errors to pharmacies.

**Increased Efficiency:** One of the benefits of ETP is an increase in the efficiency of the system. General practitioner (GP) surgeries would benefit from improvements of repeat prescribing and a reduction in telephone prescription queries from pharmacies. These benefits would not just save time for the GPs but also for the surgeries' administrative staff and receptionists. Pharmacies would benefit from improved efficiency through the reduction in the number of drug queries with GPs, no transcription requirement and savings in prescription collection services. For the pharmacist a reduction in time spent on computing and endorsing would mean more time available to spend on patient management, which could liberate pharmacy time for clinical duties. Pharmacists would also benefit from the overall increased efficiency of the system through faster payment cycles.

At the PPA, efficiency benefits would be increased with the removal of the requirement for the transcription of prescriptions. Looking at things from a patient's perspective, the new system...
would be more convenient. It would save them time travelling to a GP surgery and possibly having to travel to a pharmacy to collect their drugs.

**Better Communication Channels:** ETP would lead to better communication channels between GPs, pharmacists and the PPA. The goal of seamless care between hospitals, GPs and community care would be a step nearer, if not in reality, with the electronic transmission of information. The establishing of improved communication channels could also lead to the establishment of new information channels between GP and pharmacy for the exchange of clinically related information, for example, patients' purchase of over the counter (OTC) medication. Thus the rollout of ETP could be the enabler for better communication channels to be established and could provide the business case for these channels to be installed.

**Decreased Costs:** Mundy and Chadwick (2002) illustrated that various researchers have identified one of the benefits of ETP to be decreased costs throughout the prescription processing system. All parties would benefit from a reduction in the expense of the paper based prescribing system. In a Huddersfield University analysis, GPs, dentists, receptionists and pharmacists identified resource savings as one of the major benefits to be gained from an ETP system. GPs could benefit from reduced administration costs and time saving made from the transformation of a repeat prescribing process. Pharmacists would save time and money from reduced prescription callbacks to patient's GPs and through an improved repeat prescription process. A reduction in the resources required for prescription transcription would be a direct cost saving to the PPA and some pharmacists have suggested that has the potential for reducing pricing costs. In their fieldwork the authors' observed rows of data operators at the PPA carrying out the task of transcribing the millions of prescriptions that arrive each month (current figures are nearly one million prescriptions per working day). If ETP could reduce the workforce by a fraction, it could make a noticeable difference to the cost of the prescription process. ETP has the potential to eliminate this workforce altogether in the long term and therefore make a really significant difference.

**Improved Quality:** The quality of prescriptions produced in an ETP system would be far superior to the present quality of paper prescriptions. In this context, quality refers to conformance to prescription standards, with regards to both the drugs that are prescribed and the other data that is included on the prescription form. For example, on an electronic prescription, there will always be an electronic signature, or the ETP system would refuse to accept it, whereas with paper prescriptions GPs may forget to sign. Missing signatures mean that the pharmacist has
to call the GP’s surgery, which may delay the drugs being dispensed to the patient. Research undertaken in the Derbyshire Royal Infirmary (a UK NHS hospital) between 1998-9; found that the quality of prescriptions constructed electronically was far superior to those of the present paper based prescription.

**Improved Public Health:** Improvements in the prescription processing system could lead to improved patient care and overall improved public health. Improved public health will come as a direct benefit of the advantages identified above. Fewer medication and transcription errors will result in fewer medical complications as a result of prescription error. Money saved from the consequent reduced litigation and fraud reduction could be used towards the provision of better patient care in the NHS. ETP can also help to increase the amount of information available to GPs about their patients.

**Improved Practice:** Alongside improved public health, there should also be an improvement in practice at the GP’s surgery, the pharmacy and the PPA. In the GP’s surgery, the use of an electronic application for the generation of the prescription could lead to a “greater evaluation and assessment of the practice”, “reduced litigation” and improved practice through “greater implementation of evidence based treatments and guidelines”. Note, however, that GPs will need to have the time, resources and the will to implement these improvements - ETP is only an enabler. When the electronic prescription is transferred to the pharmacy, the pharmacist’s application in conjunction with a decision support system could automatically print out drug labels, keep records etc. but this reveals nothing special about ETP. The existing systems today typically do this already, as well as being connected to their stock control and re-ordering systems. It therefore becomes incumbent on ETP that it be integrated into the pharmacists’ existing systems; otherwise it would be a step backwards for them and would be likely to be strongly resisted. At the PPA, real time access to prescribing and dispensing patterns can help to target health resources and provide an early warning system for the community. Real time prescribing statistics could also lead to improved public health planning at a government level. The PPA is likely to be the major beneficiary from ETP.

On the other hand, the heaviness in the role of use of electronic information systems in the health field will improve health services at the governmental and private health sectors and will also improve the supervision of health issues at the official health bodies such as the Ministry of Health (MOH) in Saudi Arabia. In addition, this will improve the local pharmaceutical companies and suppliers. Bharatam, (2003, pp. 4 - 5) emphasised that pharmacists need to
manage information too. Recent trends have shown an increasing number of new prescriptions and medication, which are being taken up in a big way. Under the "new economy" and the "new health insurance" regime many changes are expected in the field of pharmacy management, for example in maintaining patient records. Pharmacists need to update themselves on every medication, its therapeutic usage, side effects, drug interactions and dosage forms. Pharmacy informatics is a tool to improve communication between pharmacists, medical practitioners and patients (see Figure 3.1). It also helps to streamline the work of hospitals, clinics and retail pharmacists.

Figure 3.1 Pharmacy Informatics


Bharatam added that the system involved the development of relational data base systems with comprehensive patient data, complete drug interaction database, drug alert, etc. This allowed the pharmacist to spend time in patient counselling. The data management related to the pharmacy was manipulated by a non-pharmacy expert, causing errors and bottlenecks in the effective development of pharmacy informatics tools. Hence, the field is currently limited to the creation of databases and retrieving information. Effective interpretation of the trends observed in the data of pharmacy practice has not yet been accomplished; in other words, the available data is not being converted to information and further to knowledge. A pharmacist with an information technology background (a pharmacy informaticist) would be able to derive viable new conclusions that could change the field of pharmacy practice since the necessary information to define new laws of pharmacy practice are all part-and-parcel of pharmacy informatics. The added advantage of this field is to reduce the imperceptible and ubiquitous "unease" between the pharmacy practice experts and the health care providers.
In the United States, in spite of implementing information technology at the health sectors medication errors have still been observed. Wilson et al., (2005, p. 499) reported that in the United States in spite of the physicians, pharmacists and nurses being diligent about preventing adverse drug events and medication errors, preventable events still occur, often as a result of inadequate availability of information or institutional information-system failures. In U.S. hospitals each year it is estimated that, more than 700,000 adverse drug events will occur and that nearly 28% are attributed to preventable medication error, with most occurring during drug ordering. Others occur at the time of pharmacist processing, drug administration and monitoring. Deaths from medication errors are estimated to total some 7000 per year.

Wilson et al., (2005, pp. 499 - 505) illustrated that the Mayo Clinic implemented the hospital rules-based system (HRBS) as the next generation of medical informatics for patient safety as it can rapidly identify and communicate crucial information to the clinician in order to optimize patient care. Prevention strategies targeting systems rather than individuals are generally most effective in reducing errors. Computerized information systems are gaining increasing recognition as a tool for reducing medication errors. Strategies used by these systems include improved communication with clinicians, more accessible medical knowledge, better monitoring techniques, automated calculations and support for clinical decisions. The Mayo Clinic developed its first rule-based informatics programme during the late 1980s to reduce medication errors and to improve education and communication with clinicians. The system predominantly monitored antimicrobial prescribing practices and resulted in improvements in hospital patient care and drug cost savings. The success of this programme led to the expansion of a common technological architecture called the Hospital Rule-Based System (HRBS), composed of several subsystems, one of which for Pharmaceutical care. The rule-based subsystems were developed for more comprehensive, multidisciplinary patient monitoring and cost containment. The goals of the HRBS are to enhance the quality of patient care through:

b) Reduction of medication errors.
c) Reduction of costs.
d) Increased communication with and documentation by health care providers.

Moreover, Wilson et al mentioned that all HRBS subsystems used computerized rules. Each rule contained a set of conditions that, when met by a patient, identified situations in which review and intervention by an infectious-diseases physician, pharmacist, nutrition specialist,
infection control officer, or nurse may be beneficial. The concepts for the rules were developed by physician and pharmacist specialists and were incorporated into computerized logic by the HRBS programming team. The rules utilised information from any of the integrated electronic data, including demographic information, calculated values, laboratory and microbiology data and drug information.

Another study in the United States shed light on the advantages of implementing electronic prescribing systems. The study of Ross et al., (2005, pp. 410 - 411) illustrated the effects of electronic prescribing on formulary compliance and generic drug utilization in the ambulatory care setting, electronic prescribing (e-prescribing) supporting physicians in the process of prescribing by providing drug and formulary information at the point of care. Several studies have indicated that a computerized physician order entry (CPOE), a form of e-prescribing used in inpatient settings, had a positive effect on prescribing practices in terms of patient safety, drug cost savings and quality of care. However, e-prescribing in the ambulatory setting is not as well established. In 1999, only 2% of outpatient prescriptions written by 650,000 physicians in the United States were written electronically. There was increasing interest in e-prescribing use in the outpatient setting: a survey of 1,200 practicing physicians revealed that 8% used e-prescribing in 2003 and researchers estimated that 17% of physicians would use e-prescribing by 2004. Forty-seven state Boards of Pharmacy have approved the use of e-prescribing and the recently passed Medicare Modernization Act requires the establishment of standards for e-prescribing and offers incentives to improve adoption rates.

Ross et al emphasised that E-prescribing offers numerous potential benefits, including the potential for a reduction in medication errors, due, in part, to more legible prescriptions and the ability to check for drug-drug and drug-allergy interactions; a reduced administrative burden that results in provider time savings and improved efficiency; improved patient satisfaction; improved formulary compliance, cost savings and time, fewer calls between pharmacists and physicians and a high level of satisfaction among physicians. However, barriers to implementation, including technological issues and financial obstacles, have impeded the widespread adoption of e-prescribing. Prescription cost-management strategies have traditionally included use of formularies, generic utilization, co-payments and prior authorization. It is remarkable that physicians were generally unaware of the differential in prescription co-payment amounts until informed by the patient or pharmacist. Physicians recognize the importance of drug costs in prescribing decisions, but most report a lack of
access to drug cost data, hindering their ability to advise patients and to modify their prescribing decisions.

Furthermore, Ross et al. highlighted that E-prescribing offers the ability to provide physicians with immediate access to the formulary and generic status of prescribed agents, allowing them to discuss medication costs and alternative choices with patients at the point of care.

Ross's study was a retrospective examination of the relationship between predominant e-prescribing to formulary compliance and generic utilization, performed from the perspective of a health plan. In order for a managed care organization (MCO) to invest in e-prescribing technology for their providers, they would need evidence to support the investment; therefore, an overall cost advantage of e-prescribing would need to be demonstrated. The study hypothesis was that predominant e-prescribers would demonstrate higher ratios of formulary compliance and generic utilization than traditional prescribers because of the informational support offered at the point of care during drug prescribing.

The key points of the aims of the current study are similar to the key points of the study presented on Finnish medication prescribing and prescription issues. Suomi & Salmivalli, (2002, pp. 485 - 488) described electronic prescription developments in Finland as traditional health care (comprising several different activities, such as selling pharmaceuticals to consumers), which has been very strictly regulated and stipulated with numerous standards. One of the biggest obstacles in the launching of the electronic prescription system has concerned data security issues, especially problems related to electronic signature, i.e. how to confirm user identity. In addition, society is at a turning point; according to various studies the biggest challenge for the health service is the ageing of the population. It is also a matter of resources; health services have to be delivered to an increasing number of people with ever-scarcer resources. Suomi & Salmivalli described the key issues of their study in the following points, which are in part similar to the key issues of the current research:

**Prescriptions:** Medicines may be sold to the public only by pharmacies and subsidiary pharmacies, except in sparsely populated areas, where non-prescription products may be sold by medicine dispensaries owned by pharmacies. A prescription is a document written by a physician, the pharmacy delivers the medicine to patients according to the physician's instructions. Approximately 36 million prescriptions are ordered annually, which is roughly 7 prescriptions per head of population. There were, however, several problems that relate to paper form prescriptions; the biggest problems appear to be difficulty in reading physicians'
handwriting and the possibility of falsification of prescriptions. Obscure prescriptions cause problems for pharmacies, as interpreting prescriptions must also be checked by the physician, which increases the amount of work and delays in the delivery of medicine. Furthermore, it seems that not all physicians have up-to-date information about the medicine market; physicians occasionally order particular package sizes or strengths of medicines that have actually been replaced by new ones.

**Users:** In the field of the health care industry there are several different combinations of customers; for example, users can be the personnel of private or public health care, or patients. Purchasing decisions can be made by the patient him/herself or by the specialist of health care. Payers can be public reimbursement systems, insurance companies, employers, or even patients.

**Industry players:** The pharmaceutical industry in Finland has been undergoing major structural changes since the 1980s. The number of manufacturers has decreased steadily due to mergers and acquisitions. Another feature has been the specialisation of manufacturers; at the moment there are a few new manufacturers emerging in such niche fields, such as asthma medication. The aggregate turnover of Finnish manufacturers and marketers of medicines represented approximately 1,646 billion Euros in 2000. At present, there are three major wholesalers in the Finnish medicine markets. The wholesaling is arranged as a single channel distribution, meaning that products of a certain manufacturer can be ordered only through one wholesaler. The Pharmaceuticals Pricing Board approves reasonable wholesale prices for medicines as wholesalers may not decide their prices completely independently.

**Pharmacies are privately owned:** Permission to own and operate a pharmacy is granted by the National Agency for Medicines. An extra annual tax is levied on proprietary pharmacists under the Pharmacy Tax Act. The amount of pharmacy tax depends on its turnover and is confirmed annually by the National Agency for Medicines, according to a progressive pharmacy tax table. This means that large pharmacies are charged more than small ones. Manual processing of prescriptions is time-consuming and requires plenty of labour that could be used elsewhere.

**Physicians:** Approximately 80 percent of all medicament expenditure is due to prescription medicines, which means that physicians are the most important single loop in the pharmaceutical supply chain to rationalise medical expenditure and costs. General practitioners basically need information on the prices of medicines, refunds and adverse drug reactions.
However, it seems that the price of medicines is not a particularly dominant factor when a prescription is written. More important factors tend to be the availability of a particular medicine, other medication of the patient and the general practitioner's personal preferences. The physician sometimes orders a prescription without exact knowledge of what other medication the patient has received from other physicians and whether the drugs could together have adverse side effects.

Citizen: The role of citizens is to pay the bill, at least partly. There is a functioning refund system for medical costs; however, patients indisputably pay more for medication than they did ten years ago. Patients appreciate the reliability of the present system; however, this reliability has its price. The excess of the patient is greater in Finland than in many other European countries. Currently, citizens receive a paper copy of the prescription but finding out the total medication of the patient can be difficult. Efficiency of medical care can be severely hindered by user behaviour. They may for example not take the prescribed medicine as a result of cost.

Authorities and societal surroundings: The authorities monitor and, if necessary, interfere in the action of private operators, such as pharmacies or physicians. There are also some actors who are not formal authorities but who also have a strong mandatory right from their members; for example, unions including The Association of Finnish Pharmacies and The Finnish Medical Association. Variable data is provided to the above mentioned authorities from the prescriptions, mainly currently in paper form with significant time lag.

Providers: There are few software providers in Finland, which have developed electronic prescription applications. The case company was MediWeb Ltd. a Finnish SME, established in 1996, whose managing director was interviewed as an expert from the provider side.

Electronic Prescription Development Initiatives in Finland: Suomi & Salmivalli indicated that in the year 1998, 64.8% of Finns (over 32 million citizens) received reimbursement for medication expenditure, the aggregate sum being over 550 million Euros. Approximately 36 million prescriptions are prescribed annually in Finland; this means roughly one prescription every second. Overall, the flow of money and information are considerable in the prescription process; this places huge requirements on the processing system, whether in paper or electronic form. Taking into consideration the huge paper flow, the Social Insurance Institution of Finland has established a research group in order to map out the possibilities of utilising an electronic prescription system. The preliminary investigation project was to be finished by the end of November 2001. On the other hand, in the private sector there are several different
medication actors possessing an interest in electronic prescriptions, for example, pharmaceutical companies have their own interests, pharmacies theirs and, finally there are a few innovative companies developing new means of managing prescriptions in electronic form. The primary role of the authorities is to protect the minimum standards of healthcare. Moreover, the authorities advance the quality of healthcare and develop the well-being of individuals. Consequently, in 1998 the Ministry of Social Affairs and Health in Finland initiated a three-year training programme, named ROHTO (a programme for rational prescribing). By utilising available data on the usefulness and overall financial implications of various drug treatments, the programme's aim was to improve the medication habits of doctors. Therefore, electronic prescriptions were viewed from the viewpoint of authorities as part of a larger integrity, that is, continuous improvement of national health care. So far, electronic prescriptions have been piloted only a few times in limited environments.

Another study sheds light on the Australian electronic medication management system to improve the prescribing method and prescription dispensing between the clinics and the pharmacies. The Victorian Hospitals Electronic Prescribing and Decision Support (VHEPADS), (2003, pp. 7 - 22) illustrated that physician prescribing is associated with about 56% of avoidable medication errors, nurse administration 34% and pharmacy and clerical staff the rest. The problems have been listed below:

1. Physician prescribing problems.
2. Pharmacist dispensing errors.
4. Patient problems.

The VHEPADS mentioned that HealthConnect which is a 10 year plan for developing a shared national electronic health record (from cradle to grave), in accordance with national standards, and originally estimated at $430 million. The 2001 - 2002 Commonwealth Budget allocated $16 million over two years to research and development, in addition to $2.5 million committed previously. MediConnect aims to share summary medication records of consenting consumers between clinicians and pharmacists, in both hospitals and general practices, in order to allow more complete medicine records to facilitate drug interaction and consumer allergy checking. MediConnect started life as the Better Medication Management System (BMMS). It was part of HealthConnect. The Commonwealth Budget of 2000 allocated $64.5 million over four years to implement the BMMS with a target commencement date of July 2001.
MediConnect proposes to use Internet technology and HL7 message standards to send summary medication information between GP, hospital and pharmacy computers and a central HIC database with security provided by Public Key Infrastructure (PKI). Field tests are currently being conducted in Ballarat and Launceston. An overview of MediConnect is shown in Figure 3.2.

**Figure 3.2 MediConnect Concept**

![MediConnect Concept Diagram](image)


The VHEPADS reported that patient safety and quality use of medicines was substantially improved by the Electronic Medication Management (eMed) systems. The VHEPADS defined the broad specifications of an eMed system as follows:

- It will replace paper-based systems by enabling hospital medical officers to select a patient's electronic medical record, pick up on clinical problems, bring up relevant guidelines, protocols and care plans and populate an electronic patient medication record accordingly if so desired. It will moreover allow drug prescriptions to be entered and/or modified online and transmitted to the pharmacy department. Furthermore, it will have a number of decision support capabilities, such as the ability to calculate and check drug doses, assess drug-drug, drug-disease, drug-allergy and drug-laboratory interactions and produce specific alerts and/or reminders in response to significant events through programmable rules. In
addition, it will allow ward pharmacists to check prescriptions on-line, assist nurses to administer and record drugs given as well as facilitate the monitoring of medication-related events by all staff.

- It will minimise patient and/or drug mismatch by the use of bar coding and scanning technology as well as incorporate on-line antibiotic approval and advice systems, adverse drug reaction notification and PBS "authority to prescribe" notifications. Moreover, it will track drug use at the patient level and facilitate education and audits by providing patterns of use matched against physicians, units, ward locations and disease categories.

- It will control drug inventory at the ward and hospital level, minimise illicit usage and provide tools to allow hospital drug information pharmacists to update shared, machine-readable, drug and therapeutic knowledge repositories in order to add information about trial drugs, "off-label" indications and local treatment protocols and care plans (Guidelines Central).

- It will comply with State and Commonwealth security and privacy provisions and given patients' consent, the eMed system will share discharge and medication summary information with the patient's GP and MediConnect.

One of the detailed studies focused on the implementation of information technology at the health sectors in Brazil. Costa et al., (2004, pp. 371 - 376) in their study indicated that there have been only a few reports on Brazil that effectively analyzed the use of technology in the development of systems to computerize hospital activities and operations. This lack of systematic studies has caused uncertainty among administrators about the consequences of their decisions when defining computer resources. With the crisis in the health sector in Brazil, Information Technology (IT) came as a more efficient and transparent alternative to managing operations in health care centres. There was little effective software as well as few experts in the various administrative areas of a hospital. The specific cultural characteristics in these institutions were responsible for a number of failures in the acquisition or development of software. The Hospital's Drugstore was the selected administrative area in which the computerization process was to begin. This area was responsible for the distribution of medication to all the clinics in the hospital as shown in Figure 3.3 and is internally called the Medication Dispatching Sector.
### Figure 3.3 Systematising the Medication Distribution System and the Qualitative Results in the New System for Prescription and Distribution

<table>
<thead>
<tr>
<th>Activity</th>
<th>Former system (manual)</th>
<th>New system (computerized)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Prescription</strong></td>
<td>Long preparation time, frequently repetitive work</td>
<td>Reduction in time to prescribe (especially after second prescription for same patient)</td>
</tr>
<tr>
<td></td>
<td>Parenteral solutions with manual calculations</td>
<td>Parenteral solutions with automated calculation</td>
</tr>
<tr>
<td></td>
<td>On occasion, physicians' handwriting caused problems</td>
<td>Precision in designating medication</td>
</tr>
<tr>
<td></td>
<td>Prescription using commercial name</td>
<td>Possibility to review prescriptions in similar situations</td>
</tr>
<tr>
<td><strong>Ordering (Infirmary)</strong></td>
<td>Transcribes prescriptions to orders Possibility of errors in the process of transcribing</td>
<td>Automatic orders, no more transcriptions Assistants are freer</td>
</tr>
<tr>
<td></td>
<td>Transcription by assistants (1 per clinic, 21 clinics) who perform other tasks</td>
<td>Medication codes are automatically added (transparent to user)</td>
</tr>
<tr>
<td></td>
<td>Medication codes manually transcribed (nearly 800)</td>
<td>Possible to track medication through the computer</td>
</tr>
<tr>
<td></td>
<td>Transcription time too long</td>
<td>Precision in reading medication Order preparation time is insignificant</td>
</tr>
<tr>
<td><strong>Dispensing</strong></td>
<td>Typing operations (9 typists)</td>
<td>Data automatically entered</td>
</tr>
<tr>
<td></td>
<td>Possibility of error in separation</td>
<td>No need for typing</td>
</tr>
<tr>
<td></td>
<td>Handwriting could cause error</td>
<td>Medication code checked against code prescribed (avoids errors in separation)</td>
</tr>
<tr>
<td></td>
<td>Fractions of medication</td>
<td>Fractions of all medication</td>
</tr>
<tr>
<td></td>
<td>No need to label</td>
<td>Labeling (bar code), including fractioned medication</td>
</tr>
<tr>
<td></td>
<td>Records of failures onto the orders</td>
<td>Standardized and automatic notes</td>
</tr>
<tr>
<td><strong>Transport</strong></td>
<td>Orders moved through messengers</td>
<td>Orders automatically wired</td>
</tr>
<tr>
<td></td>
<td>Dispensing times concentrated in a given period</td>
<td>Dispensing planned as needed</td>
</tr>
<tr>
<td></td>
<td>Messengers searched orders in the clinics</td>
<td>Messengers freed</td>
</tr>
<tr>
<td><strong>General</strong></td>
<td>Manual system potentiizes conflicts</td>
<td>Automatic system with few people moving around</td>
</tr>
<tr>
<td></td>
<td>Non-existence of structured IT sector</td>
<td>More precise and transparent communication system</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Information sector structured after this system</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Interface with pharmaceutical Industry for the use of bar codes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Creating an Information culture</td>
</tr>
</tbody>
</table>

Costa et al added that the main complaints by pharmacists involved in the distribution process concerned the high level of average stock and the lack of information and transparency in the internal procedures. A diagnostic assessment of the main problems in this area was conducted first; this showed that physicians prescribed medication for each patient; upon receiving the prescriptions, infirmaries would change them into orders to be placed per bed (three copies) and send them to the drugstore. The drugstore received the orders, separated the medication and sent it back to the infirmaries with the third copy of the order. The wards received, verified and administered the medication. The system for dispensing was very much integrated into the other areas of the hospital, for example, it interfaced with procurement; with receipt of materials; with infirmaries, which received and administered the medication; with physicians who prescribed it; with finance and social work sectors in the hospital some medication was dispensed free of charge.

Costa et al stated that some characteristics of the new information and operations system were highlighted by the participants: they believed that the required information for managing operational and managerial activities, bar codes etc. were to be used to input data; all pill and ampoules should be fractionated; the fractionated packages should also bear bar codes. In its early days, the project evolved so as to deal with the need for doctors' prescriptions to be electronic, i.e. those physicians should have to use computers to prescribe medication for a given patient. This information was to be cabled between the floors of the hospital to the dispatch sector, by means of a computer network. However, at the time, it was impossible to prescribe medication electronically in Brazil. To overcome this obstacle, the decision was for prescriptions to be printed: doctors would sign the printed prescription and the infirmary would administer the medication based on that document. Only the information on the prescription would be sent electronically to the dispensing area. The prescribed medication would then be sent to the infirmary, which would have it administered according to the printed document. The complete flow of the stock material in and out would be transferred to the central computer run by a company at some point during the day. After the new system was set up, presentations were made and others suggestions were collected from other sectors involved in the system's operation.

These definitions were the result of thorough investigation into market trends and they involved specialists in the IT area who were teaching at the university. The hardware physical structure was designed and specified, along with a pilot project for the network to hold the new
customer-host system to be developed in the paediatric clinic's nursery which already prescribed through computers using a locally developed system. The choice of a computer network fulfilled the user-friendliness requirement. The choice of operating system, of databank and of the programming language, followed technical criteria for safety and availability of professionals on the local market and the limited IT capacity of the hospital to produce the required software.

Costa et al highlighted that the pilot project was comprised of the following: after doctors prescribed the medication it would electronically proceed to the infirmary, which would then place the order. The computerized order was stored in the drug store's computer. The medication would be separated in the drug store, be assigned a bar code and then leave the depository. The order would not be sent directly to the drug store because the medication which was not available in fractions needed to be inspected in the infirmaries. As well as the medication that is part of the permanent stock in the infirmaries, only the correct doses to be administered on a given day were ordered. This information would be transferred to a large central computer that would control stock. The definition of the complete hardware/software structure was based on this pilot project, also taking into account the prospect of rapid growth in other areas as soon as its validity had been confirmed. It was possible to develop an internal IT structure in the hospital by promoting a culture of information.

Another detailed study on implementing information technology at the health sectors in Taiwan by Tsai Liua et al., (2004, pp. 383 - 385) described an integrated pharmaceutical information system (IPIS) that most people in Taiwan acquired drug guidelines or pharmaceutical information directly from the medical professionals treating them. However, there was little incentive for healthcare providers to provide patients with comprehensive information. The current reimbursement policy of the Bureau of National Health Insurance is based mainly on the volume of medical services and not on the quality of care or patient education service. As a result, healthcare providers do not devote significant resources to educating or informing patients. However, modern patients wish to be better informed about their diseases and the drugs they are taking.

Tsai Liua et al added that frequent questions asked by patients relate to drug safety, including indications and contra-indications to taking drugs, therapeutic doses, drug reactions, possible allergies and food drug interactions. In addition, they request information about how to store their drugs and what they should do if they forget to take a dose. Providing answers to all these
questions is difficult due to a shortage of patient education professionals. Appropriate pharmaceutical education could help patients have a better understanding of the benefits and risks of medication; it could also help to improve medication compliance and co-operation with caregivers. Empowering patients with drug knowledge is therefore desirable. If possible, this should be accomplished in a cost-effective manner that does not increase the workload of existing healthcare professionals. It has become increasingly clear that in hospital settings, patient safety can be improved by the introduction of an integrated computer-based medical care system.

Tsai Liua et al. indicated that there are at least two methods of data integration: one is the acquisition of fragmented or isolated data, based on individual patient information stored in various hospital departments; the other is the collection of patient education materials related to his/her medical treatment or care. An integrated pharmaceutical information system (IPIS) was developed to provide pharmaceutical education materials based on an individual patient's profile of his/her prescriptions. The profile can automatically be built up by retrieving relevant information from physician order entry systems and hospital information systems. The system incorporates a multimedia drug database containing pictures of individual medications, drug guidelines, summaries for drug use and links to relevant materials. The system can only be accessed and used within the hospital.

The integrated pharmaceutical information system (IPIS) consists of an IPIS server and clients (see Figure 3.4), the client is an Internet based browser, which interacts with the server to retrieve and display the information for users. The IPIS server consists of the following major components: an integration gateway, a document manager, a drug database, a patient profile and a system administration and management component. The integration gateway is used to connect the IPIS server to the Hospital Information System (HIS). Through the gateway the IPIS server can retrieve a patient's clinical data from the HIS, such as medication orders, prescriptions and medical records.
The patient's clinical data combined with his/her demographic data comprises the patient's profile. Currently IPIS is used to help outpatients acquire their pharmaceutical education materials. Hence, the patient profile is organized into four categories: patient identity, visit time, diagnoses and prescribed drugs. Each outpatient has his/her own electronic folder containing data from these four categories for each visit. Thus, when the patient logs into the IPIS, he/she can easily access the required pharmaceutical education materials based on the links between his/her patient profile and the document manager. The document manager organizes pharmaceutical education materials. Materials are in one of three formats, i.e. Microsoft Word (MSWord), Portable Document Format (PDF), or JPG. The appearances of a drug are usually represented by a JPG file, directions for the use of a drug (published by pharmacy vendors), are usually represented by PDF files and drug guidelines, produced by clinicians and pharmacists, are represented by MSWord files.

Tsai Liua et al added that each drug item includes the necessary education materials associated with it. Thus, a hierarchy of pharmaceutical education materials can be formed from general to specific by the patient profile, drug guidelines and directions of use, as shown in Figure 3.7. Once the patient enters into the system, his/her profile is first displayed as shown in the
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bottom screen of Figure 3.5. The profile includes the patient's medication history in which each row represents a prescribed drug and the prescribing doctor's note for the use of the drug. For example, in Figure 3.7 the first row shows the prescribed drug is Herbesser 30 mg/tablet, the doctor's notes for the drug are: three times a day, one tablet each time and take by mouth. If the patient wants to look for more detailed drug information, he/she can click the drug item; the detailed directions for use and the picture of the drug are displayed on the front screen. Such organization of patient data and their education documents can enable patients to easily access their medication histories and required pharmaceutical educational materials.

Figure 3.5 The Hierarchical Representation of the IPIS Pharmaceutical Documents.


More importantly, the system provides specific information according to the patient's requirements. The IPIS was developed and installed at Taipei Medical University Wanfang Hospital (TMUWFH) in July 2002. It was developed to compensate for a shortage of patient education professionals and operates within the hospital. It cannot be accessed from outside the hospital and this considerably minimizes security concerns. Any patient who wishes to utilize the system must first apply for a user account and password and also provide their date of birth. As a safeguard against unauthorized use, these three pieces of information must be entered when logging into the system.
3.4 Summary:

The key issues of this study have been taken into consideration during reviewing the literature; the selective studies in this chapter discussed the subjects that related to the issues of this research which focused on the problems of the handwritten prescriptions, the methods which were used by the physician to prescribe medication, as well as the system used at the pharmacies to receive the prescriptions from health sectors and the current situation of the systematization of dispensing and supplying medication. Generally, this chapter centred on the development of medication and the pharmacies' Information Technology Systems (ITSs) and particularly, the ITSs in developed and developing countries, as well as the ITSs in the Medication and Pharmacy Services in Saudi Arabia. It gave information on technology developments in Medication Administration Records (MAR) and patients’ Electronic Files Systems (EFSs), as well as focused on experiments that were used in hospital and pharmacy management in developed and developing countries.

Particular systems were identified in the United States, the United Kingdom, Finland, Australia, Brazil and Taiwan, including the Drug Utilization Review (DUR) in the United States and the prescription system in the United Kingdom, the Computerized Physician Order Entry (CPOE) system and the hospital rules-based system (HRBS) as the next generation of medical informatics for patients. The P-Care subsystem, the Electronic Prescribing System (EPS) and the Electronic Transmission of Prescriptions (ETP), centred mainly on medication errors, medication management, patient safety, patient filing records and health services. This is very important and would be especially useful in the government and the private health sectors in Saudi Arabia.

These systems were planned and designed some time ago and were provided with the technologies that supported them with the infrastructure, in order for them to be more useful in the environments of these countries. In Saudi Arabia, in spite of all this progress in health services, throughout the world the health information system is still developing. However, much of the previous systems mentioned are not suitable for the Saudi situation, or may need to be modified. At the same time it is necessary to take into consideration the differentiation in each environment.

Therefore, the researcher found it useful to study the existing environments in which systems need to be devised. A system needs to be developed that will help to unite the two main health sectors, i.e. the government and the private sector. This leads to the idea of proposing an integrated system to be used by current technician/drug/medication databases as well as local
and international pharmaceutical companies through the use of the Internet. This system, the researcher anticipates, will utilise most of the benefits of the systems in Europe, America and Asia, at the same time making it relevant to Saudi Arabia.

In the next chapter, a general review of research methodologies and a selection of the methodology to be applied in this research are discussed; the reasons for this choice are also outlined.
4. Research Methods

4.1 Introduction:

This chapter is divided into two parts; the first part is devoted to the definitions of appropriate empirical research methods, and the research instruments which were used for collecting the data. The second part is devoted to the research method used throughout. This study uses a Mixed Method to combine two main types of empirical research, the "Quantitative approach and the Qualitative approach". The researcher will describe each method and relate them to various research paradigms and strategies explaining some of the most common data capture methods employed, in addition the strengths and weaknesses of the Mixed Method will be discussed. This study will illustrate the most suitable research method to carry out the required data analysis Survey Questionnaire and Interview Technique. The procedures of data collation, data preparation and analysis will be equally described. The use of the Soft System Methodology (SSM) and the reasons for adopting SSM for this study are also discussed in greater detail. SSM is dependent on the wealth of the information gathered that describes the 'problem situation, unstructured'. In addition, a comparison of both the current Health Information System (HIS) at the Ministry of Health in Saudi Arabia and the National Health Services (NHS) in the United Kingdom within the framework of the study will also be discussed. A literature review and empirical data collection were specifically undertaken and thus both will contribute to the study findings (see Figure 4.1).

This chapter reviews a number of research methods used in the field of social sciences and information system research. There are two main types of empirical research: the quantitative and the qualitative approach. Larsen, (2002) reported that after several decades of information system research, IS Implementation has been defined as "an organizational effort to diffuse an appropriate technology within a user community". As the field developed, many different research methods were imported from other fields of research. With quantitative approaches initially gaining the highest level of acceptance and qualitative approaches gaining acceptance during the last decade, the field now accepts both quantitative and qualitative research approaches. While the results of qualitative research may sometimes be used by researchers applying quantitative approaches to similar research problems, some approaches are founded on the belief that the researcher should know nothing about previous writings on a research
problem, such as grounded research. Both approaches to research have led to extensive streams of research.

DeMarrais & Lapen, (2004, pp. 2-3) mentioned changes which have occurred in research, in education and the social sciences "Research in education and the social sciences has changed dramatically over the past few decades. With few exceptions, until the 1980s, the typical research training in universities focused on statistics, measurement and experimental methods, with little or no attention to approach."

Furthermore, it has been reported that qualitative research gained more prominence through the 1980s, while the paradigm wars took place, in which scholars heatedly debated the virtues and limitations of quantitative versus qualitative methodologies. They were quoted as saying that these debates are largely over, with researchers in both camps recognizing the value of multiple views and approaches to research practice. Students in professions such as education, business, nursing and social work, as well as in the social sciences, have access to courses and programmes in both qualitative and quantitative approaches to research. Moreover, DeMarrais & Lapen added that in the 21st century, the theoretical and methodological debates continue as scholars critique and rethink what might be in social science research. Researchers today are keenly aware of the multiple methodologies available for contributing new knowledge to the disciplines and the challenges entailed in the use of each of these approaches.

DeMarrais & Lapen, (2004, pp. 4-5) pointed out that the terms relating to methodology and the method carry different meanings. A method is a particular research technique or way to gather evidence about a phenomenon. Methods are the specific research we use in research projects to gain a fuller understanding of phenomena. Examples of methods include surveys, interviews and participant observation. These methods or tools can be used in many different approaches to research. It used methodology to describe the theory of how an inquiry should proceed that involves analysis of the principles and procedures in a particular field of inquiry. Much more than simply methods or tools of research, methodology involves the researchers' assumptions about the nature of reality and the nature of knowledge.

The quantitative approach is characterised by research methods of formulating hypotheses, which were tested through controlled experiment or statistical analysis Kaplan & Duchon, (1988) reported how quantitative and qualitative methods were combined in a longitudinal multidisciplinary study of interrelationships between perceptions of work and a computer information system. The research uses a mixed approach as reported in information systems
and health informatics literature. Over the last decade, several authors have identified the reasons for mixing quantitative and qualitative data; (Ramon et al. 2006) employing multi-method or mixed method approaches are recurrent topics of debate in academia. As a result, scholars from various backgrounds and disciplines recommend the use of multiple methods to study complex social phenomena. Multi-method approaches refer to the use of multiple methods (typically quantitative and qualitative) in conducting research. Other terms used for multi-method approaches are mixed method studies, multi-methodology and integrating quantitative and qualitative methods, among others.

**Figure 4.1 Research Methods**

![Image of research methods diagram]

- Critical Literature Review
- Questionnaire Survey Semi-Structured Interview
- Soft System Methodology (SSM Mode)
- Health Information System (HIS) MOH Saudi Arabia and (NHS) United Kingdom (Comparison)
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4.2 Part One:

The initial question is not 'which methodology?' But 'what do I need to know and why?' then 'what is the best way to collect information?' and when we have this information, what shall we do with it?

No approach depends solely on one method any more than it would exclude a particular method merely because it is labelled 'quantitative', 'qualitative', 'case study', 'action research', or whatever. We may consider that a study making use of a questionnaire will inevitably be quantitative, but it may also have qualitative features. Case studies, which are generally considered to be qualitative studies, can combine a wide range of methods, including quantitative techniques. Methods are selected because they will provide the data we require to produce a complete piece of research. In a more extensive study to use more than one method of data collecting, this multi-method approach is known as triangulation. The key to triangulation is to see the same thing from different perspectives and thus to be able to confirm or challenge the finding of one method with those of another (Bell, 2005, pp. 115 – 116).

4.2.1 Quantitative, Qualitative and Mixed Methodology:

There are currently three major research paradigms in education (and in the social and behavioural sciences). These are quantitative research, qualitative research and mixed research.

For most of the 20th century the quantitative paradigm was dominant. During the 1980s, the qualitative paradigm came of age as an alternative to the quantitative paradigm and it was often conceptualized as the polar opposite of quantitative research. Finally, although the modern roots of mixed research go back to the late 1950s, it truly became the legitimate third paradigm with the publication of the Handbook of Mixed Methods in Social and Behavioural Research in 2003, by Tashakkori and Teddlie. At the same time, mixed research has been conducted by practicing researchers throughout the history of research.

The definitions for each are provided below:

- Quantitative research – research that relies primarily on the collection of quantitative data. Quantitative research has two major subtypes: experimental and non-experimental research.
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- Qualitative research – research that relies on the collection of qualitative data. Qualitative research has five major subtypes: phenomenology, ethnography, case study, grounded theory and historical research.

- Mixed research – research that involves the mixing of quantitative and qualitative methods or paradigm characteristics. Bear in mind that the mixing of quantitative and qualitative research can take many forms as the possibilities for mixing are almost infinite. Mixed research also has two major subtypes: mixed method and mixed model research (Johnson & Christensen, 2004, pp. 29-30).

4.2.1.1 Quantitative Research:

Fairbrother, (2007, p. 40) defined quantitative research as relying on the collection of numerical data which are then subjected to analysis using statistical routines. By contrast, qualitative research relies on "meanings, concepts, context, descriptions and settings. Quantity refers to amounts, while quality refers to the essence of things. Among quantitative types of research are descriptive studies, correlational research, causal comparative research and experimental studies. Qualitative research methods include ethnography, historical research and case study research. To explain the differences between these methods is to compare them along the lines of purpose, data sources, methods of data collection, data analysis and reporting.

Lazaro & Marcos, (2006, pp. 758 - 659) defined the quantitative method as proposing to measure and analyze causal relationships between variables within a framework of free values. It is based on the positivism that supports empirical research since all phenomena can be reduced to empirical indicators that represent truth. This fact is due to the existence of one truth and is independent of human perception. Therefore, the investigator and the thing investigated are independent entities. The quantitative research methods work with data in numerical form collected from a representative sample and analyzed usually through statistical methods. The ultimate objective is to identify the dependent and independent variables, eliminating inadequate variables and in this way to reduce the complexity of the problem so that the initial hypothesis can be confirmed or discarded.

Sale et al., (2002, p. 44) defined the quantitative paradigm that is based on positivism. Science is characterized by empirical research; all phenomena can be reduced to empirical indicators which represent the truth. The ontological position of the quantitative paradigm is that there is only one truth, an objective reality that exists independent of human perception. Epistemologically, the investigator and investigated are independent entities. Therefore, the investigator is capable of
studies a phenomenon without influencing it or being influenced by it; inquiry takes place as through a one way mirror. The goal is to measure and analyze causal relationships between variables within a value-free framework. Techniques to ensure this include randomization, blinding, highly structured protocols and written or orally administered questionnaires with a limited range of predetermined responses. Sample sizes are much larger than those used in qualitative research so that statistical methods, to ensure that samples are representative, can be used.

4.2.1.2 Qualitative Research:

Fairbrother, (2007, p. 43) defined a fundamental purpose of qualitative research is to capture the research subject's perspective and views of values, actions, processes and events. Qualitative research presents the "emic", insider's perspective, empathising with the subjects of research. Through methods such as detailed participant observation and in-depth unstructured interviews, subjects are given far more latitude to share their own views, with the researcher tending towards surrendering control to the researched in the process of inquiry.

Mack et al., (2005, p. vi -2 ) defined qualitative research as a type of scientific research. In general terms, scientific research consists of an investigation that:

- Seeks answers to a question.
- Systematically uses a predefined set of procedures to answer the question.
- Collects evidence.
- Produces findings that were not determined in advance.
- Produces findings that are applicable beyond the immediate boundaries of the study.

Mack et al. added: that the qualitative research shares these characteristics. Additionally, it seeks to understand a given research problem or topic from the perspectives of the local population it involves. Qualitative research is especially effective in obtaining culturally specific information about the values, opinions, behaviours and social contexts of particular populations. Qualitative research methods are gaining in popularity outside the traditional academic social sciences, particularly in public health and international development research. Whereas quantitative research methods once dominated these fields, researchers have now begun drawing from a more diverse repertoire of methodologies as they tackle international public health problems. Qualitative methods have become important tools within this broader
approach to applied research largely, because they provide valuable insights into the local perspectives of study populations.

Mack et al. illustrated that the great contribution of qualitative research is the culturally specific and contextually rich data it produces. Such data are proving critical in the design of comprehensive solutions to public health problems in developing countries, as scientists, medical doctors, pharmaceutical companies and humanitarian organizations have come to recognize that biomedical solutions are only partial remedies. Qualitative methods are also effective in identifying intangible factors, such as social norms, socioeconomic status, gender roles, ethnicity and religion, whose role in the research issue may not be readily apparent.

Mack et al. consider that when used along with quantitative methods, qualitative research can help us to interpret and better understand the complex reality of a given situation and the implications of quantitative data. Although findings from qualitative data can often be extended to people with characteristics similar to those in the study population, gaining a rich and complex understanding of a specific social context or phenomenon typically takes precedence over eliciting data that can be generalized to other geographical areas or populations. In this sense, qualitative research differs slightly from scientific research in general.

Ospina, (2004, p.3) reported that researchers using one or the other tackle empirical research differently. Everet and Louis (1981) clarify the assumptions that ground each by distinguishing two research stances: “inquiry from the outside”, often implemented via quantitative studies and “inquiry from the inside” via qualitative studies. These approaches differ in the degree of the researcher’s immersion in terms of experiential engagement, direct contact with the research participants and physical involvement in the setting. In the “inside” or qualitative approach, the researcher aims for a holistic picture from historically unique situations, where idiosyncrasies are important for meaning. The researcher uses an inductive mode, letting the data speak. In contrast, traditional “outside” or quantitative researchers aim to isolate the phenomenon, to reduce the level of complexity in the analysis and to test hypotheses derived previously.

Lazaro & Marcos, (2006, pp. 758 – 659) defined that qualitative method examines the process of assigning meanings. It is based on interpretation and constructivism, taking into account that multiple realities and multiple truths exist based on the construction of a social reality that is constantly changing. Therefore, the investigator and the object of study are interactively intertwined in such a way that discoveries are created mutually within the context of the
situation that moulds the investigation. Furthermore, qualitative research methods mainly analyze visual and textual data in such a way that the sample is restricted to just a few or even only one example. Hence, this type of method allows the complexity of the problem to be confronted, keeping in mind that results are not the objective. Rather, the goal is to be able to generate new theorems or improve existing ones.

Darlington & Scott, (2002, p. 2) reported that the qualitative research is not new. Historians have always analysed documentary evidence, much of it non-quantitative data such as correspondence, as their primary source material and through oral history methods have added in-depth interviewing to their repertoire in recent decades. Anthropology, from its conception as a discipline in the mid-nineteenth century, used qualitative methods such as field observation and informant interviewing to understand cultural patterns and social relationships. Sociology has always drawn upon both quantitative and qualitative methods, such as in the influential Chicago school of urban research in the 1920s and has often utilised both approaches. Organisational theory has been based largely on case studies created from an amalgam of observation, documentary material and interviews.

Darlington & Scott added that in recent years specializations, such as medical anthropology and medical sociology, have relied heavily on qualitative methods to explore issues relating to health and illness, from the micro-context of the hospital ward or clinic through to the broader socio-cultural context. Qualitative methods have extended well beyond the boundaries of the social sciences in academia. Market research was originally based on the social survey but now complements this with focus groups to tap the processes and nuances of consumer opinion, as does research on public opinion and voting intentions.

4.2.1.3 Mixed Method Approach:

Mixed research approach is the class of research studies in which a researcher mixes or combines quantitative and qualitative research techniques into a single research study. Mixed research helps to improve the overall quality of research. Quantitative and Qualitative methods are compatible and can be mixed. Mixed research provides a framework for conducting a study that incorporates quantitative and qualitative research approaches. In each mixed research study, a combination of quantitative and qualitative data is collected, analyzed and interpreted using systematic principles. Mixed research takes most of the space on the research continuum that varies from not mixed (i.e., what is called monomethod) to fully mixed. A monomethod research study involves the exclusive use of either a quantitative or qualitative research
approach. As long as both quantitative and qualitative research approaches are used within the same investigation, the study moves from being monomethod to at least a partially mixed method, even though one of the research approaches is used only minimally. Mixing or integration of elements of quantitative and qualitative research becomes greater and greater. Mixed research is a growing field. As such, many mixed research designs are still being developed. There are two major methods of mixed research, mixed model research and mixed method research. (Johnson & Christensen, 2004, pp. 410-415).

Bazeley, (2002, p. 2) points out that most social scientists were thinking mixed methods are in terms of some combination of Qualitative and Quantitative approaches to research. Qualitative and Quantitative approaches have been distinguished (and thereby defined) on the basis of the type of data used (textual or numeric; structured or unstructured), the logic employed (inductive or deductive), the type of investigation (exploratory or confirmatory), the method of analysis (interpretive or statistical), the approach to explanation (variance theory or process theory) and for some, on the basis of the presumed underlying paradigm (positivist or interpretive/critical; rationalistic or naturalistic). Perhaps our inability to clearly specify what all of us have a general sense of is indicative of the lack of a clear distinction that what we are talking about is a continuum with a number of independent dimensions along which any particular research may be placed. If one uses numbers, interpretation is still involved. If one's data are texts, counting may still be appropriate. Variables do not necessarily have clear-cut meanings; processes can be revealed through numeric analysis as well as through narrative and so on. This inability to definitively distinguish one approach from another has implications for the acceptability of mixing methods in that "lines of conflict" cannot be clearly drawn. Because there is no necessary congruence between the different dimensions of the quantitative qualitative distinction, the terms themselves are most useful either for giving a sense of overall direction in a study, or simply as descriptors of the type of data being used (textual or numeric). Even the latter is problematic, but it at least avoids the problems associated with suggesting there are such things as quantitative or qualitative paradigms or methodologies.

4.2.1.3.1 Strengths of Mixed Research:

- Words, pictures and narrative can be used to add meaning to numbers.
- Numbers can be used to add precision to words, pictures and narrative.
- Can provide quantitative research strengths.
- Researcher can generate and test grounded theory.
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- Can answer a broader and more complete range of research questions because the researcher is not confined to a single method or approach.
- The specific mixed research designs have specific strengths and weaknesses that should be considered (e.g., in tow-phase sequential design, the phase one results can be used to develop and inform the purpose and design of the phase two component).
- Researcher can use the strengths of an additional method to overcome the weaknesses in another method by using both in a research study (this is the principle of complementarity).
- Can provide stronger evidence for a conclusion through convergence and corroboration of findings (this is the principle of triangulation).
- Can add insights and understanding that might be missed when only a single method is used.
- Can be used to increase the generalizability of the results.
- Qualitative and quantitative together produces more complete knowledge necessary to inform theory and practice (Op.cit:p.414).

4.2.1.3.2 Weaknesses of Mixed Research:

- It can be difficult for a single researcher to carry out both qualitative and quantitative research, especially if two or more approaches are expected to be done concurrently (i.e., it might require a research team).
- The researcher has to learn about multiple method and approaches and understand how to appropriately mix them.
- Methodological purists contend that one should always work within either a qualitative or quantitative paradigm.
- It is more expensive.
- It is more time consuming.
- Some of the details of mixed research remain to be fully worked out by research methodologists (e.g., problems of paradigm mixing, how to qualitatively analyze quantitative data, how to interpret conflicting results) (Op.cit:p.414).

4.2.2 Approaches to Research:

Different styles, traditions or approaches use different methods of collecting data, but no approach prescribes nor automatically rejects any particular method. Quantitative researchers collect facts and study the relationship of one set of facts to another (Bell, 2005, p. 7).
4.2.2.1 Action Research:

Action research is an approach which is appropriate in any context when specific knowledge is required for a specific problem in a specific situation, or when a new approach is to be grafted on to an existing system (Cohen and Manion 1994, p.194). It is not a method or a technique. As in all research, the methods selected for gathering information depend on the nature of the information required. It is applied research, carried out by practitioners who have themselves identified a need for change or improvement, sometimes with support from outside the institution; other times not. The aim is to arrive at recommendations for good practice that will tackle a problem or enhance the performance of the organization and individuals through changes to the rules and procedures within which they operate (Op.cit:p.8).

McNiff & Whitehead, (2006, p. 36) defined that Action Research has been around for some 70 years. It has always been linked with social change for social justice. The term 'action research' appeared in a 1961 speech by Martin Luther King. In the 1950s action research was taken up in education, specifically by the teaching profession and Stephen Corey's (1953) book Action Research to Improve School Practices became influential in America.

Action research is about practitioners creating new ideas about how to improve practice and putting those ideas forward as their personal theories of practice. This is different from traditional social science, which is about official researchers producing theory, which practitioners apply to their practice, so immediately we are in a context of power and politics around the struggle for knowledge and recognition as a knower (Ibid: p.5).

Action research is a form of enquiry that enables practitioners everywhere to investigate and evaluate their work. They ask, what am I doing? What do I need to improve? How do I improve it? Their accounts of practice show how they are trying to improve their own learning and influence the learning of others. These accounts come to stand as their own practical theories of practice, from which others can learn if they wish (Ibid: p.5).

Action research has become increasingly popular around the world as a form of professional learning. It has been particularly well developed in education, specifically in teaching and is now used widely across the professions. One of the attractions about action research is that everyone can do it, so it is for 'ordinary' practitioners as well as principals, managers and administrators. Students can also do and should do, action research.
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Action research can be a powerful and liberating form of professional enquiry because it means that practitioners themselves investigate their own practice as they find ways of living more fully in the direction of their educational values. They are not told what to do. They decide for themselves what to do, in negotiation with others. This can work in relation to individual and also collective enquiries. More and more groups of practitioners are getting together to investigate their collective work and put their stories of learning into the public domain. We can use action research for many purposes, but not for all.

The action research family is wide and diverse, so inevitably different people say different things about what action research is, what it is for and who can do it and how. You need to know about these issues, so that you can take an active part in the debates. Taking part also helps you to get to grips with why you should do action research and what you can hope to achieve.

4.2.2.2 The Grounded Theory Approach:

Glaser & Strauss, (2006 pp. 17-18) considered that the qualitative method was still the only way to obtain data on many areas of social life not amenable to the techniques for collecting quantitative data. There is no fundamental clash between the purposes and capacities of qualitative and quantitative methods or data. Any clashes concern the primacy of emphasis on verification or generation of theory to which heated discussions on qualitative versus quantitative data have been linked historically. We believe that each form of data is useful for both verification and generation of theory, whatever the primacy of emphasis. Primacy depends only on the circumstances of research, on the interests and on the kinds of material he needs for his theory. The crucial elements of sociological theory are often found best with a qualitative method, that is, from data on structural conditions, consequences, deviances, norms, processes, patterns and systems; because qualitative research is, more often than not, the end product of research within a substantive area beyond which few research sociologists are motivated to move; and because qualitative research is often the most "adequate" and "efficient" way to obtain the type of information required and to contend with the difficulties of an empirical situation.

Bell, (2005, pp. 18 - 19) illustrated that the grounded theory approach to qualitative data analysis was developed by Glaser and Strauss in the 1960s during the course of a field observational study of the way hospital staff dealt with dying patients (1965, 1968). Strauss (1987) tells us that:
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The methodological thrust of the grounded theory approach to qualitative data analysis is toward the development of theory, without any particular commitment to specific kinds of data, lines of research, or theoretical interests. So, it is not really a specific method or technique. Rather it is a style of doing qualitative analysis that includes a number of distinct features, such as theoretical sampling and certain methodological guidelines, such as the making of constant comparisons and the use of a coding paradigm, to ensure conceptual development and density.

Grounded theory is best defined as a research strategy whose purpose is to generate theory from data. 'Grounded' means that the theory will be generated on the basis of data; the theory will therefore be grounded in data. 'Theory' means that the objective of collecting and analysing the research data is to generate theory. The essential idea in grounded theory is that theory will be developed inductively from data.

Case, (2007, p. 148) highlighted the Grounded Theory as "Theories tied to observation and meat to apply in a particular area of application are called "grounded" (Glaser and Strauss 1967). In their study of the awareness of death, Glaser and Strauss demonstrated that the middle-range theory is constructed by "grounding" it in observation—that is, building a theory by relying more on observed data than on abstract ideas. Yet, the so-called "grounded theory" approach does not rely entirely on induction reasoning from particulars to generalizations), but rather moves back and forth from data-gathering to deduction (reasoning from generalizations to particular cases) to test the theory."

Case added: "Grounded theories may serve as building blocks for formal theories, while remaining close enough to real-world observations as to give us confidence in their validity. An example from information seeking would be Kuhlthau's (1993a) model of the search process. Kuhlthau's model was developed through close observation of the ways that information seekers construct knowledge by tying it to what they already know as they pass through various stages of uncertainty and understanding. This model was derived from a general, psychological theory (i.e., Kelly, 1963), Kuhlthau's model could be expanded into a more general theory of information seeking through further observation and development. To see how these ideas evolve, let us begin by looking at the foundations of information seeking theories".

4.2.2.3 Soft System Methodology (SSM):

Checkland & Scholes, (2005, p. 28) quote a definition of Soft Systems Methodology from von Bulow "SSM is a methodology that aims to bring about improvement in areas of social concern by activating in the people involved in the situation a learning cycle which is ideally
never ending. The learning takes place through the iterative process of using systems concepts to reflect upon and debate perceptions of the real world and again reflecting on the happenings using systems concepts. The reflection and debate is structured by a number of systemic models. These are conceived as holistic ideal types of certain aspects of the problem situation rather than as accounts of it. It is taken for granted that no objective and complete account of a problem situation can be provided".

Checkland & Scholes, (2005, pp. 91 - 96) illustrated that in recent years a specific effort has been made to use SSM within the National Health Service and this has been fruitful. For example, the study which helped the East Berkshire Community Medicine Department (EBCMD) with the problem of measuring its performance. The practice of community medicine as consisting of more than the provision of epidemiological data; CMD was actively involved in helping to manage the delivery of health care programmes in the District. The study needed to understand not only the ideas (and controversy) underling the different conceptions of community medicine, but also the basic mechanisms operating at district level in the NHS in the provision of health care.

Checkland & Scholes added the client for the study was practical way in which we would use it in the study. We were happy in the circumstances to accept the role of doing the study in continual dialogue with Dr Cobb and his staff, rather than simply facilitating it by providing methodological help. The Lancaster team felt the need to get to know the NHS and its culture better and this provided a chance to do that. Given Dr Cobb's interest in the methodology it was agreed that a series of 'project notes' indicating progress would be issued and that these would cover both the substantive work and the use of SSM. Four such notes were issued in the course of the work; they were found to be helpful in disciplining the team to make explicit both their understanding of NHS practice and their use of SSM.

Soft systems methodology (SSM) is essentially about creating multiple systemic perspectives of a particular situation. SSM was developed by Peter Checkland in the late 1960s at the University of Lancaster in the United Kingdom. Originally it was seen as a modeling tool, but in later years it has been used increasingly as a method of facilitating learning and identifying meaning. At the heart of SSM is a comparison between a problem situation as it is and some simple models of the ways in which it might be perceived. Out of this comparison arose a better understanding of the situation (research) and some ideas for improvement (action) (Williams, 2007).
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SSM places priority on processes of enquiry, in particular, learning about the world view and sense of values, of all the people concerned with a given situation. SSM focuses on understanding a situation in its entirety rather than on improvement or change through the usual problem-solving methods. The problems and puzzles of human activity systems may not be easily solved by hypothesis testing procedures that are often used in natural sciences, since the elements and factors in human relationships may be interrelated in a complex manner. Unlike a hard systems approach which may be appropriate for well-defined technical problems, SSM, a soft systems approach to problem solving, is applied to fuzzy ill-defined situations involving human beings and cultural considerations (Tajino & Smith, 2005, p. 450).

Williams, (2007) indicates that the classic SSM method has seven stages:

Stage (1) The Problem Situation, Unstructured: The problem situation is first experienced, as it is, by the researcher. That is, the researcher makes a few presumptions about the nature of the situation as possible.

Stage (2) The Problem Situation Expressed: In this step, the researcher develops a detailed description, a "rich picture," of the situation within which the problem occurs. In addition to the logic of the situation, the rich picture also tries to capture the relationships, the value judgments people make and the "feel" of the situation.

Stage (3) Root Definition of Relevant System: Next the "root definition," the essence, of a relevant system, is defined.

Checkland provides the mnemonic CATWOE as a checklist for ensuring that the important features of a system are included:

- Customers (the system's beneficiaries).
- Actors (who transform inputs to outputs).
- Transformation (from inputs to outputs).
- Weltanschauung (relevant worldviews).
- Owners (who have veto power over the system).
- Environmental constraints that need to be considered.

We then use these elements to construct a root definition. This is often in the form of "a system that does: P (what) by Q (how) to contribute to achieving R (why)." Once this root
definition has been developed, we then take a "cultural analysis": We explore the roles, norms, values and politics relevant to the root definition.

Stage (4) Making and Testing Conceptual Models: This is a critical, challenging and rigorous step. The task now is to develop systems models using only the elements of the root definition and cultural analysis, in a way that flows logically from that root definition and cultural analysis. The focus is on simplicity—the possible models should have as few components as possible (Checkland recommends no more than seven) yet demonstrate all the properties that define a system.

Stages (5, 6 and 7) from Conceptual Models to Improvements: Checkland recommends constructing several relevant models using different root definitions by choosing different CATWOE, thus creating the multiple perspectives and multiple models. The final stages of the methodology discuss, compare and contrast these models with the problem situation. The insights these discussions bring are used to identify ways of improving the problem situation.

Braithwaite et al (2002, pp. 194-196) highlighted the soft system methodology (SSM) as a solution to health problems and has been quoted as saying that wherever one looks in the health system one finds complex, unresolved issues. Most are deep-seated, system problems. Soft systems methodology (SSM) is presented as a staged approach for health care by which sustainable solutions to difficult problems may be developed and enacted. Checkland et al (1972) (Checkland and Scholes 1990; Hindle, Checkland, Mumford and Worthington 1995) took many ideas from the systems theory and incorporated them into an approach now termed SSM. It takes account of much of what is important in the core characteristics and provides a way of thinking and acting that is generally considered to be sufficiently comprehensive and flexible to be relevant to many kinds of problem situations. In outline, there is an interactive process that incorporates four main stages, as follows:

1. Developing a 'rich' picture of the situation that is considered problematical (that is, ensuring many different perspectives are elicited).

2. Developing systems models (pictures or diagrams) of one or more aspects of the problem situation, as a basis for discussion and learning about 'the real world.'

3. Comparing people's systems models with other people's models as a means to understand the real world and to learn about the real world.
4. Identifying opportunities for improvement and making changes as a basis for further learning.

These ideas have emerged in several ways that have been dispersed over time and place. For example, continuous quality improvement accentuated continual learning and involvement of people performing the work. Social science research methods were developed with the specific intention of understanding the nature of individuals' perceptions of problems and their cultural determinants. Many SSM ideas are explicitly or intuitively incorporated into successful problem-solving exercises. The Journal Systems Research and Behavioural Science is devoted to reports about such exercises. The significant contribution of SSM is that it provides more structure, a richer, staged methodology than is otherwise likely to be present. For example, when discussing evaluation of a health care activity, it may happen by chance that there is a debate about players' differences in goals: that (say) clinicians view league tables showing relative performance among practitioners as no more than an attempt by non-clinicians to gain control and reduce medical autonomy, whereas other players believe league tables are an ethical way of informing consumers. SSM ensures that these kinds of differences in perceptions are identified, made explicit and discussed. Moreover, SSM provides processes (including the language) that help to ensure the discussions are efficient and result in a way forward and are based on deepening participants' understanding of the system of which they are a part. These feature more structure, taking account of players' differences, a common language and systems understanding which are missing from the commonly observed approaches centred on power, economic, scientific and managerialist thinking.

4.2.2.4 Soft Information System (SIS) and Health Informatics:

Atkinson et al, (2002, p. 142) defined the soft information systems and technologies methodology (SISTeM) as an approach capable of facilitating interventions as well as underpinning research within the field of health informatics. This approach has been developed through a series of participative multi-disciplinary projects within healthcare settings that have incorporated and integrated IS and organisational development. SISTeM is a second-generation soft methodology, driven by problem situations in which an explicit need has arisen to deal with issues and exploit opportunities in which technologies, especially information systems (IS), are of paramount importance. It is based upon the underpinning concept of the human/machine activity system. This enables technological activity to be represented within soft modelling tools and techniques on an equal basis to that of humans and also to integrate
them directly with traditional Information System Development (ISD) tools and techniques, as well as approaches to process reconfiguration and cultural development. This is the environment when exploring the nature and use of decision support tools within care. An emergency ward is an assembly of humans and things whose function is to primarily deliver care. The work of doctors and nurses articulates with the functioning of monitors, of order forms and laboratory routines to keep an intensive care patient stabilized, to treat the acute traffic accident victim, or to provide long term care to a chronic diabetic.

In an other study (Atkinson et al. 2001. p. 4) has illustrated the applications of SISTeM which he considers has been used to support the development of information systems and business processes associated with clinical care, in areas such as the surgical treatment of breast cancer, radiotherapy and cystic fibrosis, as well as care for stroke patients and children's services. It has also been used to design a clinical audit and governance processes at the level of services and hospitals. Within the managerial arena SISTeM has, in the past, been deployed to create development pathways for linking clinical activity monitoring, to contracting and resource management within a hospital. A further development area has been that of IS strategy at the regional and organisational levels. Application selection and evaluation within procurement has also been a major area in which the approach has been seen to add value. Working with the NHS to develop the Electronic Patient Record [EPR] has been an important area, not the least for the development of SISTeM itself; for it was from this that the concept of the human/machine activity system was derived. All the projects identified have been participative and multi-professional, including IS&T professionals. Their disparate views and interests of these stakeholders are accommodated and addressed in many ways throughout SISTeM’s cycles, stages, deriving and incorporating all aspects of various forms of modelling, agenda forming and decision making, whether strategic or operational. Finally, SISTeM facilitates the realization of the change itself, often within multi-organisational and multi-stakeholder contexts.

4.2.3 Methods of Data Collection:

4.2.3.1 Survey:

Groves et al., (2005, p. 2) defined a "survey" as a systematic method for gathering information from (a sample of) entities for the purposes of constructing quantitative descriptors of the attributes of the larger population of which the entities are members. The word "systematic" is deliberate and meaningfully distinguishes surveys from other ways of gathering information.
The phrase "a sample of" appears in the definition because sometimes surveys attempt to measure everyone in a population and sometimes just a sample.

In other definitions a survey may be occasioned simply by a need for administrative facts on some aspects of public life; or be designed to investigate a cause-effect relationship or to throw fresh light on some aspect of sociological theory. When it comes to subject matter, all one can say is that surveys are concerned with demographic characteristics, the social environment, the activities, or the opinions and attitudes of some groups of people. A survey will aim to obtain information from a representative selection of the population and from that sample will then be able to present the findings as being representative of the population as a whole. In surveys, all respondents will be asked the same questions in, as far as possible, the same circumstances. Question wording is not as easy as it seems and careful piloting is necessary to ensure that all questions mean the same to all respondents. Information can be gathered by means of self-completion questionnaires (as in the case of the census) or by an interviewer. Whichever method of information gathering is selected, the aim is to obtain answers to the same questions from a large number of individuals to enable the researcher not only to describe but also to compare, to relate one characteristic to another and to demonstrate that certain features exist in certain categories. Surveys can provide answers to the questions what? Where? When? and How? but it is not so easy to find out Why? Causal relationships can rarely, if ever, be proved by the survey method. The main emphasis is on fact-finding and if a survey is well structured and piloted, it can be a relatively cheap and quick way of obtaining information (Bell, 2005, pp. 13 - 14).

Surveys are the most popular method for collecting data for evaluations. Surveys involve asking questions of specific individuals and then obtaining their responses. The responses are usually tabulated or analyzed and presented as evaluation findings. Conducting a survey is a low-cost and relatively straightforward way to obtain data from many people in a short period of time. However, obtaining answers that accurately reflect the attitudes or behaviours of a study population is more difficult than it may seem on the surface. Fortunately, there has been a great deal of research on survey research methods in the past 20 years that can guide the collection of accurate data.

Surveys can be administered by mail, over the phone, in personal interviews, in group settings and, increasingly, directly on personal computers and through the Internet. The choice of a mode of administration will determine the type of instrument that is needed (mailed questionnaire versus phone interview), the amount of time it will take to collect the responses.
and the cost of the survey. Usually, these decisions are made by weighing respondent capacities, cost and data quality. Many evaluations employ more than one method of administration and in many cases, alternative methods will be necessary for populations with disabilities and for those who speak other languages. Methods of accommodation can include providing large-print questionnaires for visually impaired respondents or obtaining responses from surrogates, such as caregivers for medically frail individuals.

After the mode of administration is decided, items can be organized into an instrument. In general, the instrument should be organized to begin with questions that establish rapport and capture the interest of respondents and end with demographic items that some respondents may be reluctant to provide in the beginning. Questions should be ordered to minimize the cognitive effort of the respondents. Questions referring to similar things should be placed close together. Survey length is always an issue when organizing an instrument and often requires setting tough priorities so that the most important evaluation questions are adequately addressed.

Survey administration requires careful planning and painstaking follow-through if the survey is to yield accurate data. From monitoring and coaching interviewers to making sure that surveys are properly logged in and identification numbers checked off, survey administration requires adherence to the detailed procedures no matter which mode of administration is being used. Preparation of data for analysis and the analysis itself are intimately tied together. In surveys that rely on computer-assisted telephone interviews, the data are entered directly by the interviewers, allowing evaluators to avoid potential errors from hand entry. Scanning machines and software also eliminate having people enter data by hand.

Collecting survey data that meet current standards for accuracy requires a great deal of expertise. Numerous organizations have arisen that specialize in survey research, many of which are members of the American Association of Public Opinion Researchers. Many evaluators subcontract with these organizations for collecting survey data, depending on the scope and complexity of the survey. Whether working alone or collaborating with others, evaluators who choose to conduct surveys have a wealth of research and resources that can make their survey findings more accurate (Henry, 2007).

Johnson & Christensen, (2004, pp. 160-194) expand on the method of data collecting by stating that all empirical research relies on one or more method of data collection. There are six major methods of data collection:
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1. Tests (includes standardized tests that usually include information on reliability, validity and norms as well as tests constructed by researchers for specific purposes, skills tests, etc).
2. Questionnaires (self-report instruments).
3. Interviews (situations where the researcher interviews the participants).
4. Focus groups (a small group discussion with a group moderator present to keep the discussion focused).
5. Observation (looking at what people actually do).
6. Existing or Secondary data (using data that are originally collected and then archived or any other kind of “data” that was simply left behind at an earlier time for some other purpose).

This research focused on two methods of data collection, questionnaires and interviews.

4.2.3.1.1 Questionnaires:

A questionnaire is a self-report data collection instrument that is filled out by research participants. Questionnaires are usually paper-and-pencil instruments, but they can also be placed on the web for participants to go to and "fill out", a questionnaire is composed of questions and/or statements. There are some principles should be taken by the researcher into consideration during designing the questionnaire:

- The questionnaire items are matched to the research objectives.
- Understanding the research participants.
- Using natural and familiar language and writing items that are clear, precise and relatively short. Also does not use "leading" or "loaded" questions.
- Avoiding double-barrelled questions and negatives.
- Determining whether an open-ended or a closed ended question is needed and using mutually exclusive and exhaustive response categories for closed-ended questions.
- Considering the different types of response categories available for closed-ended questionnaire items.
- Use multiple items to measure abstract constructs. in addition consider using multiple methods when measuring abstract constructs.
- Using caution if reverse the wording in some of the items to prevent response sets. (A response set is the tendency of a participant to respond in a specific direction to items regardless of the item content).
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- Developing a questionnaire that is easy for the participant to use.
- Always pilot test the questionnaire.

A. Strengths of Questionnaires:
- Good for measuring attitudes and eliciting other content from research participants.
- Inexpensive (especially mail questionnaires and group administered questionnaires).
- Can provide information about participants' internal meanings and ways of thinking.
- Can administer to probability samples.
- Quick turnaround.
- Can be administered to groups.
- Perceived anonymity by respondent may be high.
- Moderately high measurement validity (i.e., high reliability and validity) for well constructed and validated questionnaires.
- Closed-ended items can provide exact information needed by researcher.
- Open-ended items can provide detailed information in respondents' own words.
- Ease of data analysis for closed-ended items.
- Useful for exploration as well as confirmation.

B. Weaknesses of Questionnaires:
- Must usually be kept short.
- Reactive effects may occur (e.g., interviewees may try to show only what is socially desirable).
- Non-response to selective items.
- People filling out questionnaires may not recall important information and may lack self-awareness.
- Response rate may be low for mail and email questionnaires.
- Open-ended items may reflect differences in verbal ability, obscuring the issues of interest.
- Data analysis can be time consuming for open-ended items.

4.2.3.1.1 Population and Sample Size:

The population is simply all the members of the group that are of interest. A sample is a sub-set of the population that is usually chosen because to gain access to all members of the population
is prohibitive in time, money and other resources. A key issue in choosing the sample relates to whether the members chosen are representative of the population. Often the sample is chosen randomly from a list that contains all the members of the population. Such a list is called a sampling frame. Some methods of selecting samples, e.g. quota sampling, do not require a sampling frame. To determine the sample size it is usual to work back from how many responses (completed questionnaires) are required for the analysis. One simple rule is to look for about 20-30 responses in each of the major sub-categories of the sample. For example, if a key aspect of the research is to compare males and females, there should be an equal number of females to males among the responses. This number then needs modifying by the anticipated response rate to determine the target sample size. It is quite common for survey response rates to be around 20%, which means sending out five times as many questionnaires. For the example above, this would mean 300 questionnaires to obtain 60 responses (Burgess, 2001, p.4).

Johnson & Christensen, (2004, pp. 199 - 225) illustrate some important terms used in sampling:

- A sample is a set of elements taken from a larger population.
- The sample is a subset of the population which is the full set of elements or people or whatever you are sampling.
- A statistic is a numerical characteristic of a sample, but a parameter is a numerical characteristic of population.
- Sampling error refers to the difference between the value of a sample statistic, such as the sample mean and the true value of the population parameter, such as the population mean. Note: some error is always present in sampling. With random sampling methods, the error is random rather than systematic.
- The response rate is the percentage of people in the sample selected for the study who actually participate in the study.
- A sampling frame is just a list of all the people that are in the population. Here is an example of a sampling frame (a list of all the names in my population and they are numbered). Note that the following sampling frame also has information on age and gender included in case you want to draw some samples and do some calculations.

Statistical studies (surveys, experiments, observational studies, etc.) are always better when they are carefully planned. The problem should be carefully defined and operationalized. Experimental or observational units must be selected from the appropriate population. The
study must be randomized correctly. The procedures must be followed carefully. Reliable instruments should be used to obtain measurements. Finally, the study must be of adequate size, relative to the goals of the study. It must be "large enough" that an effect of such magnitude as to be of scientific significance will also be statistically significant. It is just as important, however, that the study is not "too big," where an effect of little scientific importance is nevertheless statistically detectable. Sample size is important for economic reasons; an under-sized study can be a waste of resources for not having the capability to produce useful results, while an over-sized one uses more resources than are necessary. In an experiment involving human or animal subjects, sample size is a pivotal issue for ethical reasons. An under-sized experiment exposes the subjects to potentially harmful treatments without advancing knowledge. In an over-sized experiment, an unnecessary number of subjects are exposed to a potentially harmful treatment, or are denied a potentially beneficial one (Lenth, 2001, p. 187).

Among the questions that a researcher should ask when planning a study is "How large a sample do I need?" If the sample size is too small, even a well conducted study may fail to answer its research question, may fail to detect important effects or associations, or may estimate those effects or associations too imprecisely. Similarly, if the sample size is too large, the study will be more difficult and costly and may even lead to a loss in accuracy. Hence, optimum sample size is an essential component of any research. When the estimated sample size cannot be included in a study, post-hoc power analysis (the average power of tests used in a particular field) should be carried out. Approaches for estimating sample size and performing power analysis depend primarily on the study design and the main outcome measure of the study. There are distinct approaches for calculating sample size for different study designs and different outcome measures. Additionally, there are also different procedures for calculating sample size for two approaches of drawing statistical inference from the study results, i.e. confidence interval approach and test of significance approach (Zodpey, 2004, p. 123.)

4.2.3.1.1.2 Sampling in Quantitative and Qualitative Research:

A. Sampling in Quantitative Research:

1. Random Sampling:
   - Simple random
   - Systematic sampling:
     - Firstly, determine the sampling interval, which is symbolized by "k," (it is the population size divided by the desired sample size).
• Secondly, randomly select a number between 1 and k and include that person in your sample.
• Thirdly, also include each k\textsuperscript{th} element in your sample. For example if k is 10 and your randomly selected number between 1 and 10 was 5, then you will select persons 5, 15, 25, 35, 45, etc.

- Stratified random sampling:
  • Proportional stratified sampling.
  • Disproportional stratified sampling.
- Cluster Random Sampling:
  • One-stage cluster sampling.
  • Two-stage cluster sampling.

2. Non-random Sampling:

- Convenience sampling.
- Quota sampling.
- Purposive sampling.
- Snowball sampling.

B. Sampling in Qualitative Research:

- Maximum variation sampling (i.e., you select a wide range of cases).
- Homogeneous sample selection (i.e., you select a small and homogeneous case or set of cases for intensive study).
- Extreme case sampling (i.e., you select cases that represent the extremes on some dimension).
- Typical-case sampling (i.e., you select typical or average cases).
- Critical-case sampling (i.e., you select cases that are known to be very important).
- Negative-case sampling (i.e., you purposively select cases that disconfirm your generalizations, so that you can make sure that you are not just selectively finding cases to support your personal theory).
- Opportunistic sampling (i.e., you select useful cases as the opportunity arises).

Mixed purposeful sampling (i.e., you can mix the sampling strategies into more complex designs tailored to your specific needs) (Johnson & Christensen, 2004, pp. 199 - 225).
4.2.3.1.1.3 The Pilot Study and Validity and Reliability:

The pilot study is useful to check whether questions and instructions are clear; the layout works and to find out whether respondents are going to have any objections to particular questions. Piloting also provides an indication of how long it will take to complete the questionnaire, as well as indicate whether any important topics have not been included. In addition, there are six things to consider during questionnaire piloting:

1. Did any questions make respondents uncomfortable because they were too personal?
2. Did any questions have to be asked more than once because they were not easy to understand?
3. Were any of the questions misunderstood and misinterpreted?
4. Were any of the questions difficult to read and not liked by interviewer/respondent?
5. Did the questionnaire take long to administer/complete? Were there sections that dragged on?
6. Were there sections/questions where respondents would have liked more opportunity to provide longer answers?

Whatever procedure for collecting data is selected, it should always be examined critically to assess to what extent it is likely to be reliable and valid. Reliability is the extent to which a test or procedure produces similar results under constant conditions on all occasions. Validity is an altogether more complex concept. Usual definitions of validity are that it tells us whether an item or instrument measures or describes what it is supposed to measure or describe, but this is rather vague and leaves many questions unanswered. 'Validity' mean 'the design of research to provide credible conclusions; whether the evidence which the research offers can bear the weight of the interpretation that is put on it' (Bell, 2005, pp. 117 – 118).

Furthermore, the use of reliability and validity are common in quantitative research and is reconsidered in the qualitative research paradigm. Since reliability and validity are rooted in the positivist perspective they should be redefined for their use in a naturalistic approach. As reliability and validity used in quantitative research are providing a springboard to examining what these two terms mean in the qualitative research paradigm, triangulation is used in quantitative research to test the reliability and validity and can also illuminate ways to test or maximize the validity and reliability of a qualitative study. Therefore, reliability, validity and
triangulation, if they are relevant research concepts, particularly from a qualitative point of view, have to be redefined in order to reflect the multiple ways of establishing truth (Golafshani, 2003, p. 597).

4.2.3.1.2 Interviews:

Hancock, (2002, pp. 9 - 10) determined that interviews can be highly structured, semi-structured or unstructured. Structured interviews consist of the interviewer asking each respondent the same questions in the same way. A tightly structured schedule of questions is used, very much like a questionnaire. The questions may even be phrased in such a way that a limited range of responses can be elicited. For example: "Do you think that health services in this area are excellent, good, average or poor? Bearing in mind the cost of conducting a series of one to one interviews, the researcher planning to use structured interviews should carefully consider that the information could be more efficiently collected using questionnaires.

Semi-structured interviews (sometimes referred to as focused interviews) involve a series of open ended questions based on the topic areas the researcher wants to cover. The open ended nature of the question defines the topic under investigation but provides opportunities for both interviewer and interviewee to discuss some topics in more detail. If the interviewee has difficulty answering a question or provides only a brief response, the interviewer can use cues or prompts to encourage the interviewee to consider the question further. In a semi-structured interview, the interviewer also has the freedom to probe the interviewee to elaborate on the original response or to follow a line of inquiry introduced by the interviewee.

Unstructured interviews (sometimes referred to as "depth" or "in depth" interviews have very little structure at all. The interviewer goes into the interview with the aim of discussing a limited number of topics, sometimes as few as one or two and frames the questions on the basis of the interviewee's previous response. Although only one or two topics are discussed they are covered in great detail. Subsequent questions would depend on how the interviewee responded. Unstructured interviews are exactly what they sound like - interviews where the interviewer wants to find out about a specific topic but has no structure or preconceived plan or expectation as to how they will deal with the topic. The difference with semi-structured interviews is that in a semi-structured interview the interviewer has a set of broad questions to ask and may also have some prompts to help the interviewee, but the interviewer has the time and space to respond to the interviewee's responses.
Qualitative interviews are semi-structured or unstructured. If the interview schedule is too tightly structured this may not enable the phenomena under investigation to be explored in terms of either breadth or depth. Semi-structured interviews tend to work well when the interviewer has already identified a number of aspects that he wants to be sure of addressing. The interviewer can decide in advance what areas to cover but is open and receptive to unexpected information from the interviewee. This can be particularly important if a limited time is available for each interview and the interviewer wants to be sure that the "key issues" will be covered.

Qualitative interviews should be fairly informal. Interviewees should feel as though they are participating in a conversation or discussion rather than in a formal question and answer situation. However, achieving this informal style is dependent on careful planning and on skill in conducting the interview.

Semi-structured interviews should not be seen as a soft option requiring little forethought. Good quality qualitative interviews are the result of rigorous preparation. The development of the interview schedule, conducting the interview and analysing the interview data all require careful consideration and preparation. These matters are discussed in the Trent Focus Resource Pack: 'Using Interviews in a Research Project'.

In an interview, the interviewer asks the interviewee questions (in-person or over the telephone).

4.2.3.1.2.1 Strengths of Interviews:

• Good for measuring attitudes and most other content of interest.

• Allows probing and posing of follow-up questions by the interviewer.

• Can provide in-depth information.

• Can provide information about participants' internal meanings and ways of thinking.

• Closed-ended interviews provide exact information needed by researcher.

• Telephone and e-mail interviews provide very quick turnaround.

• Moderately high measurement validity (i.e., high reliability and validity) for well constructed and tested interview protocols.

• Can use with probability samples.
• Relatively high response rates are often attainable.

• Useful for exploration as well as confirmation.

4.2.3.1.2.2 Weaknesses of Interviews:

• In-person interviews are usually expensive and time consuming.

• Reactive effects (e.g., interviewees may try to show only what is socially desirable).

• Investigator effects may occur (e.g., untrained interviewers may distort data because of personal biases and poor interviewing skills).

• Interviewees may not recall important information and may lack self-awareness.

• Perceived anonymity by respondents may be low.

• Data analysis can be time consuming for open-ended items.

• Measures need validation (Johnson & Christensen, 2004, pp. 160 - 194).

4.3 Part Two:

4.3.1 Selection of Research Method:

After reviewing the various types of research strategy, techniques were used to acquire empirical data as discussed in the previous section. Predominantly based on a systems science approach to problem understanding, the researcher decided to select two methods to fulfil the aims and the objectives of this study. First, a Mixed Method approach in the form of Quantitative and Qualitative methods. In this method the survey instruments were used in the form of Questionnaires and Interview, whereas the second method used in this study was the Soft System Method (SSM).

This research selected a mixed method as reported in the information systems and health informatics literature. The researcher pointed in the introduction of this chapter, to several authors who had identified the reasons for mixing quantitative and qualitative data such as Kaplan & Duchon, (1988) as well as Ramon et al. (2006).

To locate these studies, the researcher conducted a survey on the internet to search the different databases of the years 1990 to 2006 using key word descriptors (research method and health information systems), (qualitative and quantitative methods and research methodology), (health information systems and medication), (research design and research methodology), (Saudi Arabia and Health Information System).
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The most appropriate research method to achieve the objectives of this research was coupling the quantitative (questionnaire) and qualitative (interviews) methods. This will provide a richer picture of the result. It is anticipated that the integration of the two methods (Mixed Method) (MM) and Soft System Methodology (SSM) will provide a very effective mechanism for combining the complementary advantages of both. For this this study implemented the following:

1. The types of data collected and analyzed.
2. The priority given to quantitative or qualitative research in a given study
3. The phase of research in which the integration or relationship between quantitative and qualitative data collection and analysis occurred.

The main purpose of combining Mixed Method and Soft System Methodology was to achieve one or more of the following:

1. Arrive at a better understanding of the topic being studied;
2. Learn from specialists about certain issues related to the subject matter;
3. Become acquainted with problem areas or constraints;
4. Assess the feasibility of the topic being researched.

4.3.2 The Instruments of Data Collecting:

Questionnaires and interviews can be used in various sciences, such as information science in health care research, in order to gather a variety of information, from identifying themes for further exploration to measuring a patient’s quality of life or confirming their diagnosis, to the size of the health services and technology used within the health sector. In addition, the interview is one of the most basic forms of data gathering and can be described as a two-person conversation, initiated by the interviewer for the specific purpose of obtaining research-relevant information and focused by him on content specified by research objectives of systematic description, prediction, or explanation. Interviews can be both structured and semi-structured in nature. Semi-structured interviews that are used in this research are a popular and effective method to assess views when the target sample is small. If this uses a non-standard set of questions, the interviewer will have a list of themes and questions which may vary from interview to interview; the order of questions might also vary. The interviewer may omit some questions and add others when required. The main aim of the interview is to gather evidence about the organisations concerned and to obtain opinions, feelings and exceptions relating to
co-operation activities. Therefore, this study has employed semi-structured interviews. (see Figure 4.2) clarifies the relationship between the questionnaires and the interviews.

To meet the objectives of the research, the researcher used two methods to collect primary data:

- The Survey in the form of Questionnaires.
- The Interview Technique in the form of Semi-structured interviews.

The use of surveys permits a researcher to study more variables at one time, whilst data can be collected about real world environments. The researcher chose the survey and interview methods for the following reasons:

- The survey was an appropriate research instrument to begin the investigation because it is able to reach a large number of geographically dispersed sectors and establishments.
- It is also the least time-consuming and the most effective data collection procedure.
- Interviews can help to gather valid and reliable data, which are relevant to the research question(s) and objectives.

Furthermore, collecting the data by using these two methods will help the researcher to achieve the future outcome of the research. the data:

- Evaluate the computer experience of physicians and pharmacists.
- Evaluate the background of physicians and pharmacists in basic computer programmes and the information resources concerning pharmaceuticals and medications.
- Investigate the importance of using computers in the health services, such as patient records, medication prescribed, as well as prescriptions sent to pharmacies.
- Understand the attitude of physicians, pharmacists, patients, the official authorisation department at the Ministry of Health, medication companies, medication suppliers, distributors and the Saudi Pharmaceutical Society on the following:
  A) The current situation for medication prescribing and the prescription.
  B) The difficulties and the problems with handwritten prescriptions.
  C) The role of pharmacies, suppliers, authorization departments and the Saudi pharmaceutical society in developing medication services, as well as the use of information technology.
4.3.3 Physicians, Pharmacists and the General Public Sample Size:

In this study, the population was defined as a Non-random Sample. A quota sample was chosen for the survey by dividing the population and the sector locations, according to the regions using the Jeddah map to classify the areas, also using the guide books of the Directorate of Health Affairs and Pharmaceutical companies. The samples were selected from different governmental and private health sectors, such as hospitals, dispensaries, community pharmacies and the general public. Twenty-three hospitals and dispensaries were visited and questionnaires distributed to physicians. Thirty-one of the participants were pharmacy sites, such as hospitals and dispensary pharmacies, six represented pharmaceutical companies, groups such as Al-Nahdi which was selected by the researcher, as well as a group of pharmacists as a quota sample to distribute the questionnaires to. In addition, twenty-eight site names were participants from society (see Tables 4.1 & 4.2).

The study selected this technique sample for many reasons:
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- It is the most basic type of the Non-random Sample.
- It helped the researcher to identify the major groups or subgroups,
- The researcher could determine the number of people to be included in each of these groups,
- Convenience samples of people selected for each group,
- As a result, the researcher attempted to obtain the right number of people in each group (Johnson & Christensen, 2004, p. 215).

Table 4.1 The Participants and Numbers of the Questionnaires Distributed and Returned

<table>
<thead>
<tr>
<th>The Participants</th>
<th>No Distributed</th>
<th>No Returned</th>
<th>% of Returns</th>
<th>Overall of Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physicians</td>
<td>340</td>
<td>219</td>
<td>64.5%</td>
<td>15.6%</td>
</tr>
<tr>
<td>Pharmacists</td>
<td>315</td>
<td>168</td>
<td>53.3%</td>
<td>12%</td>
</tr>
<tr>
<td>The General Public</td>
<td>740</td>
<td>618</td>
<td>83.5%</td>
<td>44.4%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1395</strong></td>
<td><strong>1005</strong></td>
<td><strong>72%</strong></td>
<td></td>
</tr>
</tbody>
</table>

Table 4.2 The Numbers of the Questionnaires Per Sample Group

<table>
<thead>
<tr>
<th>The Health Sectors</th>
<th>Printed</th>
<th>Distributed</th>
<th>Returned</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Physicians at Ministry of Health Hospitals</td>
<td>120</td>
<td>120</td>
<td>98</td>
</tr>
<tr>
<td>2 Physicians at Military and Other Government Hospitals</td>
<td>50</td>
<td>50</td>
<td>39</td>
</tr>
<tr>
<td>3 Physicians at Private Sector Hospitals</td>
<td>120</td>
<td>120</td>
<td>55</td>
</tr>
<tr>
<td>4 Physicians at Private Sector Dispensaries</td>
<td>50</td>
<td>50</td>
<td>27</td>
</tr>
<tr>
<td>5 Pharmacists at Ministry of Health Hospitals</td>
<td>34</td>
<td>34</td>
<td>21</td>
</tr>
<tr>
<td>6 Pharmacists at Military and Other Government Hospitals</td>
<td>21</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td>7 Pharmacists at Private Sector Hospitals Pharmacies</td>
<td>60</td>
<td>60</td>
<td>33</td>
</tr>
<tr>
<td>8 Pharmacists at community Private Pharmacies</td>
<td>200</td>
<td>200</td>
<td>93</td>
</tr>
<tr>
<td>9 The General Public</td>
<td>740</td>
<td>740</td>
<td>618</td>
</tr>
<tr>
<td>10 Total</td>
<td>1395</td>
<td>1395</td>
<td>1005</td>
</tr>
</tbody>
</table>

All Participants in All Sectors

<table>
<thead>
<tr>
<th>The Participants</th>
<th>Government and Military Sectors</th>
<th>Private Sectors</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Physicians</td>
<td>170</td>
<td>170</td>
<td>340</td>
</tr>
<tr>
<td>2 Pharmacists at Hospitals</td>
<td>55</td>
<td>60</td>
<td>115</td>
</tr>
<tr>
<td>3 Pharmacists at Community Pharmacies</td>
<td>=========</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>4 The General Public</td>
<td>740</td>
<td></td>
<td>740</td>
</tr>
<tr>
<td>5 Total</td>
<td>1395</td>
<td></td>
<td>1395</td>
</tr>
</tbody>
</table>
4.3.4 Questionnaire Design:

Anybody can write down a list of questions and photocopy it, but producing worthwhile and generalisable data from questionnaires needs careful planning and imaginative design. The great popularity with questionnaires is that they provide a "quick fix" for research methodology. Questionnaires offer an objective means of collecting information about people's knowledge, beliefs, attitudes and behaviour.

- Do our patients like our opening hours?
- What do teenagers think of local anti-drug campaigns and have they changed their attitudes?
- Why don't doctors use computers to their maximum potential?

Questionnaires can be used as the sole research instrument (such as in a cross sectional survey) or within clinical trials or epidemiological studies. Randomised trials are subject to strict reporting criteria, but there is no comparable framework for questionnaire research. Hence, despite a wealth of detailed guidance in the specialist literature, elementary methodological errors are common. Inappropriate instruments and lack of rigour inevitably lead to poor quality data, misleading conclusions and woolly recommendations (Boynton & Greenhalgh, 2004, p. 1312).

In this research the questionnaires were designed in two stages, including in-depth reviewing of the health informatics questionnaires. In addition, the researcher took into consideration that questions must reflect the aims and objectives of the study, must be easy to read, comprehensible and acceptable. This survey was designed for three groups of participants:

1- Physicians.
2- Pharmacists.
3- The General Public.

Most of the questions in this research instrument were closed and simply required the respondent to tick an appropriate box (✓). Additionally, the respondents were given the chance to add other information and add comments. This process enabled the respondents to indicate their answers to most questions. The questionnaire was Arabised. The purpose of the Arabic version of the questionnaire was to permit respondents with little or no knowledge of English to respond. Final version of the three groups questionnaires are listed in the Appendixes 2 & 3.
The questionnaires viewed by physicians included 39 questions, 38 for pharmacists and 26 questions for the general public. The three groups shared 26 standard questions, 12 extra questions were shared by physicians and pharmacists and moreover the physicians' questionnaire included one more question than the pharmacists' questionnaire.

Three forms of questionnaires were designed and distributed, each one comprising a group of questions such as:

4.3.4.1 Part One: Profile of Participants:

Part one consists of 5 questions (Q1-Q5) relative to physicians, 4 questions relative to pharmacists (Q1-Q4) and 2 questions relating to the general public, which focus on nationality of participants and years of practice at work, qualifications, experience of computer use and their departments at work.

4.3.4.2 Part Two: Experience in Computer Use:

Part two consists of 4 questions (Q6-Q9) for physicians, 4 questions relative to pharmacists (Q5-Q8) and 4 questions (Q3-Q6) relating to the general public, which focus on the current use of a computer at work or at home, computer background level, the hours a week to use a computer at work or at home. In addition the evaluation of the experience of computer programmes such as Word, PowerPoint, Excel, Access, Internet browsing skills, medicine and pharmaceutical database search, an electronic patient medical record system and an electronic prescription system.

4.3.4.3 Part Three: The opportunities and the necessity of the information technology, the difficulties and the problems with the handwritten prescription, information technology and medication services and the role of the pharmacies:

Part three consists of 20 questions (Q10-Q29) relative to physicians, 20 questions relative to pharmacists (Q9-Q28) and 16 questions (Q7-Q22) relating to the general public, which addresses physicians and pharmacists. The first four questions focus on the availability of an electronic information system at work locations to be linked to other health sectors, such as hospitals, dispensaries, clinics and medication suppliers, distributors, pharmacies as well as the Ministry of Health, the opportunity to use the computer in order to obtain patient and medication information, as well as the necessity to use a computer in order to obtain patient and medication information to complete the task.
The other questions were shared between all of the participants and focus on the necessity to use a computer in order to prescribe medication, as well as the necessity to use a computer in order to send the medication prescriptions to the pharmacies, how physicians are still using paper prescription systems to prescribe medication and how they still prescribe medication by hand. Moreover, how handwritten prescriptions are kept by the patient themselves after purchasing medication.

In addition, questions focus on the medication prescribed by physicians and why patients are not asked whether they prefer the cheaper or more expensive options. Furthermore, physicians do not write down alternative medication (brand names or generic names) while they prescribe medication. Other questions asked were about the difficulties and the problems with handwritten prescriptions, as well as how physicians asked patients to bring medication after purchase to the clinic to check prior to use. In addition, there are questions about the difficulties patients face reading some of the prescriptions since they are not written clearly as well as being unable to read the dosage as it is unclearly marked on the prescription or by the pharmacist. Finally, three questions were asked firstly, about how pharmacists need to ask patients about their health problems in order to be sure of the medication prescribed. Secondly, about patients who were compelled to return to the physician or call them to ask about the medication dosage since this was not clear and finally about the behaviour of pharmacists while medication is not available in the pharmacy.

4.3.4.4 Part Four: The Current Situation for Medication and Health Services in Jeddah:

Part three consists of 10 questions (Q30-Q39) relative to physicians, 10 questions relative to pharmacists (Q29-Q38) and 4 questions (Q23-Q26) relating to the general public. Four questions were shared by all participants, which focus on the ability for doctors to check drug interactions via electronic information resources while prescribing as this is important for medication and patient safety. Two questions were asked about whether pharmacies have an efficient and timely process in place to obtain critically needed medication when this is not immediately available in pharmacy stock to dispense prescriptions or if they are working without any technical programmes or machines and whether all drug stocktaking operations are carried out in a traditional way. The fourth question focused on whether useful written information on drugs is available in the pharmacy to patients in the community who do not speak Arabic or English.
Six further questions shared between physicians and pharmacies focus on whether the workplace is or is not an information system member that is connected to the Ministry of Health, medication companies, distributors and pharmacies as well as whether the medication supplied by companies and distributors, has been fully completed without any technical or computerized use. Two questions focus on whether the Ministry of Health and the Saudi Pharmaceutical Society regularly provide the workplace, such as hospitals or pharmacies, with technical supporting ideas and advice. The final questions concerned whether the Ministry of Health is able to predict the availability of medication in the local market, as well as providing accurate statistics on medication consumption along with the connection between the pharmacies, the Ministry of Health and the Saudi Pharmaceutical Society in developing medication services.

4.3.5 Pre-testing Questionnaire Pilot Study:

The two pilot studies of the research were carried out in March 2006, firstly, from 4th to 8th of March through thirty questionnaires which were distributed to physicians, pharmacists and the general public in Jeddah. The sample of physicians were selected from some governmental and private hospitals and the pharmacists from the governmental hospitals and community pharmacies, the general public were from King Abdul Aziz University employees and some private companies. After initial corrections the second pilot study was carried out from 14th to 18th of March through fifteen questionnaires distributed to some physicians and pharmacists and the general public. The overall response rate was 100% in both studies. The questionnaire for the pilot study was translated into Arabic. The researcher gave a brief introduction on the aims and objectives of the research. The outcome of the pilot phase enabled the researcher to make minor modifications in the cover letter which included the questionnaires. Furthermore, there were modifications in all parts of the questionnaires, which were extended to four parts. Essential modifications were made to part four that was understood as an aspiration question for the future, whereas it was intended to question to what extent did respondents agree about the context in the current situation.

4.3.6 Development of the Final Questionnaire and Distribution:

After testing the questionnaires through the pilot study, the development of the final questionnaires gave the researcher sufficient confidence that questions were appropriate to distribute. For this all questionnaires:
Chapter - 4

Research Methodology

1. Were sent out with an accompanying letter, including the identity of King Abdul Aziz University as well as the permission, which was obtained from them as an authority that was conducting the study.

2. Included acknowledgements of all the participants for their co-operation.

3. Described the importance of the participation for scientific research and for future planning and development of society.

4. Described for the participants the degree of confidentiality to expect and explained the importance of the study for society.

5. All modifications were carried out to make the questionnaire clearer.

6. The number of questions was limited to fit a five page layout for physicians and pharmacists and a three page layout for people in society.

7. The researcher included in the questionnaires his contact information, a phone number and E-mail address, for participants to know whom to contact should they have any enquiries.

The distribution for all groups started between 18th March and 14th June 2006. The development of the final questionnaires provided the researcher with confidence that the questions were appropriate to distribute. During the distribution, the researcher used a map of Jeddah to apply the daily work programme by defining the locations of the participants, as well as the numbers required.

As mentioned previously in sample size section, a quota sample helped the researcher to apply the technique of questionnaire distribution. During the pilot study the researcher observed three important observations:

➢ Participants such as physicians and pharmacists were busy in their work, thus it was difficult to wait until they had answered all the questions on time.

➢ Participants in their work gave precipitated answers since they were unable to find enough time to respond.

➢ The researcher was unable to stay in waiting areas to collect copies of the questionnaire from general public "patients" participants and thus requested they call the researcher for these to be collected. This contributed to invalidating the responses or non guarantee of their return.

For this, the researcher selected participants such as physicians and pharmacists from the governmental and private health sectors such as hospitals, dispensaries, clinics and pharmacies. Moreover participants from the general public were selected from most districts in Jeddah City
from limited, middle and high income areas. The technique of the selection and distribution was:

- Regarding participants such as physicians and pharmacists; after selecting the health sectors where the questionnaires were distributed, the researcher used a daily works plan. The plan was to distribute the questionnaires in the mornings between 07:30AM -01:30PM as well as in the afternoons between 04:30PM -10:30 and to collect the answered questionnaires. Weekends were spent inputting the results on separate sheets of the SPSS computer software. In case some participants delayed their answers, the researcher recollected them the next day or at a time that they defined.

- Regarding the general public participants, Saudi's citizens have diverse experiences of different governmental and private health sectors. As a result the researcher decided to select participants from various sectors such as education, official government offices, private and business establishments. The same technique used with the physicians and pharmacists was employed with the general public to distribute and collect the questionnaires.

4.3.7 Semi-Structured Interviews:

A semi-structured interview was designed for two groups of interviewees; the first was prepared for the directors of the departments at The Ministry of Health (MOH) in Riyadh City and the Directorate of Health Affairs (DHA) in Jeddah. The second was designed for the office managers at the medication companies and suppliers in branches of Riyadh and Jeddah cities (see Table 4.3). The interviews were carried out between 11th of June and until 11th of July 2006. The details about the procedures which followed to execute the interviews and the difficulties which faced the researcher will be detailed in Chapter 6. The list of the names of the companies and distributors of medications were provided to the researcher from the Department of Medicinal and Pharmaceutical Authorization at Directorate of Health Affairs, The Ministry of Health in Jeddah and the Guide of Product Information by Manufacturer, Agents and Distributers, which was provided from Al-Bassateen Medication Co. in Jeddah. Both of them helped the researcher to select the suppliers of the medications. The official interviewees were selected as a result to their relation of their job position in the medication services. In these interviews, the researcher focused the questions on the beneficiaries of the services and the means of telecommunications available, as well as questions on using the Internet and the web site of the departments. Other questions focused on the accessibility of
the possibilities and features, as well as an important question on information technology and computer programs used at work. The final questions focused on their opinions in the hypotheses of the research. For more details see Appendixes 4 & 5.

### Table 4.3 The Research Participants for the Semi-Structured Interviews

<table>
<thead>
<tr>
<th>Departments of the Interviewees</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Health Administration at The Ministry of Health, Riyadh</td>
<td>Chancellor</td>
</tr>
<tr>
<td>2 Project Section at the General Directorate Computer at</td>
<td>Project Manager</td>
</tr>
<tr>
<td>The Ministry of Health, Riyadh</td>
<td></td>
</tr>
<tr>
<td>3 Systems Department at the General Directorate Computer at The</td>
<td>Department Manager</td>
</tr>
<tr>
<td>Ministry of Health, Riyadh</td>
<td></td>
</tr>
<tr>
<td>4 Department of Computer at the Directorate of Health Affairs,</td>
<td>Department Director</td>
</tr>
<tr>
<td>The Ministry of Health, Jeddah</td>
<td></td>
</tr>
<tr>
<td>5 The IT Centre at the Maternity and Children’s Hospital, The</td>
<td>IT Manager</td>
</tr>
<tr>
<td>Ministry of Health, Jeddah</td>
<td></td>
</tr>
<tr>
<td>6 Department of Medicinal and Pharmaceutical Authorization at the</td>
<td>Department Director</td>
</tr>
<tr>
<td>Directorate of Health Affairs, The Ministry of Health, Jeddah</td>
<td></td>
</tr>
<tr>
<td>7 Department of Medicinal Supplying and Warehouses at the</td>
<td>Department Director</td>
</tr>
<tr>
<td>Directorate of Health Affairs, The Ministry of Health, Jeddah</td>
<td></td>
</tr>
<tr>
<td>8 Department of Statistic at the Directorate of Health Affairs,</td>
<td>Department Director</td>
</tr>
<tr>
<td>Jeddah</td>
<td></td>
</tr>
<tr>
<td>9 Balsam Healthcare Corp. Ltd. (BHC), Jeddah</td>
<td>project supervisor</td>
</tr>
<tr>
<td>10 Saudi Pharmaceutical Industries &amp; Medical Appliances Corporation (SPIMACO), Riyadh</td>
<td>Branch Marketing Director</td>
</tr>
<tr>
<td>11 Al-Gosaibi, Medications Department and Administration and</td>
<td>Manager Assistant</td>
</tr>
<tr>
<td>Governmental Affairs Riyadh</td>
<td></td>
</tr>
<tr>
<td>12 Tabuk Pharmaceutical Mfg.Co., Jeddah</td>
<td>Western Region Sales Manager</td>
</tr>
<tr>
<td>13 Salehiya Trading Establishment, Jeddah</td>
<td>Branch Marketing Director</td>
</tr>
<tr>
<td>14 Cigalah Trading Est., Jeddah</td>
<td>Branch Marketing Director</td>
</tr>
<tr>
<td>15 Al-Bassateen Medication Co., Jeddah</td>
<td>Branch Marketing Director</td>
</tr>
</tbody>
</table>

#### 4.3.8 Data Preparation and Analysis:

After conducting qualitative and quantitative research, all questionnaires were coded and input to computers as groups. Each group had a separate sheet on the computer software which used the Statistical Package for Social Science (SPSS), the popular statistical software often used in social studies. Each stage of the research was analysed separately and then comparisons were made on one sheet. This programme is used to derive statistical analyses, such as the frequencies, cross-tabulations, and statistical measure the Kruskal-Wallis H test, Mann-Whitney U test and the Chi-Square Test. In regards to the interviews these were analysed by
the researcher by comparing the answers of the Interviewees. More details on the data analysis of this study and the different techniques and tests carried out are found in Chapters 5 and 6.

4.4 Summary:

This chapter has focused on the use of multiple methods (typically quantitative and qualitative), as well as discussed the mixed research method approach as reported in information systems and health informatics literature. In addition, the chapter has illustrated the methods of data collection in empirical research, as well as the strengths and weaknesses of the selection method. The researcher has assessed the methods selected in this research and the tools employed to analyze the results of the data collected. In the following chapters, Chapter 5 will analyze the data collected from the questionnaires, whereas Chapter 6 will analyze the interviews.
Chapter - 5  
Data Collection and Questionnaire Analysis

5. Data Collection and Questionnaire Analysis

5.1 Introduction:

The purpose of this chapter is to present the findings and the analysis of the data collected from the questionnaire surveys conducted in Jeddah, Saudi Arabia that were undertaken during the period March 2006 to June 2006. This chapter has been divided into six sections:

1. The first section discusses questionnaire distribution, the profile of the participants, Information Technology (IT) use and practices.

2. The second section discusses the first hypothesis which addresses the lack of up to date information technology and knowledge of communication systems and the availability of medication in the health sectors in Jeddah. Moreover, it will evaluate the respondents with regard to the availability of electronic information resources for doctors using a computer in order to obtain information on patients and medication. It also requests information from physicians and pharmacists on electronic systems which connect their work places and other health services.

3. The third section discusses the second hypothesis which addresses the regular use of traditional methods of prescribing medication leading to defective medication services in Jeddah. In this section there are responses to questions on handwritten paper prescription systems and the difficulties which patients face in using this method.

4. The fourth section discusses the third hypothesis which addresses health professionals and patients in Jeddah and refers to the problems and disadvantages of current methods of medication prescribing and prescriptions.

5. The fifth section discusses two different sections of questions on the fourth hypothesis. This asked all groups about The Ministry of Health, pharmaceutical companies and suppliers who have been unable to develop medication services and as a result require an information system to provide real statistics on the size of medication prescribing and consumption.

6. The sixth section discusses the opinions of all participants of all groups collected from the last section of the questionnaires.
5.2 Data Analysis:

The data collected were transferred to a pre-prepared data sheet for coding and analyzed using the Statistical Package for Social Sciences Studies (SPSS, V13.0). This software was used to derive a statistical measure for data responses by calculating frequencies and visualizing the results by producing frequency charts and tables of cross-tabulated data. Three tests were used in this analysis, the Kruskal-Wallis H test, Mann-Whitney U test and the Chi-Square Test. The purpose of using descriptive analysis is to present the data in an understandable and less complex form.

5.3 Test Scales of the Variables:

The tests used in this analysis were employed to test the means values by comparing them with certain variables values. A Likert five-point scale was used in this analysis.

“A commonly used 5-point Likert scale format to measure with a 5-point scale. The 3 rating is right in the middle and it indicates neutrality or mixed satisfaction. When calculating the mean weighted average you have a standard point of comparison” (Gwinner, 2006, p. 1).

“2-point and 4-point scales force you to take a positive or negative states (e.g. agree or disagree). 3- or 5-point scales allow you to stay neutral (e.g. neither agree nor disagree). These 5 response categories (strongly disagree to strongly agree) are among the most commonly used and are practical” (Paity et al, 2003, p. 6).

5.4 Hypothesis Testing:

A null hypothesis ($H_0$) defined by Cohen and Holliday (1998, p. 115) as:

“is a hypothesis of no difference, the reason why we have to state our hypothesis in the null form is that inferential statistical techniques are designed to allow us to estimate how far above or below zero a difference or relationship can be expected to lie due to random sampling error. The further a difference or relationship is above or below zero, the less chance it has of occurring as a result of random sampling error and the greater chance it has of being statistically significant.”

In another definition Johnson and Christensen (2004, pp. 472 - 497) defined the null ($H_0$) and alternative ($H_1$) hypothesis as:
"The null hypothesis, represented by the symbol $H_0$ is a statement about a population parameter and states that some condition concerning the population parameter is true. In most educational research studies, the null hypothesis ($H_0$) predicts no difference or no relationship in the population. It is the null hypothesis that is the hypothesis directly tested using probability theory. In particular, hypothesis testing operates under the assumption that the null hypothesis is true. Then, if the results obtained from the research study are very different from that expected under the assumption that null hypothesis is true, the researcher rejects the null hypothesis and then tentatively accepts the alternative hypothesis. The null hypothesis is the focal point in hypothesis testing because it is the hypothesis that is directly tested.

The alternative hypothesis represented by the symbol $H_1$, states that the population parameter is some value other than the value stated by $H_0$. The alternative hypothesis typically asserts the opposite of the $H_0$ and usually represents a statement of a different or a relationship that is consistent with what the researcher actually believes is true. The null and alternative hypotheses are logically contradictory because they cannot both be true at the same time. Remember that the alternative hypothesis is consistent with the researcher's research hypothesis, which means that the researcher is interested in supporting the alternative hypothesis, not the null hypothesis."

5.5 Section One:

5.5.1 Questionnaire Distribution Numbers:

The total number of questionnaires distributed were 1395 (100%) and the total number of respondents shown in Table 5.1 represented 1005 (72%) from all groups, the percentage of respondents for each Physician represented 219 (21.8%), Pharmacists 168 (16.7%) and the General Public 618 (61.5%) as shown in Figure 5.1.

<table>
<thead>
<tr>
<th>The Respondents</th>
<th>Quantity of Respondents</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physicians</td>
<td>219</td>
<td>21.8%</td>
</tr>
<tr>
<td>Pharmacists</td>
<td>168</td>
<td>16.7%</td>
</tr>
<tr>
<td>The General Public</td>
<td>618</td>
<td>61.5%</td>
</tr>
<tr>
<td>Total</td>
<td>1005</td>
<td>100.0%</td>
</tr>
</tbody>
</table>
5.5.2 Participant Types:

Participants, according to group type or location are shown in (Table 5.2 and Figure 5.2). The analysis of the returned questionnaires shows that the majority of respondents represented Physicians at Ministry of Health Hospitals as 98 (9.8%), whereas 39 (3.9%) represented Military Physicians and Other Government Hospitals. 55 (5.5%) represented Private Sector Hospitals while the lowest number of 27 (2.7%) came from Private Sector Dispensaries. Pharmacists 21 (2.1%) came from the Pharmacies of the Ministry of Health Hospitals as well as an equal number from Military and Other Government Hospitals. Pharmacists in Private Sector Hospitals represented respondents with 33 (3.3%) of the questionnaires whereas the highest number came from community pharmacies in the Private Sector representing 93 (9.3%). Finally the total number of participants from the general public was represented as 618 (61.5%).

Figure 5.1 Respondents of the Questionnaires
Table 5.2 Participants According to Group Type or Work Location

<table>
<thead>
<tr>
<th>The Participants</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physicians at Ministry of Health Hospitals</td>
<td>98</td>
<td>9.8%</td>
</tr>
<tr>
<td>Physicians at Military and Other Government Hospitals</td>
<td>39</td>
<td>3.9%</td>
</tr>
<tr>
<td>Physicians in Private Sector Hospitals</td>
<td>55</td>
<td>5.5%</td>
</tr>
<tr>
<td>Physicians at Private Sector Dispensaries</td>
<td>27</td>
<td>2.7%</td>
</tr>
<tr>
<td>Pharmacists at Ministry of Health Hospitals</td>
<td>21</td>
<td>2.1%</td>
</tr>
<tr>
<td>Pharmacists at Military and Other Government Hospitals</td>
<td>21</td>
<td>2.1%</td>
</tr>
<tr>
<td>Pharmacists in Private Sector Hospitals</td>
<td>33</td>
<td>3.3%</td>
</tr>
<tr>
<td>Pharmacists in the Private Sector</td>
<td>93</td>
<td>9.3%</td>
</tr>
<tr>
<td>The General Public at Home and Work</td>
<td>618</td>
<td>61.5%</td>
</tr>
<tr>
<td>Total</td>
<td>1005</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Figure 5.2 Participants According to Group Type or Work Location
5.5.3 Profile of Participants:

5.5.3.1 Participant Nationality:
With regard to question 1 part one, relative to nationality, the total number of respondents shown in Table 5.3 represented 940 (93.5%), the majority of them being Saudis 577 (57.4%) whereas 363 (36.1%) were non-Saudis. 65 (6.5%) of them did not provide a response; as a result the SPSS system defined them as missing numbers.

<table>
<thead>
<tr>
<th>The Nationality</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saudi</td>
<td>577</td>
<td>57.4%</td>
</tr>
<tr>
<td>Non Saudi</td>
<td>363</td>
<td>36.1%</td>
</tr>
<tr>
<td>Total</td>
<td>940</td>
<td>93.5%</td>
</tr>
</tbody>
</table>

5.5.3.2 Years of Professional Practice:
The findings show that the years of practice answered by both Physicians and Pharmacists represented N= 382 (98.7%); the majority or respondents had between 0 -5 years 204 (52.7%) as indicated in Table 5.4.

<table>
<thead>
<tr>
<th>Years of Work Practice</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 5 Years</td>
<td>204</td>
<td>52.7%</td>
</tr>
<tr>
<td>6 - 10 Years</td>
<td>76</td>
<td>19.6%</td>
</tr>
<tr>
<td>11 - 15 Years</td>
<td>45</td>
<td>11.6%</td>
</tr>
<tr>
<td>16 - 20 Years</td>
<td>27</td>
<td>7.0%</td>
</tr>
<tr>
<td>&gt; 20 Years</td>
<td>30</td>
<td>7.8%</td>
</tr>
<tr>
<td>Total</td>
<td>382</td>
<td>98.7%</td>
</tr>
</tbody>
</table>

5.5.3.3 I.T Experience:
In response to question 5 part one, the I.T. experience of all groups, the total number of respondents represented N= 1004 (99.9%) missing number 1 (0.1%). 896 (89.2%) of respondents answered (Yes) in comparison with 108 (10.0%) of respondents who answered (No).
5.5.3.4 Computer Use:

In response to question 6 in part two, relative to the use of computers at work or home the findings are shown in Table 5.5. The total number of Physicians and Pharmacists 348 (89.9%) responded that they used the computer at work, missing numbers were 39 (10%), the measure of the answers were in compliance with the five point Likert scales (Never == > Always). The Likert scale of the findings was 3.21 which moved from occasionally to often. The highest number of respondents 98 (25.3%) responded always. The general public responded that they used the computer at work or at home in 567 (91.7%) questionnaires, missing numbers were 51 (8.3%). The Likert scale of the findings was that 3.90 responded often. The highest number of respondents 218 (35.3%) responded always.

<table>
<thead>
<tr>
<th>Computer Use</th>
<th>Physicians and Pharmacists</th>
<th>General Public</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>Percent</td>
</tr>
<tr>
<td>Never</td>
<td>65</td>
<td>16.8%</td>
</tr>
<tr>
<td>Rarely</td>
<td>46</td>
<td>11.9%</td>
</tr>
<tr>
<td>Occasionally</td>
<td>87</td>
<td>22.5%</td>
</tr>
<tr>
<td>Often</td>
<td>52</td>
<td>13.4%</td>
</tr>
<tr>
<td>Always</td>
<td>98</td>
<td>25.3%</td>
</tr>
<tr>
<td>Total</td>
<td>348</td>
<td>89.9%</td>
</tr>
</tbody>
</table>

5.5.3.5 Computer Background Levels:

In response to question 7 part two, relative to the computer background level of participants, respondents were asked to list their experience (see Table 5.6) which indicated five choices starting gradually from no experience, little experience, intermediate and advanced split into four levels and expert level of experience. The total number of respondents from all groups represented 916 (91.1%), missing numbers were 89 (8.9%) and the Likert scale of the findings was 4.69 which inclined from towards Intermediate 2 to Intermediate 3. (see Table 5.6) determines the frequencies and percentage of respondents to this question. The highest number that answered that their computer background level was Intermediate 4 represented 167(16.6%) as shown in Figure 5.3. In other words the highest level was intermediates whereas the lowest number was represented by 7(.7%) which indicates that they had no experience.
Table 5.6 Computer Background Levels of All Groups

<table>
<thead>
<tr>
<th>Background Levels</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Experience</td>
<td>7</td>
<td>0.7%</td>
</tr>
<tr>
<td>Little Experience</td>
<td>147</td>
<td>14.6%</td>
</tr>
<tr>
<td>Intermediate1</td>
<td>82</td>
<td>8.2%</td>
</tr>
<tr>
<td>Intermediate2</td>
<td>75</td>
<td>7.5%</td>
</tr>
<tr>
<td>Intermediate3</td>
<td>119</td>
<td>11.8%</td>
</tr>
<tr>
<td>Intermediate4</td>
<td>167</td>
<td>16.6%</td>
</tr>
<tr>
<td>Advanced1</td>
<td>93</td>
<td>9.3%</td>
</tr>
<tr>
<td>Advanced2</td>
<td>63</td>
<td>6.3%</td>
</tr>
<tr>
<td>Advanced3</td>
<td>63</td>
<td>6.3%</td>
</tr>
<tr>
<td>Advanced4</td>
<td>55</td>
<td>5.5%</td>
</tr>
<tr>
<td>High Experience</td>
<td>45</td>
<td>4.5%</td>
</tr>
<tr>
<td>Total</td>
<td>916</td>
<td>91.1%</td>
</tr>
</tbody>
</table>

Figure 5.3 Computer Background Levels of All Groups

5.5.3.6 Hours of Computer Use:
Participants were asked about the time they used the computer each week. The total number of respondents represented 885 (88.1%) and the numbers of missing answers stood at 120 (11.9%). The majority of respondents 246 (24.5%) selected (1 to 4 hours) indicating that they
used the computer weekly. The Likert scale of use for hours was 2.89 which indicates that they used the computer from 4 to 7 hours a week. It is clear from (Table 5.7 and Figure 5.4) that 137 (13.6%) participants used the computer weekly for (7 to 10 hours) and 171 (17.0%) of the participants used it for (10 to 12 hours), which reflects that the number of participants increased while the hours of use increased. In other words the number of participants should logically decrease while the hours of computer use increased.

<table>
<thead>
<tr>
<th>Hours per Week</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Hour</td>
<td>167</td>
<td>16.6%</td>
</tr>
<tr>
<td>1 to 4 Hours</td>
<td>246</td>
<td>24.5%</td>
</tr>
<tr>
<td>4 to 7 Hours</td>
<td>164</td>
<td>16.3%</td>
</tr>
<tr>
<td>7 to 10 Hours</td>
<td>137</td>
<td>13.6%</td>
</tr>
<tr>
<td>10 to 12 Hours</td>
<td>171</td>
<td>17.0%</td>
</tr>
<tr>
<td>Total</td>
<td>885</td>
<td>88.1%</td>
</tr>
</tbody>
</table>

Figure 5.4 Hours of Weekly Computer Use at Work or at Home by All Groups
5.5.3.7 Evaluation of Participant I.T Experience:

Participating Physicians and Pharmacists were asked four questions to evaluate their experience in computer use such as programmes, browsing skills on the internet, the searching of medical and pharmaceutical databases as well as their experience with electronic prescription systems. The scale of responses was divided into five points from (No Experience => Expert). In response to question 1 relative to computer programmes, the total number of participants represented 347 (89.7%) and the missing number was 40 (10.3%). The Likert scale of the findings was 2.79 which inclined towards the intermediate level. The same level was selected for the highest number of participants which represented 146 (37.7%), in comparison to 6 (1.6%) respondents who considered they were experts. In response to question 2, relative to participant experience in internet browsing skills, the total number of participants represented 348 (89.9%) and the missing number was 39 (10.1%). The Likert scale of the findings was 3.20 which indicated the choices moved from intermediate and inclined towards advanced. Here again the highest number of respondents who represented 154 (39.8%) selected intermediate, whereas the lowest number answered that they had no experience representing 20 (5.2%) of the participants. For more details on the first and second question analysis (see Table 5.8).

Table 5.8 Evaluation of Experience in Computer Programmes & Internet Browsing Skills for Both Physicians & Pharmacists

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Computer Programmes</th>
<th>Internet Browsing Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>Percent</td>
</tr>
<tr>
<td>No Experience</td>
<td>34</td>
<td>8.8%</td>
</tr>
<tr>
<td>Beginner</td>
<td>89</td>
<td>23.0%</td>
</tr>
<tr>
<td>Intermediate</td>
<td>146</td>
<td>37.7%</td>
</tr>
<tr>
<td>Advanced Level</td>
<td>72</td>
<td>18.6%</td>
</tr>
<tr>
<td>An Expert</td>
<td>6</td>
<td>1.6%</td>
</tr>
<tr>
<td>Total</td>
<td>347</td>
<td>89.7%</td>
</tr>
</tbody>
</table>

In response to question 3 and 4, relative to the evaluation of Physician and Pharmacist experience of medical and pharmaceutical database search and electronic prescription system use, Table 5.9 shows the total number of respondents who answered question 3 represented 343 (88.6%) with 44 (11.4%) missing, whereas the Likert scale of the findings were 2.61 which indicates that most participants considered themselves as intermediate. Furthermore the median scale was 3 identical to question 1 and 2. On the other hand the highest number of
respondents 108 (27.9%) selected intermediate in comparison to the lowest number 13 (3.4%) who considered that they were expert in searching on medical and pharmaceutical databases. Finally, in response to question 4 the total number of participants represented 341 (88.1%) missing number was 46 (11.9%), while the Likert scale of the findings was 1.71 which indicates that respondents inclined towards beginner. Furthermore, the median was 1 with the highest number of respondents with no experience represented 222 (57.4%), while the lowest number 6 (1.6%) considered themselves to be expert in electronic prescription systems.

Table 5.9 Evaluation of Experience of Medical and Pharmaceutical Database Search & Electronic Prescription Systems by Both Physicians & Pharmacists

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Medical and pharmaceutical database search</th>
<th>Electronic prescription systems</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>Percent</td>
</tr>
<tr>
<td>No Experience</td>
<td>84</td>
<td>21.7%</td>
</tr>
<tr>
<td>Beginner</td>
<td>65</td>
<td>16.8%</td>
</tr>
<tr>
<td>Intermediate</td>
<td>108</td>
<td>27.9%</td>
</tr>
<tr>
<td>Advanced Level</td>
<td>73</td>
<td>18.9%</td>
</tr>
<tr>
<td>An Expert</td>
<td>13</td>
<td>3.4%</td>
</tr>
<tr>
<td>Total</td>
<td>343</td>
<td>88.6%</td>
</tr>
</tbody>
</table>

Respondents from the general public were questioned on the evaluation of their experience in Internet browsing skills. The total number of participants represented 572 (92.6%) and the missing number was 46 (7.4%), while the Likert scale of the findings was 3.06 which moved from intermediate to the beginning of advanced the median was 3. The highest number of respondents 237 (38.3%) as shown in Table 5.10 considered themselves to be intermediate in comparison to the lowest number 33 (5.3%) who considered themselves to be expert.

Table 5.10 Evaluation of Internet Browsing Skills by the General Public

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Experience</td>
<td>57</td>
<td>9.2%</td>
</tr>
<tr>
<td>Beginner</td>
<td>82</td>
<td>13.3%</td>
</tr>
<tr>
<td>Intermediate</td>
<td>237</td>
<td>38.3%</td>
</tr>
<tr>
<td>Advanced Level</td>
<td>163</td>
<td>26.4%</td>
</tr>
<tr>
<td>An Expert</td>
<td>33</td>
<td>5.3%</td>
</tr>
<tr>
<td>Total</td>
<td>572</td>
<td>92.6%</td>
</tr>
</tbody>
</table>
5.6 Section Two:

5.6.1 The First Hypothesis:

The health sectors in Jeddah city lack information technology and communication systems to update knowledge and availability of medication.

In this section the researcher accumulated responses that contributed to the first hypothesis testing. Participants were asked four questions as shown in Table 5.11, the first question was asked to all groups whereas other questions were limited to Physicians and Pharmacists. The questions focused on the lack of information technology and communication systems within the health sector which aimed at updating the knowledge of both Physicians and Pharmacists with regard to the availability of medication. The other questions focused on electronic information resources and the opportunity of using the computer as well as electronic systems linked between health sectors.

Table 5.11 Questions Supporting the First Hypothesis

<table>
<thead>
<tr>
<th></th>
<th>Question</th>
<th>Response</th>
<th>Likert Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Do you agree with the researcher about the availability of electronic information resources for Physicians to currently check drug interactions while prescribing medication and patient safety?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Do you have any opportunity of using the computer in order to obtain patient information?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Do you have any opportunity of using the computer in order to obtain information on medication?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Do you have in your work location any electronic system connected to other health sectors such as: A- Hospitals, dispensers, clinics B- Suppliers or distributors or medication dealers C- Pharmacies D- The Ministry of Health</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5.6.1.1 Availability of Electronic Resources for Physicians:

Regarding the availability of electronic resources for Physicians, 841 (83.7%) of participants answered the question. The missing number was 164 (16.3%). Table 5.12 shows the Likert scale of responses in five points from $(Disagree Strongly \Rightarrow Agree Strongly)$. The highest number of respondents 352 (35.0%) disagreed while the lowest number of respondents 5 (.5%) agreed strongly. The Likert scale of the findings was 1.80 which inclined towards disagree.
Table 5.12 Availability of Electronic Resources for Physicians to Check Drug Interactions while Prescribing as well as Importance of Medication and Patient Safety, Distributed to All Groups

<table>
<thead>
<tr>
<th>Answers</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disagree Strongly</td>
<td>337</td>
<td>33.5%</td>
</tr>
<tr>
<td>Disagree</td>
<td>352</td>
<td>35.0%</td>
</tr>
<tr>
<td>Neutral</td>
<td>136</td>
<td>13.5%</td>
</tr>
<tr>
<td>Agree</td>
<td>11</td>
<td>1.1%</td>
</tr>
<tr>
<td>Agree Strongly</td>
<td>5</td>
<td>.5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>841</strong></td>
<td><strong>83.7%</strong></td>
</tr>
</tbody>
</table>

A Kruskal-Wallis Test was conducted to compare two or more groups of cases on the variable of the availability of electronic resources for Physicians to check drug interactions while prescribing which is important for medication and patient safety. Where null hypothesis $H_0$ stated that there was no difference in responses of the respondents to the question, do you agree about the availability of electronic information resources for Physicians to currently check drug interactions while prescribing medication and patient safety. An alternative hypothesis $H_1$ stated that there was a difference in responses. The test value was 4.8 and the df value was 2. The significance value was $p>0.05$ which indicates that there is significance to support $H_0$.

5.6.1.2 Using Computers in Order to Obtain Patient and Medication Information:

The number of Physicians and Pharmacists who use the computer in order to obtain patient information from patient records via electronic systems represented 383 (99.0%) and missing number 4 (1.0%) participants and those who obtained medication information via the same resource represented 379 (97.9%) and the missing number was 8 (2.1%) participants. The Likert scale of the findings when referring to patient information inclined towards occasionally with 2.37, whereas when referring to medication information prescribed to patients this equally inclined towards occasionally with 2.26. Table 5.13 shows the highest number of respondents when asked about patient information, represented by 192 (49.6%) which indicates never while the lowest number of respondents of 33 (8.5%) indicates rarely. In response to medication information, the highest number of respondents represented 187 (48.3%) which equally indicates never while the lowest number of respondents represented 28 (7.2%) which indicates often.
### Table 5.13 Physicians, Pharmacists and Computer Use to Obtain Patient & Medication Information

<table>
<thead>
<tr>
<th>The answers</th>
<th>Patient Information</th>
<th>Medication Information</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>Percent</td>
</tr>
<tr>
<td>Never</td>
<td>192</td>
<td>49.6%</td>
</tr>
<tr>
<td>Rarely</td>
<td>33</td>
<td>8.5%</td>
</tr>
<tr>
<td>Occasionally</td>
<td>49</td>
<td>12.7%</td>
</tr>
<tr>
<td>Often</td>
<td>41</td>
<td>10.6%</td>
</tr>
<tr>
<td>Always</td>
<td>68</td>
<td>17.6%</td>
</tr>
<tr>
<td>Total</td>
<td>383</td>
<td>99.0%</td>
</tr>
</tbody>
</table>

The Mann-Whitney U test was used to test Two-Independent-Samples Test coming from the same population. It is to analyze computer use to obtain patient and medication information from both Physicians and Pharmacists. Where null hypothesis $H_0$ stated that there was no difference in responses of the respondents to the two questions, do you have any opportunity of using the computer in order to obtain patient information. Secondly do you have any opportunity of using the computer in order to obtain information on medication. An alternative hypothesis $H_1$ stated that there was a difference in responses of the respondents to the same two questions. The test value 152 and the significance value represented $P=.005$ for computer use to obtain patient information which indicates that there is significance to support $H_0$. The test value 142 and the significance value represented $P<0.001$ for use to obtain medication information which indicates that there is no significance in regards to use to obtain medication information supporting the hypothesis ($H_1$).

#### 5.6.1.3 Electronic Links with other Health Sectors:

Physicians and Pharmacists answered question 4 which focused on the electronic links to other health sectors from their work locations, the other health sectors such as hospitals, dispensers, clinics, suppliers or distributors or medication dealers, pharmacies and The Ministry of Health. The main question as shown previously in Table 5.11 asked whether respondents have in their work locations any electronic system connected to other health sectors. Under this question there are four section names of locations of health sectors or services. The total number of respondents of the first section which referred to hospitals, dispensaries and clinics as shown in Table 5.14 were 336 (86.8%) with missing numbers 51 (13.2%). 282 (72.9%) of them answered (No) while 54 (14.0%) answered (Yes); whereas shown in Table 5.14 the total of the second section which referred to medication suppliers were 317 (81.9%) respondents and the missing
numbers were 70 (18.1%), 282 (72.9%) answered (No) and 35 (9.0%) of them answered (Yes).

In the third section which referred to links to pharmacies, the total of respondents as shown in Table 5.15 were 321 (82.9%) and the number of respondents missing were 66 (17.1%), the majority of them were 270 (69.8%) who answered with (No) and 51 (13.2%) answered (Yes).

The final section referred to Physicians and Pharmacists about the links to The Ministry of Health, the total of the respondents as shown in Table 5.15 was 317 (81.9%) and missing was 70 (18.1%), the maximum number who answered (No) was 281 (72.6%) and 36 (9.3%) who answered (Yes).

Table 5.14 Physicians & Pharmacists Answered About the Electronic Links between their Work Locations and other Health Sectors

<table>
<thead>
<tr>
<th>Hospitals, Dispensaries and Clinics</th>
<th>Medication Suppliers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>Percent</td>
</tr>
<tr>
<td>No</td>
<td>282</td>
</tr>
<tr>
<td>Yes</td>
<td>54</td>
</tr>
<tr>
<td>Total</td>
<td>336</td>
</tr>
</tbody>
</table>

Table 5.15 Physicians & Pharmacists Answered About the Electronic Links between their Work Locations and other Health Sectors

<table>
<thead>
<tr>
<th>Pharmacies</th>
<th>The Ministry of Health</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>Percent</td>
</tr>
<tr>
<td>No</td>
<td>270</td>
</tr>
<tr>
<td>Yes</td>
<td>51</td>
</tr>
<tr>
<td>Total</td>
<td>321</td>
</tr>
</tbody>
</table>

5.7 Section Three:

5.7.1 The Second Hypothesis:

In Jeddah city regular use of traditional methods of prescribing medication lead to defective medication services.

In this section, the hypothesis test was supported by analyzing the responses. The hypothesis focused on the regular use of traditional methods of prescribing medication via handwritten paper prescription systems. Table 5.16 shows six questions were asked to all groups, the first two questions focused on the methods used by Physicians while writing prescriptions, whereas the second two questions referred to the difficulties patients face with handwritten prescriptions. The last two questions referred to the difficulties patients face while reading dose descriptions.
Table 5.16 Questions of the Second Hypothesis Distributed to All Groups

<table>
<thead>
<tr>
<th></th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Did Physicians use the paper prescription system to prescribe medication?</td>
</tr>
<tr>
<td>2</td>
<td>Did all health providers (Physicians) prescribe medication by handwritten prescriptions?</td>
</tr>
<tr>
<td>3</td>
<td>Did patients face any difficulties or were there any problems with the handwritten prescription?</td>
</tr>
<tr>
<td>4</td>
<td>Is it difficult for patients to read some of the prescriptions?</td>
</tr>
<tr>
<td>5</td>
<td>Is it difficult for patients to read the dose description because it is not clear from the prescription?</td>
</tr>
<tr>
<td>6</td>
<td>Is it difficult for patients to read the dose description because Pharmacists were not clear?</td>
</tr>
</tbody>
</table>

5.7.1.1 Paper Prescription Use and Handwritten Prescribed Medication:
The total number of respondents who were asked about whether Physicians still use paper prescription systems to prescribe medication represented 1000 (99.5%) and missing numbers were 5 (5%) participants with the Likert scale of findings at 4.55 which inclined towards always. The highest number of respondents 718 (71.4%) as shown in Table 5.17 answered (always) while the lowest number of 16 (1.6%) participants answered (never). The total number of respondents who were asked about whether Physicians prescribed medication by handwritten prescriptions represented 986 (98.1%) and missing numbers was 19 (1.9%) with the Likert scale of findings at 4.5 which inclined towards always. The highest number of respondents represented 613 (61.0%) which means (always) while the lowest number represented 10 (1.0%) which means (never).

Table 5.17 All Groups Responded to:

<table>
<thead>
<tr>
<th></th>
<th>Physicians still using paper prescription systems to prescribe medication</th>
<th>Physicians prescribing medication by handwritten prescriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>Percent</td>
</tr>
<tr>
<td>Never</td>
<td>16</td>
<td>1.6%</td>
</tr>
<tr>
<td>Rarely</td>
<td>31</td>
<td>3.1%</td>
</tr>
<tr>
<td>Occasionally</td>
<td>54</td>
<td>5.4%</td>
</tr>
<tr>
<td>Often</td>
<td>181</td>
<td>18.0%</td>
</tr>
<tr>
<td>Always</td>
<td>718</td>
<td>71.4%</td>
</tr>
<tr>
<td>Total</td>
<td>1000</td>
<td>99.5%</td>
</tr>
</tbody>
</table>
5.7.1.2 Difficulties with Handwritten Prescriptions:
Participants responded to two questions on the difficulties patients face and the problems with handwritten prescriptions, as well as the difficulties for some patients to read prescriptions. In response to question 1 the total number of respondents represented 994 (98.9%) and the missing number was 11 (1.1%) with the Likert scale of findings at 3.6 which inclined towards (often) at the beginning. In response to question 2 the total number of respondents represented 997 (99.2%) and missing number was 8 (.8%) with the Likert scale of findings at 3.92 which inclined towards (often) at the end.

The highest number of respondents 458 (45.6%) who referred to the difficulties patients face and the problems with handwritten prescriptions, as shown in Table 5.18 responded (occasionally) while the lowest of 46 (4.6%) responded (never). The highest number of respondents 423 (42.1%) who referred to the difficulties for patients to read prescriptions responded (often) while the lowest number of 23 (2.3%) responded (never).

Table 5.18 All Groups Responded to:

<table>
<thead>
<tr>
<th>Patients facing difficulties and problems with handwritten prescriptions</th>
<th>Difficulties for patients to read prescriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>Percent</td>
</tr>
<tr>
<td>Never</td>
<td>46</td>
</tr>
<tr>
<td>Rarely</td>
<td>210</td>
</tr>
<tr>
<td>Occasionally</td>
<td>458</td>
</tr>
<tr>
<td>Often</td>
<td>202</td>
</tr>
<tr>
<td>Always</td>
<td>78</td>
</tr>
<tr>
<td>Total</td>
<td>994</td>
</tr>
</tbody>
</table>

5.7.1.3 Unclear Dose Description from Prescriptions and Pharmacists:
The last two questions in this section referred to patients being unable to read dose descriptions because these were not clear from prescriptions and Pharmacists. In response to question 1, the total number of respondents represented 996 (99.1%) and the missing number was 9 (9%) with the Likert scale of findings at 3.29 which inclines towards (often) while in response to question 2, the total number of respondents represented 998 (99.3%) and the missing number was 7 (.7%) with the Likert scale of findings at 2.65 which inclined towards (occasionally).
The highest number of respondents referred to question 1, as shown in Table 5.19 represented 365 (36.3\%) which means *(often)* while the lowest number represented 55 (5.5\%) which means *(never)*. In response to question 2 the highest number of respondents 360 (35.8\%) responded *(occasionally)* while the lowest number of 31 (3.1\%) responded *(always)*.

**Table 5.19 All Groups Responded to:**

<table>
<thead>
<tr>
<th></th>
<th>Patients are unable to read dose descriptions because they are not clear from the prescription</th>
<th>Patients are unable to read dose descriptions because they are not clear from the pharmacist</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>Percent</td>
</tr>
<tr>
<td>Never</td>
<td>55</td>
<td>5.5%</td>
</tr>
<tr>
<td>Rarely</td>
<td>152</td>
<td>15.1%</td>
</tr>
<tr>
<td>Occasionally</td>
<td>330</td>
<td>32.8%</td>
</tr>
<tr>
<td>Often</td>
<td>365</td>
<td>36.3%</td>
</tr>
<tr>
<td>Always</td>
<td>94</td>
<td>9.4%</td>
</tr>
<tr>
<td>Total</td>
<td>996</td>
<td>99.1%</td>
</tr>
</tbody>
</table>

A Kruskal-Wallis Test was conducted to compare two or more groups of cases on the variable of six questions under the second hypothesis, to evaluate whether in Jeddah regular use of traditional methods of prescribing medication leads to defective medication services. The results show that the total number of respondents \((N=1003)\) and the Likert scale of the findings of the six questions was 3.66 which means *(often)*. Where null hypothesis \(H_0\) stated that there was no difference in responses of the respondents to each question in Table 5.16. An alternative hypothesis \(H_1\) stated that there was a difference in responses of the respondents to each question in Table 5.16. The test value was 22 and the significance value being \(P<0.001\) which supported \((H_1)\).

5.8 Section Four:

5.8.1 The Third Hypothesis:

Health professionals and patients in Jeddah city emphasise the problems and disadvantages of the current method of medication prescribing and prescriptions.

This section focuses on the third hypothesis which concentrated on the responses of health professionals and patients concerning the problems and disadvantages of current methods of medication prescribing and prescriptions in Jeddah. As shown in Table 5.20 all groups were asked six questions. The first two questions focused on the opportunities which Physicians give patients while prescribing cheaper or more expensive medication or writing alternative medication names. Question three, four and five referred to the difficulties patients face when
Chapter 5 Data Collection and Questionnaire Analysis

Bringing medication after purchase to the clinic to check before use; around the misgivings of Pharmacists who need to ask patients about their health problems in order to be sure of the medication prescribed as well as about patients who are compelled to return to the Physician or call them to ask about the medication dose because this appears unclear. The last question contains a further four elements on the behaviour of Pharmacists while medication is not immediately available in the pharmacy.

Table 5.20 Questions from the Third Hypothesis Answered by All Groups

<table>
<thead>
<tr>
<th></th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Does the Physician ask the patient while prescribing medication whether they prefer the cheaper or more expensive option?</td>
</tr>
<tr>
<td>2</td>
<td>Did Physicians write alternative medication (brand names or generic names) while they were prescribing medication?</td>
</tr>
<tr>
<td>3</td>
<td>Did Pharmacists need to ask patients about health problems in order to be sure of the medication prescribed?</td>
</tr>
<tr>
<td>4</td>
<td>Were some patients compelled to return to the Physician or call them to ask about the medication dose because this was unclear?</td>
</tr>
<tr>
<td>5</td>
<td>What is the behaviour of Pharmacists when medication is not immediately available in the pharmacy?</td>
</tr>
<tr>
<td>6</td>
<td>a) Did the Pharmacist advise the patient to buy another brand of medication or similar brand?</td>
</tr>
<tr>
<td></td>
<td>b) Did the Pharmacist advise the patient to call the Physician or go back to him to prescribe an alternative?</td>
</tr>
<tr>
<td></td>
<td>c) Did the Pharmacist call the Physician to prescribe an alternative?</td>
</tr>
<tr>
<td></td>
<td>d) Did the Pharmacist advise the patient to visit another pharmacy?</td>
</tr>
</tbody>
</table>

5.8.1.1 Patient Opportunities When Prescribing Medication:

Participants were asked two questions concerning the opportunities Physicians give to patients when prescribing cheaper or more expensive medication or alternative medication (brand names or generic names). In response to question 1, the total number of respondents who referred to cheaper or more expensive medication represented 991 (98.6%) and the missing number was 14 (1.4%) with the Likert scale of the findings at 2.15 which inclined towards (occasionally) at the beginning. In response to question 2, the total number of respondents who referred to alternative medication represented 968 (96.3%) and the missing number was 37 (3.7%) with the Likert scale of the findings at 1.99 which inclined towards (rarely) at the end.

As indicated in Table 5.21 the highest number of respondents who referred to question 1, represented 344 (34.2%) which indicated (rarely), while the lowest number represented 13 (1.3%) which indicated (always). In response to question 2, the highest number of respondents...
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Data Collection and Questionnaire Analysis

represented 443 (44.1%) which indicated (rarely) while the lowest number represented 2 (.2%) which indicated (often).

Table 5.21 All Groups Referred to Providing Patients with the Opportunities While Prescribing

<table>
<thead>
<tr>
<th>Did the physician ask patients while prescribing medication whether they prefer the cheaper or more expensive option?</th>
<th>Did the physician write an alternative medication (brand names or generic names) while they were prescribing medication?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>Percent</td>
</tr>
<tr>
<td>Never</td>
<td>300</td>
</tr>
<tr>
<td>Rarely</td>
<td>344</td>
</tr>
<tr>
<td>Occasionally</td>
<td>259</td>
</tr>
<tr>
<td>Often</td>
<td>75</td>
</tr>
<tr>
<td>Always</td>
<td>13</td>
</tr>
<tr>
<td>Total</td>
<td>991</td>
</tr>
</tbody>
</table>

5.8.1.2 Patients and Difficulties:
The previous section referred to the difficulties and problems patients face with handwritten prescriptions. For example, when patients are unable to read prescriptions, or the dose description, because these are not sufficiently clear from the prescription or from the Pharmacist. The recent section focused on other difficulties such as Physicians asking patients to bring medication after purchase to the clinic to check before use and Pharmacists who need to ask patients about health problems in order to be sure of the medication prescribed. In addition, some patients felt compelled to return to the Physician or to call them to ask about medication doses because these were not sufficiently clear. In response to question 1 the total number of respondents represented 997 (99.2%) and the missing number of the respondents was 8 (.8%) with the Likert scale of the findings at 2.13 which inclined towards (occasionally). The highest number of respondents as shown in Table 5.22 represented 438 (43.6%) which means (rarely) while the lowest number represented 10 (1.0%) which means (always) as indicated in the five point Likert scales (Never ===> Always).

In response to question 2 the total number of respondents represented 987 (98.2%) and the missing number was 18 (1.8%) with the Likert scale of the findings at 2.74 which inclined towards the end of the third quarter of (occasionally). The highest number of respondents as shown in Table 5.22 represented 322 (32.0%) which indicated (occasionally), whereas the lowest number represented 86 (8.6%) which indicated (always).
Table 5.22 All Groups Responded to Further Difficulties

<table>
<thead>
<tr>
<th></th>
<th>Did physicians ask patients to bring medication after purchase to the clinic to check before use?</th>
<th>Did pharmacists need to ask patients about health problems in order to be sure of the medication prescribed?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>Percent</td>
</tr>
<tr>
<td>Never</td>
<td>262</td>
<td>26.1%</td>
</tr>
<tr>
<td>Rarely</td>
<td>438</td>
<td>43.6%</td>
</tr>
<tr>
<td>Occasionally</td>
<td>212</td>
<td>21.1%</td>
</tr>
<tr>
<td>Often</td>
<td>75</td>
<td>7.5%</td>
</tr>
<tr>
<td>Always</td>
<td>10</td>
<td>1.0%</td>
</tr>
<tr>
<td>Total</td>
<td>997</td>
<td>99.2%</td>
</tr>
</tbody>
</table>

In response to question 3 the total number of respondents represented 991 (98.6%) and the missing number was 14 (1.4%) with the Likert scale of the findings at 2.71 which inclines towards the end of the third quarter of (occasionally). The highest number of respondents as shown in Table 5.23 represented 488 (48.6%) which indicated (occasionally) while the lowest number represented was 18 (1.8%) which indicated (always).

Table 5.23 All Groups Responded to Further Difficulties

<table>
<thead>
<tr>
<th>Patients were compelled to return to the physician or call them to ask about unclear medication doses; answered by all groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
</tr>
<tr>
<td>Never</td>
</tr>
<tr>
<td>Rarely</td>
</tr>
<tr>
<td>Occasionally</td>
</tr>
<tr>
<td>Often</td>
</tr>
<tr>
<td>Always</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

5.8.1.3 Pharmacist Behaviour when Medication is Unavailable:

Question six was asked to all groups, concerning the behaviour of Pharmacists when medication is not immediately available in the pharmacy. As shown previously in Table 5.20 under question six there are four questions which requested participants to rank in order from (a – d) in the boxes beside each behaviour, according to the participant’s personal experience.
The total number of respondents represented 949 (94.4%) and the missing number was 56 (5.6%). The Likert scale of the findings is 2.45 which inclined towards Pharmacists requesting Physicians to prescribe an alternative, whereas the majority of respondents was 283 (28.2%), as shown in Table 5.24 responded that Pharmacists advise patients to buy another brand of medication or similar, whereas the lowest 188 (18.7%) responded that Pharmacists requested patients to call Physicians or return to prescribe an alternative.

Table 5.24 All Groups were Asked About the Behaviour of Pharmacists When Medication is not Immediately Available in the Pharmacy

<table>
<thead>
<tr>
<th>The Behaviour of Pharmacists</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advise Patient to Buy Another Brand of Medication or Similar</td>
<td>283</td>
<td>28.2%</td>
</tr>
<tr>
<td>Request Patient to Call Physician or Return to Write Alternative</td>
<td>188</td>
<td>18.7%</td>
</tr>
<tr>
<td>Call Physician to Prescribe Alternative</td>
<td>249</td>
<td>24.8%</td>
</tr>
<tr>
<td>Advise Patient to Visit Another Pharmacy</td>
<td>229</td>
<td>22.8%</td>
</tr>
<tr>
<td>Total</td>
<td>949</td>
<td>94.4%</td>
</tr>
</tbody>
</table>

A Kruskal-Wallis Test was conducted to compare two or more groups of cases for the third hypothesis, which addressed health professionals and patients in Jeddah emphasising the problems and disadvantages of the current method of medication prescribing and prescriptions. This was used to ascertain whether the mean of the answers of five questions under the third hypothesis (from Q1 to Q5 as shown previously in Table 5.20. Where null hypothesis $H_0$ stated that there was no difference in responses of the respondents to the questions (1 to 5). An alternative hypothesis $H_1$ stated that there was a difference in responses of the respondents to the questions (1 to 5). The test value was 94.5 and the significance value stood at $P<0.001$ which supported ($H_1$).

5.9 Section Five:

5.9.1 The Fourth Hypothesis:

The Ministry of Health, pharmaceutical companies and suppliers have been unable to develop medication services; as a result they require an information system to provide real statistics on the size of medication prescribing and consumption.

Under this hypothesis as shown in Table 5.25 nine questions were asked to Physicians and Pharmacists. On the other hand, as shown in Table 5.26 three questions from the same nine questions were asked to the general public.
Table 5.25 Questions Related to the Fourth Hypothesis
Aimed at Physicians and Pharmacists

<table>
<thead>
<tr>
<th></th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Most pharmacies do not have an efficient electronic process in place to obtain critically needed medication when this is not immediately available in the pharmacy.</td>
</tr>
<tr>
<td>2</td>
<td>Most pharmacies are working without any technical programmes or machines and all drug stocktaking operations are carried out in the traditional way.</td>
</tr>
<tr>
<td>3</td>
<td>Useful written information on drugs is unavailable in the pharmacy to patients in the community who do not speak Arabic or English.</td>
</tr>
<tr>
<td>4</td>
<td>The location that I am working in is not an information system member that is linked to the Ministry of Health and medication companies, distributors and health service sectors such as hospitals, dispensaries, clinics and etc.</td>
</tr>
<tr>
<td>5</td>
<td>Medication which is supplied by companies and distributors is fully complete without any technical or computerized use.</td>
</tr>
<tr>
<td>6</td>
<td>The Ministry of Health does not provide us with technical support and advice.</td>
</tr>
<tr>
<td>7</td>
<td>The Saudi Pharmaceutical Society does not provide us with technical support and advice.</td>
</tr>
<tr>
<td>8</td>
<td>The Ministry of Health is unable to predict the availability of medication on the local market, as well as provide accurate statistics on medication consumption.</td>
</tr>
<tr>
<td>9</td>
<td>There is no connection between the Ministry of Health, the Saudi Pharmaceutical Society and health sectors such as hospitals, pharmacies etc... to develop medication services.</td>
</tr>
</tbody>
</table>

Table 5.26 Questions Related to the Fourth Hypothesis Aimed at the General Public

<table>
<thead>
<tr>
<th></th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Most pharmacies do not have an efficient electronic process when this is not immediately available in pharmacy.</td>
</tr>
<tr>
<td>2</td>
<td>Most pharmacies are working without any technical programmes or machines and all drug stocktaking operations are carried out in the traditional way.</td>
</tr>
<tr>
<td>3</td>
<td>Useful written information on drugs is unavailable in the pharmacy to patients within the community who do not speak Arabic or English.</td>
</tr>
</tbody>
</table>

5.9.1.1 The Implementation of an Efficient Process When Medication is Unavailable:

The first question in this section asked Physicians and Pharmacists about whether pharmacies have an efficient process in place to obtain required medication when this is not available. The total number of respondents represented 335 (86.6%) and the missing number was 52 (13.4%). The five point Likert scales (Disagree Strongly ==> Agree Strongly) was 3.49 which inclined towards (agree). The highest number of respondents 119 (30.7%) as shown in Table 5.27 selected (agree), while the lowest number represented 39 (10.1%) which indicated (disagree strongly).
Table 5.27 Statistics Aimed at Physicians and Pharmacists:

<table>
<thead>
<tr>
<th></th>
<th>most pharmacies do not have an efficient electronic process in place to obtain critically needed medication when this is not immediately available in the pharmacy</th>
<th>most pharmacies are working without any technical programmes or machines and all drug stocktaking operations are carried out in the traditional way</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disagree Strongly</td>
<td>39</td>
<td>10.1%</td>
</tr>
<tr>
<td>Disagree</td>
<td>45</td>
<td>11.6%</td>
</tr>
<tr>
<td>Neutral</td>
<td>48</td>
<td>12.4%</td>
</tr>
<tr>
<td>Agree</td>
<td>119</td>
<td>30.7%</td>
</tr>
<tr>
<td>Agree Strongly</td>
<td>84</td>
<td>21.7%</td>
</tr>
<tr>
<td>Total</td>
<td>335</td>
<td>86.6%</td>
</tr>
</tbody>
</table>

5.9.1.2 Pharmacies Lacking Technical Programmes or Machines:

The second question in this section asked Physicians and Pharmacists about whether the pharmacies where they work lack technical programmes or machines and whether all drug stocktaking operations are carried out in the traditional way. The total number of respondents represented 345 (89.1%) and the missing number was 42 (10.9%). The Likert scale of the findings was 3.35 which inclined towards (agree). The majority of respondents as shown above in Table 5.27, 106 (27.4%) selected (agree) while the lowest number selected (disagree strongly) within range 27 (7.0).

5.9.1.3 Useful Written Information on Drug Availability in the Pharmacy:

The third question in this section asked Physicians and Pharmacists about whether useful written information on drugs is available in pharmacies for patients within the community who do not speak Arabic or English. The total number of respondents represented 313 (80.9%) and the missing number was 74 (19.1%). The Likert scale of the findings was 3.48 which inclined towards (agree). The highest number of respondents as shown in Table 5.28 represented 105 (27.1%) which indicated (agree) while the lowest number was 18 (4.7%) indicated (disagree strongly).
Table 5.28 The Responses of Physicians and Pharmacists:

<table>
<thead>
<tr>
<th></th>
<th>useful written information on drugs is unavailable in the pharmacy to patients within the community who do not speak Arabic or English</th>
<th>their work location is not an information system member that is connected to the ministry of health, medication suppliers and other medical sectors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>Percent</td>
</tr>
<tr>
<td>Disagree Strongly</td>
<td>18</td>
<td>4.7%</td>
</tr>
<tr>
<td>Disagree</td>
<td>57</td>
<td>14.7%</td>
</tr>
<tr>
<td>Neutral</td>
<td>64</td>
<td>16.5%</td>
</tr>
<tr>
<td>Agree</td>
<td>105</td>
<td>27.1%</td>
</tr>
<tr>
<td>Agree Strongly</td>
<td>69</td>
<td>17.8%</td>
</tr>
<tr>
<td>Total</td>
<td>313</td>
<td>80.9%</td>
</tr>
</tbody>
</table>

5.9.1.4 Their Work Locations and the Health Information System Membership:

The fourth question in this section asked Physicians and Pharmacists about whether their work location is an information system member that is linked to The Ministry of Health, medication suppliers and other medical sectors. The total number of respondents represented 313 (80.9%) which is equivalent to the total number of respondents from the previous question and the missing number was 74 (19.1%). The Likert scale of the findings was 3.50 which inclined towards (agree). The majority of respondents as shown above in Table 5.28 represented 93 (24.0%) which indicated (agree strongly) while the lowest number represented 32 (8.3%) which indicated (disagree strongly).

5.9.1.5 Medication is Supplied without any Technical or Computerized Use:

The fifth question in this section asked Physicians and Pharmacists about whether medication is supplied by the companies and distributors and whether it is fully completed without any technical or computerized use. The total number of respondents represented 291 (75.2%) and the missing number was 96 (24.8%). The Likert scale of the findings was 2.99 which inclined towards the beginning of (neutral). The highest number of respondents as shown in Table 5.29 was 98 (25.3%) selected (agree) and the lowest number selected (agree strongly) within range 21 (5.4%).

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Table 5.29 The Responses of Physicians and Pharmacists:

<table>
<thead>
<tr>
<th></th>
<th>Medication which is supplied by the companies and distributors is fully completed without any technical or computerized use</th>
<th>The Ministry of Health does not provide their work location with technical supporting ideas and advice</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>Percent</td>
</tr>
<tr>
<td>Disagree Strongly</td>
<td>38</td>
<td>9.8%</td>
</tr>
<tr>
<td>Disagree</td>
<td>66</td>
<td>17.1%</td>
</tr>
<tr>
<td>Neutral</td>
<td>68</td>
<td>17.6%</td>
</tr>
<tr>
<td>Agree</td>
<td>98</td>
<td>25.3%</td>
</tr>
<tr>
<td>Agree Strongly</td>
<td>21</td>
<td>5.4%</td>
</tr>
<tr>
<td>Total</td>
<td>291</td>
<td>75.2%</td>
</tr>
</tbody>
</table>

5.9.1.6 The Ministry of Health and Supporting Ideas and Advice:

Question six in this section asked Physicians and Pharmacists about whether the Ministry of Health provide their work location with technical supporting ideas and advice. The total number of respondents represented 309 (79.8%), the missing number was 78 (20.2%). The Likert scale of the findings was 3.20 which inclined towards (agree). The highest number of respondents as shown above in Table 5.29, 92 (23.8%) selected (agree) while the lowest number selected (disagree strongly) within range 39 (10.1%).

5.9.1.7 The Saudi Pharmaceutical Society and Supporting Ideas and Advice:

Question seven in this section asked Physicians and Pharmacists about whether the Saudi Pharmaceutical Society is able to provide the work location with technical supporting ideas and advice. The total number of respondents represented 236 (61.0%) and missing number was 151 (39.0%). The Likert scale of the findings was 3.17 which inclined towards (agree). The highest number of respondents as shown in Table 5.30, 59 (15.2%) selected (agree) while the lowest number selected (disagree strongly) within range 28 (7.2%).
Table 5.30 The Responses of Physicians and Pharmacists:

<table>
<thead>
<tr>
<th>The Saudi Pharmaceutical Society does not provide their work location with technical supporting ideas and advice</th>
<th>The Ministry of Health is unable to predict the availability of medication on the local market as well as provide accurate statistics on medication consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frequency</strong></td>
<td><strong>Percent</strong></td>
</tr>
<tr>
<td>Disagree Strongly</td>
<td>28</td>
</tr>
<tr>
<td>Disagree</td>
<td>49</td>
</tr>
<tr>
<td>Neutral</td>
<td>57</td>
</tr>
<tr>
<td>Agree</td>
<td>59</td>
</tr>
<tr>
<td>Agree Strongly</td>
<td>43</td>
</tr>
<tr>
<td>Total</td>
<td>236</td>
</tr>
</tbody>
</table>

5.9.1.8 The Ministry of Health and the Availability of Medication:

Question eight in this section asked physicians and pharmacists about whether the Ministry of Health are able to predict the availability of medication within the local market, as well as to provide accurate statistics on medication consumption. The total number of respondents represented 231 (59.7%) and the missing number was 156 (40.3%). The Likert scale of the findings was 3.17 which inclined towards (agree). The highest number of respondents as shown above in Table 5.30, 79 (20.4%) selected (neutral) and the lowest number selected (disagree strongly) within range 16 (4.1%).

5.9.1.9 Link between Pharmacies and the MOH and the SPS:

Question nine in this section questioned physicians and pharmacists on the link between pharmacies and The Ministry of Health and the Saudi Pharmaceutical Society for developing medication services. The total number of respondents represented 196 (50.6%) and the missing number was 191 (49.4%). The Likert scale of the findings was 2.96 which inclined towards the end of (neutral). The highest number of respondents as shown in Table 5.31, 76 (19.6%) selected (neutral) while the lowest number selected (agree strongly) within range 21 (5.4%).
Table 5.31 The Responses of Physicians and Pharmacists About Links between Pharmacies, MOH & SPS to Develop Medication Services

<table>
<thead>
<tr>
<th>Scales</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disagree Strongly</td>
<td>30</td>
<td>7.8%</td>
</tr>
<tr>
<td>Disagree</td>
<td>29</td>
<td>7.5%</td>
</tr>
<tr>
<td>Neutral</td>
<td>76</td>
<td>19.6%</td>
</tr>
<tr>
<td>Agree</td>
<td>40</td>
<td>10.3%</td>
</tr>
<tr>
<td>Agree Strongly</td>
<td>21</td>
<td>5.4%</td>
</tr>
<tr>
<td>Total</td>
<td>196</td>
<td>50.6%</td>
</tr>
</tbody>
</table>

5.9.2 The Mann-Whitney U test for Nine Questions and the Fourth Hypothesis:
The researcher computed nine questions under one mean and all of them were tested by the Mann-Whitney U test which was used to test Two-Independent-Samples come from the same population for the fourth hypothesis. This addressed the Ministry of Health, pharmaceutical companies and suppliers who have been unable to develop medication services; as a result they require an information system to provide real statistics on the size of medication prescribing and consumption. Where null hypothesis $H_0$ stated that there was no difference in responses of the respondents to the questions (1 to 9), as shown above in Table 5.25. An alternative hypothesis $H_1$ stated that there was a difference in responses of the respondents to the questions (1 to 9). The test value was 165 and the significance value stood at $p > 0.05$ which supported ($H_0$).

As the researcher indicated in the introduction to section 5, three questions out of nine were asked to the general public as shown above in Table 5.26. In response to question 1 the total number of respondents who responded to whether most pharmacies have an efficient electronic process in place to obtain critically needed medication when this is not immediately available in the pharmacy represented 509 (82.4%) and the missing number was 109 (17.6%). The Likert scale of the findings was 3.26 which inclined towards (agree). The highest number of respondents as shown in Table 5.32, 131 (21.2%) while the lowest number of respondents 78 (12.6%) selected (disagree strongly).

In response to question 2, the total number of respondents who responded to whether most pharmacies work without any technical programmes or machines and whether all drug stocktaking operations are carried out in the traditional way, represented 549 (88.8%) and the missing number was 69 (11.2%). The Likert scale of the findings was 3.52 which inclined towards (agree). The highest number of respondents as shown in Table 5.32, 170 (27.5%)
selected (agree) while the lowest number of respondents selected (disagree strongly) within range 58 (9.4%).

Table 5.32 Statistics Provided by the General Public on Whether

<table>
<thead>
<tr>
<th></th>
<th>Pharmacies do not have an efficient electronic process in place to obtain critically needed medication when this is not immediately available in the pharmacy</th>
<th>Pharmacies work without any technical programmes or machines and all drug stocktaking operations are carried out in the traditional way</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>Percent</td>
</tr>
<tr>
<td>Disagree Strongly</td>
<td>78</td>
<td>12.6%</td>
</tr>
<tr>
<td>Disagree</td>
<td>95</td>
<td>15.4%</td>
</tr>
<tr>
<td>Neutral</td>
<td>85</td>
<td>13.8%</td>
</tr>
<tr>
<td>Agree</td>
<td>120</td>
<td>19.4%</td>
</tr>
<tr>
<td>Agree Strongly</td>
<td>131</td>
<td>21.2%</td>
</tr>
<tr>
<td>Total</td>
<td>509</td>
<td>82.4%</td>
</tr>
</tbody>
</table>

A Chi-Square Test $\chi^2$ was used to test the existence of an association between two variables, Where the null hypothesis $H_0$ stated whether or not pharmacies are working without any technical programmes or machines, and all drug stocktaking operations are carried out in the traditional way which has led pharmacies to lack in efficient processes to obtain the required medication when this is not available is unrelated to whether or not they have an efficient electronic process in place to obtain the required medication when this is not available. The alternative hypothesis $H_1$ stated that these two things are associated. A result of a Chi-Square Test supported the $H_1$. The findings show the significance value is so low that it is displayed as $p<0.001$, which means that it would appear that the two variables are, indeed, related ($\chi^2 = 66.573(a)$, $df =16$, $P< 0.001$, $N =482$).

The third question asked the general public about whether useful written information on drugs is unavailable in the pharmacy to patients within the community who do not speak Arabic or English. The total numbers of respondents were 483 (78.2%) and the missing number was 135 (21.8%). The Likert scale of the findings was 3.12 which inclined towards (agree). The highest number of respondents as shown in Table 5.33, provided equal responses in three answers (disagree, neutral and agree) within range 115 (18.6%) for each answer, whereas the lowest number of respondents responded (disagree strongly) within range 55 (8.9%).
Chapter 5: Data Collection and Questionnaire Analysis

Table 5.33 Statistics Provided by the General Public on Whether Useful Written Information on Drugs is Available in the Pharmacy to Patients Within the Community Who do not Speak Arabic or English

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disagree Strongly</td>
<td>55</td>
</tr>
<tr>
<td>Disagree</td>
<td>115</td>
</tr>
<tr>
<td>Neutral</td>
<td>115</td>
</tr>
<tr>
<td>Agree</td>
<td>115</td>
</tr>
<tr>
<td>Agree Strongly</td>
<td>83</td>
</tr>
<tr>
<td>Total</td>
<td>483</td>
</tr>
</tbody>
</table>

5.10 Section Six:
5.10.1 Participant Comments:
In this section the researcher presented a group of comments which were written on the last page of the questionnaires; 27 comments were recorded by physicians, 41 by pharmacists and 133 by the general public. The total number of respondents was 201. Table 5.34 illustrates the content of the comments and the number of duplicates per comment from all groups.

Table 5.34 Participant Comments

<table>
<thead>
<tr>
<th>Comments</th>
<th>Physicians</th>
<th>Pharmacists</th>
<th>The General Public</th>
<th>Number of Duplicates</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Availability of information systems at patient information centres, at hospitals or dispensaries, will help the appointments reservation or admittance departments to calculate statistical information on medication while prescribing, as well as arrange patient visits with treatment periods.</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2 A copy of the electronic prescription must be kept with the patient.</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3 Enabling, by connecting physicians to each other via information technology, is used to discuss patient cases.</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 The signature of the physician must be visible on the electronic prescription to clarify responsibility.</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Availability of links between pharmacies and laboratories will control the side effects of medication before prescribing especially in regard to blood concentration.</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Availability of electronic information systems at the pharmacy will provide full information about patients who display chronic diseases to prescribe the medication without visiting the doctor.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>The information system will help in drug stocktaking to check the availability, the expiration and what is needed from supplies.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Availability of an electronic information system will help control and save time at clinics which are crowded.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Availability of the source which could indicate the nearest place for available medication for patients as they need it and must also provide descriptions of the medication as well as prices.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Prescriptions should be labelled with brand names or generic names.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>The warning automation system must be available to warn about medication overlap, errors and side effects.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Medication is required from patient to make allergy test before prescribing.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Physicians, medication suppliers and pharmacists share common benefits from selling medication.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Defining an alternative medication while the main medication prescribed was not available, as well as clarifying a suitable dose for the appropriate age.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Physicians have not the means to enable them to give the patient the opportunity of selecting the most suitable price of medication.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Availability of an information system will enable easy access to patient information at any place.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Medication should not be prescribed without prescriptions.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Availability of an information system is important to avoid errors.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>An electronic prescription system is required as a result of bad handwritten prescriptions from doctors.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>It is generally understood that the pharmacist who is the person who sells medication is an expert in medication content, compounds, reactions and side effects, furthermore he has more expertise than the physician in dealing with suitable medication for patients.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>The subject of this study is important and essential.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
22 Prescriptions must be computerized. | 10 | 3 | 33 | 22

23 High quality Internet and organization are required to link all government establishments, The Ministry of Health, hospitals, health centres, as well as to connect internal departments of every health centre and hospital to cover all services and follow up with maintenance, development and training, as well as to guarantee the security of patient information. | 12 | 15 | 25 | 52

24 Total | 52 | 64 | 197 | 313

5.11 Summary:

This chapter presented the findings of the questionnaire analysis. The data will form the basis of Stage One (Identifying the Problems and Opportunities) of the Systemic Intervention technique (explained in detail in Chapter 7). The findings in this chapter also support the research objectives. A number of potential issues related to Health Information Systems (HIS) and Information Technology (IT) were identified and explored. These include: access, use, skills and background.

The results of the survey showed that a lack of information technology use in the health sectors has affected health services. The results also indicated the level of difficulties and problems which are reflected by health providers and users of health services. Strengths and weaknesses were indicated in the results of the survey; the strengths being that the highest number of respondents, having some experience with computers and Internet browsing skills considered themselves to have intermediate knowledge; whereas the highest number of respondents amongst physicians and pharmacists considered themselves to have intermediate knowledge in medicine and pharmaceutical database searches.

The greatest weaknesses were represented amongst physicians and pharmacists, who showed no experience of electronic prescription system use, moreover, the unavailability of electronic resources for doctors was referred to by all groups. Also, the majority of physicians and pharmacists never used the computer to obtain patient information from patient records via electronic systems or to obtain medication information. Other weaknesses indicated that physicians still use paper prescription systems to prescribe medication.

Further weaknesses in the lack of information technology use in the health sectors showed in the electronic contacts between other health sectors and pharmacies, the Ministry of Health.
and the Saudi Pharmaceutical Society to develop medication services. Furthermore, the Ministry of Health is unable to predict the availability of medication within the local market or to provide accurate statistics within medication consumption.

The majority of physicians and pharmacists emphasized that their workplace is not an information system member that is linked to The Ministry of Health, medication suppliers and other medical sectors. In addition, pharmacies work without any technical programmes or machines; all drug stocktaking operations are carried out in the manual way and the system used by companies and distributors, is also manual and completed without any technical or computerized use.

It is clear from the findings that the difficulties which patients face are problems arising from handwritten prescriptions; the reading of prescriptions and the dose description as these are neither clear from the prescription nor from the pharmacist. Moreover, patients do not have any opportunity while physicians are prescribing medication of stating whether they prefer the cheaper or more expensive option; in addition doctors do not provide an alternative medication (brand names or generic names).

Furthermore, some physicians request that patients bring their medication after purchase to the clinic to check before use and some pharmacists need to ask the patients about their health problems in order to be sure of the medication prescribed. In addition, some patients were compelled to return to the physician or call them to ask about the medication dose as this was not sufficiently clear, which indicates more difficulties for patients.

Other weaknesses clarified during the analyses indicated that pharmacies do not have an efficient process in place to obtain needed medication when this is not available; secondly, when medication is not immediately available in the pharmacy, pharmacists should advise the patient to buy another brand of medication. Finally, prescribing information on the availability of drugs in the pharmacy to patients within the community who do not speak Arabic or English should be provided.

Furthermore the findings clarified that The Ministry of Health and the Saudi Pharmaceutical Society do not provide the physicians’ and pharmacists’ workplace with technical support ideas and advice.

The next chapter will analyse and discuss in detail the results of the interviews.
6. Data Analysis: Interview Survey

6.1 Introduction:

Semi-structured interviews were conducted and designed for two groups. The first was prepared for the directors of the departments at The Ministry of Health (MOH) in Riyadh and the Directorate of Health Affairs (DHA) in Jeddah. The second was designed for the office managers at the medication companies and suppliers in branches of Riyadh and Jeddah cities. An official covering letter was sent from King Abdulaziz University to the Directorate of Health Affairs in Jeddah to the first group of respondents. Another official cover letter from the supervisor in the Department of Information Science at King Abdulaziz University was sent to the second group of respondents. Thus, the interviewees were first made aware of the importance of the interviews as part of this research. Furthermore, the researcher indicated to interviewees that their co-operation would contribute towards realizing the aim of this research, as well as clarifying the reality of the size of the problems and difficulties which health sectors face within society with the issues of the pharmacies and medication services. A copy of each of the covering letters is shown in Appendix 5.

In spite of the procedures which the researcher abided by to arrange the interviews, certain obstacles were presented with in regard to carrying out the interviews as required. These can be summarized in the following points:

1. Some of the interviewees apologized for cancelling after agreeing to an appointment to be interviewed. They justified that they had other jobs to do, had to attend training sessions or had to attend other meetings which conflicted with the same time frame they had arranged with the researcher.

2. All the interviewees asked the researcher for a copy of the questions to read before they answered, to be sure that the questions were in keeping with the policies of their work places.

3. In spite of the agreement all interviewees refused permission for their interviews to be recorded.

4. Some of the interviewees answered questions by hand or printed responses, while some of them asked the researcher to complete these by hand for them. Moreover, some of the interviewees asked the researcher to collect the answers at a future date; this procedure
lead to further questions from the researcher in order to clarify the responses.

A total of fifteen interviews were carried out as shown in Table 6.1, eight interviews with the directors of the departments, three at The Ministry of Health in Riyadh and five at the Directorate of Health Affairs in Jeddah City. Moreover, six interviews were carried out with the marketing directors of medication companies and suppliers, two of them at the main offices in Riyadh City and four at the branches in Jeddah City. In addition, one interview was carried out with the supervisor of the project of the Health Information System in Jeddah at the Balsam Healthcare Corp. Ltd. (BHC).

### Table 6.1 The Research Participants in Semi-Structured Interviews

<table>
<thead>
<tr>
<th>Departments of the Interviewees</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Health Administration at The Ministry of Health, Riyadh</td>
<td>Chancellor</td>
</tr>
<tr>
<td>2 Project Section at the Computer General Directorate at The Ministry of Health, Riyadh</td>
<td>Project Manager</td>
</tr>
<tr>
<td>3 The Systems Department at the Computer General Directorate at The Ministry of Health, Riyadh</td>
<td>Department Manager</td>
</tr>
<tr>
<td>4 Department of Computers at the Directorate of Health Affairs, The Ministry of Health, Jeddah</td>
<td>Department Director</td>
</tr>
<tr>
<td>5 The IT Centre at the Maternity and Children’s Hospital, The Ministry of Health, Jeddah</td>
<td>IT manager</td>
</tr>
<tr>
<td>6 Department of Medicinal and Pharmaceutical Authorization at the Directorate of Health Affairs, The Ministry of Health, Jeddah</td>
<td>Department Director</td>
</tr>
<tr>
<td>7 Department of Medicinal Supplying and Warehouses at the Directorate of Health Affairs, The Ministry of Health, Jeddah</td>
<td>Department Director</td>
</tr>
<tr>
<td>8 Department of Statistics at the Directorate of Health Affairs, Jeddah</td>
<td>Department Director</td>
</tr>
<tr>
<td>9 Balsam Healthcare Corp. Ltd. (BHC) Jeddah</td>
<td>Project Supervisor</td>
</tr>
<tr>
<td>10 Saudi Pharmaceutical Industries &amp; Medical Appliances Corporation (SPIMACO) Riyadh</td>
<td>Branch Marketing Director</td>
</tr>
<tr>
<td>11 Al-Gosaibi, Medications Department and Administration and Governmental Affairs Riyadh</td>
<td>Manager Assistant</td>
</tr>
<tr>
<td>12 Tabuk pharmaceutical Mfg.Co. Jeddah</td>
<td>Western region Sales Manager</td>
</tr>
<tr>
<td>13 Salehiya Trading Establishment, Jeddah City</td>
<td>Branch Marketing Director</td>
</tr>
<tr>
<td>14 Cigalah Trading Est., Jeddah</td>
<td>Branch Marketing Director</td>
</tr>
<tr>
<td>15 Al-Bassateen Medication Co. Jeddah</td>
<td>Branch Marketing Director</td>
</tr>
</tbody>
</table>

This chapter presents the results of the interviews; the findings are grouped into three main parts:

1- Section 1 deals with the data collected from three governmental locations, the
Chapter - 6 Data Analysis: Interview survey

Chancellor of Health Administration, the section of computer projects at the General Directorate and the Systems Department in The Ministry of Health in Riyadh.

2- Section 2 deals with the data collected in Jeddah from five governmental locations at the Directorate of Health Affairs (DHA) and one in the private sector, the Department of Computers, the Department of Medicinal and Pharmaceutical Authorization, the Department of Medicinal Supplying and Warehouses of Health Affairs, the Department of Statistics and the IT centre at the Maternity and Children's Hospital (MCH). The private sector was Balsam Healthcare Corp. Ltd. (BHC).

3- Section 3 deals with the data collected from medication companies and suppliers, two in Riyadh such as SPIMACO and Al-Gosaibi and four in Jeddah such as Tabuk, Salehiya, Cigalah and Al-Bassateen.

To access the optimal method in this study by combining both the positivist and the interpretive methods, the interviews focused on the most important areas of the questionnaire to meet the hypotheses of the study:

1- The health sectors in Jeddah City lack information technology and communication systems to update knowledge and availability of medication.

2- In Jeddah City, regular use of traditional methods of prescribing medication leads to defective medication services.

3- Health professionals and patients in Jeddah City emphasize the problems and disadvantages of the current method of medication prescribing and prescriptions.

4- The Ministry of Health, pharmaceutical companies and suppliers have been unable to develop medication services; as a result they require an information system to provide real statistics on the size of medication prescribing and consumption.

To structure the interview responses for these parts, topics were grouped together to examine the current situation as follows:

A. The current status of the Information Communication Technology (ICT) and Health Information System (HIS).

B. ICT, IS and medication supplying activities and services.

C. The new Health Information System (HIS) and the ability to link and develop medication services.
D. The impact of the traditional way of medication prescribing on health services and patients.

6.2 Results of the Interviews at The Ministry of Health in Riyadh:

6.2.1 The Current Status of ICT and the HIS:

To clarify the current status of Information Communication Technology (ICT) at the Ministry of Health (MOH), the interviewees were asked eight questions about the communications means which is available at their work locations to provide services, the availability of the Internet and the missions it is used for, as well as whether they have a website, who the beneficiaries are and which services are provided.

As with any other government sectors, most of the departments at the Ministry of Health use PCs and ICT equipment for managing its works as part of the daily routine. The telecommunication systems such as telephones, faxes, are available in most offices of the main building of the MOH and in all other subsidiary buildings such as the Directorate of Health Affairs, hospitals, health centres and clinics. Communication equipment is also used for the MOH administrative works. The users of the equipment are employees of the MOH, however, there are some options facilitated to some beneficiaries who have work relations with the MOH or for renewing their job licenses. Intrant and Internet services were provided within the main plan of the Health Information System (HIS) and were available in some limited locations at the MOH sectors. The respondents illustrated that there are ICT facilities but the majority of it was still used in their daily offices tasks.

The interviewees illustrated through their answer that the Ministry of Health own some computer software which has helped in offices tasks, as well as a web site (http://www.moh.gov.sa) for profiling the ministry. In addition, there are other communication means which are available for the citizens' services. The health sector, such as hospitals and pharmacies or medication suppliers, could renew their subscriptions at different authorization departments by visiting the websites at the MOH. In addition the Ministry of Health has a plan to develop the health services in all government and private sectors. Part of the MOH programme is concerned with the Health Information System (HIS), for which they now have within reach an inclusive study (BALSAM) to develop the health system.

One of the interviewees indicated at the beginning of the Information Communication Technology (ICT) at the Ministry of Health that:
As with any beginning, in 1987 the Ministry of Health established a small department in the main building called the computer unit, which started with modest capabilities and gradually grew to become the main administration of the computer departments.

Another interviewee stated that:

In the year 2000 the Ministry of Health had seriously started considering Information Communication Technology (ICT) and Information Technology (IT) projects to develop the quality of the works as well as the Health Information System (HIS).

Also, one of the interviewees focused on the plan of the Ministry of Health to develop the HIS, stated:

Nowadays we are working with all the hospitals in the country to evaluate the quality of health provisions, Total Quality Management (TQM). Part of this programme is concerned with the Health Information System (HIS).

6.2.2 ICT, IS and the Medication Supplying Activities and Services:

Within the broad scope of the health service, the medication supplying system between the health sector and suppliers are dealt with traditionally. Interviewers were asked about two of the hypotheses in this study which mentioned that the health sectors in Jeddah City lack information technology and communication systems to update knowledge and availability of medication. Moreover The Ministry of Health, pharmaceutical companies and suppliers have been unable to develop medication services; as a result they require an information system to provide real statistics on the size of medication prescribing and consumption.

The answers of the interviewees highlighted that in regards to the government sector, the Department of Medicinal Supplying at the Directorate of Health Affairs in Jeddah, as all other supply departments in the main governorates in the Kingdom of Saudi Arabia, (KSA) have computer software linked by network to small branches. However, the private health sector has its own procedures to supply medication. Also they stated that the main medication supply administration in Riyadh, annually estimated the need for medication and all other medicine materials through the use of computer programmes, yet still purchased from the market via traditional tenders.
6.2.3 The New HIS, the Ability of Linking and Developing Medication Services:

The discourse on the HIS within the government health sector is a part of the current schedule; one of the interviewees was asked about the ability of the link between the government and the private health sector to develop medication services. He stated:

The issues of the development are a part of the thinking here in the Ministry of Health. We are planning to develop the health sector in the country, but as you know the technology in this part of the developing world will take some time to be a part of daily life.

Another question asked to another interviewee concerned any written plan at the Ministry of Health for future planning regarding the HIS. It illustrates the method of how they evaluate the need for a link between the government and the private health sector to develop medication services, stated that:

Our plan is now to complete the first stage of the infrastructure and establish hardware at all branches of the MOH. Later on we will link all of them. In the future we could link with the private sector but this will be ready when they complete their side of the development.

6.2.4 The Impact of the Traditional Way of Medication Prescribing upon Health Services and Patients:

Some difficulties were faced by patients as a result of the handwritten prescribing and the lack of electronic information resources to check the availability of the current drug at the pharmacies. Some of the government hospitals at the MOH and in the Military sector, as well as some hospitals in the private sector, already have the facilities which enable them to prescribe medication by using the electronic base and to send it directly to the internal pharmacies. However, they still work within their locations. They are unable to know if the medication is available within the local market. Interviewees were asked about the impact of the traditional way of medication prescribing and how this affected the health services in Jeddah.

Interviewees’ answers clarified that there are difficulties facing people who need to know what physicians prescribe in their prescription and the dose that they should be taking.
Chapter - 6

One of them stated that he was faced such difficulties:

I sometimes need to visit more than one pharmacy to find medication.
As I know that the new system will be completed at all locations that we are working with, some of these difficulties will be resolved.

6.3 Results of the Interviews at The Ministry of Health in Jeddah:

The same questions were asked to interviewees in Riyadh who work at the Directorate of Health Affairs and at the Ministry of Health in Jeddah.

6.3.1 The Current Status of ICT and the HIS:

In Jeddah there is dissimilarity within the health sector as to ICT use, however, most of the locations have computers for office tasks. The largest private hospitals used ICT for patient admittance, reservation and file records as well as for sending prescriptions to the internal pharmacy. Recently the locations at the MOH started using ICT at several hospitals; the initial attempts were started at six locations and completed the infrastructure and the hardware and software. The step after that completed the link between the six locations and is now effective. The future plan provides thirty two main locations and 104 primary health care centres with equipment and software which will support all the locations in order to operate as one group within the HIS.

The interviewees were asked eight questions about the communication means which were available at their work locations to provide their services and about the availability of the Internet and the role which it played. They were also asked whether they have a website, who the beneficiaries are, what the services are and advantages they provide from their website.

The answers of the interviewees stated that the Directorate of Health Affairs (DHA), an authorisation sector at the MOH, manages and provides the administration services at the MOH health sectors in the western region. The DHA has a plan for developing the methods of the health services; therefore, they own the conventional communication technology, including the internet at the main locations. The health sectors such as hospitals, pharmacists, medication suppliers and companies need to issue licenses to practice their work or to import medication and medical equipment. The Department of Medicinal and Pharmaceutical Authorization at the Directorate of Health Affairs is the place that they need to deal with for all issues which make their work possible. Therefore, this department is one of the locations which was interviewed by the researcher. Via the website (www.eHealth.gov.sa), the health sector could browse the
latest news and regulations needed to practice or renew their work or licences; to activate the services of the DHA they need permission by using usernames and passwords. Furthermore, they could use E-mail or fax and telephone numbers to request their services.

Figure 6.1 Screen of the Web of the Department of Medicinal and Pharmaceutical Authorisation at the Directorate of Health Affairs in Jeddah

On the other hand, the general Administration of Medicinal Supplying in Riyadh (GAMS) is one of the most important departments at the MOH; it performs a main role in providing medication, medicinal and laboratory necessities, surgical equipment...etc. The GAMS links all other Medicinal Supplying Administrations in all regions within the KSA via a network. The relationship between the GAMS and all other administration branches provides supervision relationships and coordination. The activation of the relationship between the GAMS and the branches is based on the utilization of ICT. The supply information system at the DHA has served the administration in Jeddah and links other small locations, which are near Jeddah, such as small towns or villages. They have worked together to estimate the needs of medicinal supply at all health sectors in the Jeddah region. In addition, their computer system helps them in order to collect the data that they need to know about medication and equipment.
Moreover, the Department of Statistics at the MOH is a service which deals with health affairs to collect the figures, data of the manpower, patients, medication, places and equipment in the government and private sector. In every Directorate of Health Affairs there is a Department of Statistics that deals during each twelve months with the different departments at the hospitals, health centres and dispensaries. Some of these departments are linked with the Statistics Department of ICT and some of them are still dealt with in traditional ways. By using the software which was established by the MOH in all regions of the Kingdom, they could input all the statistical data that was collected from the departments within all the health sectors. The different health departments and administration sections send the data in paper form and their employees input it into the computers and send it to the main statistics administration at the MOH in Riyadh by using the leased lines. All the statistical information is published in the yearbooks and on the MOH webpage.
Chapter - 6 Data Analysis: Interview survey

Furthermore, The Maternity and Children’s Hospital (MCH) is one of the locations which has a local area network (LAN), is also one of six hospitals which has a completed programming system. The hospital website is profiling the administration and medical departments as well as the hospital services; it has a full information system linked between all departments in one network. Also it is still dealing with the first steps of this information technology and everybody there from their staff was still in training.

6.3.2 ICT, IS and the Medication Supplying Activities and Services:

The computer software which is used at the Administration of Medicinal Supply is regarded as an old basic system in comparison with the recent software and systems in the fields of health and medication. One of the interviewees illustrated that he was worried about the current software which is available in his administration, concerning whether it is compatible with the new health information system. Also the current computer system at the Department engages groups of services at the department, such as planning, following and collecting the needs of the medication and medicinal equipment from the different regions around the Jeddah area; moreover, controlling the stock at the warehouses by reviewing the activity of the stock and medication in the different warehouses, such as the transfer, the import and exports and any damage.

He said:

The current system which was established via The National Computer System Company (NATCOM) used by MOH employees in all Medicinal Supply and Warehousing departments, are using it in different processes. It is available for MOH employees and our dealers use the main website of the MOH to follow new invitations for tenders, as well as for the descriptions and stipulations.

He added:

We are now working with old computer software linked to the Ministry of Health and all other branches, it is from the earlier generation of Windows software. I am worried about it when we transfer the data to the new Health Information System (HIS). At the same time we have spent a large amount of money on the current system, if it is not compatible with the new system it will be a heavy loss.
6.3.3 The New Health Information System (HIS), the Ability of Linking and Developing Medication Services:

As the researcher previously outlined about the current status of ICT and HIS, the new HIS applications in Jeddah have made good progress across many health services within the large health sectors. However, the question in this section of the study is about the advance in prescribing medication services, as well as the development of the ability to link to different expected users.

The answers highlighted that the MOH is working to establish an integrated health information system; many companies are working together to provide and operate the hardware and software. The new system takes into consideration the main health measures, operations and services including medication applications; however, the applications need to work within a time and stage table. Moreover, the software which is used at the majority of the largest governmental and private hospitals in Jeddah, such as the Maternity and Children's Hospital (MCH) are a semi-integrated system, linking all departments to each other including the pharmacy, which receives orders from the physicians to prepare medication for the patients. However, it does not give any warning about the stock levels on the shelves.

For example, the software which is operated by Balsam Healthcare Corp. Ltd. (BHC) in MCH is now working in all departments in the administration, the admission, the wards, the x-ray departments and pharmacy,...etc. but it is still under testing.

Despite the availability of equipment, hardware and software, there are still obstacles ahead of completing the objectives of the HIS in the governmental and private health sectors. During the interview day at the Maternity and Children's Hospital (MCH) the researcher attended a discussion meeting between a group of the hospital staff and the technical team from the IT department in the hospital and the system operators of the Balsam Company. The main points discussed were about the administrative and technical problems, such as the lack of completing patient file records and the delay in inputting data from some departments. The project supervisor of Balsam Healthcare (BHC) stated that:

It is important to give success to the HIS in the health sectors; we could execute this through cooperation together and participation from all parties in the project. We will support the project through the new generation of IT in this field and we will give people their training. All that we need from them is
to attend and inform us about the problems which they are faced with when they are applying the instructions during their tasks.

Figure 6.3 The New HIS at the Maternity and Children's Hospital MCH in Jeddah Provided by Balsam Healthcare Corp. Ltd. (BHC)

Source: Balsam Healthcare Corp. Ltd 2006. Oasis Hospital management Information System.

6.3.4 The Impact of Traditional Medication Prescribing in the Health Services and for Patients:
The interviewees in Jeddah were asked the same question which the researcher asked the interviewees in Riyadh, as to the impact of traditional medication prescribing and how it has affected the health services in Jeddah.

Their responses agreed that there were problems with the handwritten prescription method; in addition there is no control on the repetition of the medication or on the way of selling it. In other words, everyone can prescribe it for himself or repeat it. On the other side, the interviewees emphasised that the MOH rules are clear for all health sectors including pharmacies about the services of prescribing medication, which must be written clearly and must explain to patients how to use it. Moreover, physicians and pharmacists must clarify everything about the medication before giving it to the patient. In addition, they said that they should take care with the regulation as this will help to decrease the problems of medication error.
Furthermore, the interviewees mentioned that the role of the new Information Technology (IT) will help to reduce the defects which they faced in the current procedure in medication prescribing. They indicated that the picture had changed for the people who use the electronic prescriptions in hospitals as the new system. Also, they illustrated the method to solve the problems must begin with the electronic system. It must be established in all health sectors via using computer systems in all departments for all people who work in hospitals and clinics and link them to the pharmacies and they think that the high percentage of problems will disappear.

6.4 Results of the Interviews at the Medication Companies and Suppliers in Riyadh and Jeddah Cities:

Thirteen questions were asked to every interviewee at every Medication Company or supplier. They focused on the users of their services and the ICT means, as well as the IT at their establishments, the policies and the tools they used to know the needs of the medication for the market. In addition, there were questions about the hypotheses of the study.

6.4.1 The Current Status of ICT and the HIS:

The current status of the Information Communication Technology (ICT) and The Health Information System at the Medication Companies and Suppliers was no better off than within the status of the governmental and the private health sectors. All Medication Companies and Suppliers use the same means of communication technology and they do not have any other option of using the information health system to link the health sector, except for a limited use. The first eight questions, to interviewees at the MOH in Riyadh and in Jeddah Cities to interviewees at the Medication Companies and Suppliers, concerned the communication means available at their work locations to provide their services and about the availability of the Internet and the missions that it was used for. They also enquired whether they have a website, who the beneficiaries are, what the services are and advantages they provide from their website.

All the interviewees introduced their companies as a pharmaceutical manufacturing and marketing company. They are dealing with and provide all governmental and private health sectors, such as hospitals, dispensaries and pharmacies with all medication and medicinal equipment, some of them dealing with medical and laboratory equipment, pharmaceuticals, medical disposables and hospital supplies, and also provide other companies who distribute medication.

The interviewees illustrated that they are using communication means such as telephones, faxes
and computers for daily routine works. In addition, most of them have websites such as spinaco, algosaibi, Tabuk pharmaceutical and salehiya. They are using E-mails for trade dealing with suppliers and importers and also provide customers with information about their services and where they can buy via the home pages.

On the other hand, some of the interviewees indicated that they have software such as Applications and Products in Data Processing (SAP) systems as enterprise resource planning (ERP). Some of the companies also use local area network LAN via the DSL, to link all departments with the main server and to activate the data transferring between the company and medication importers.

### 6.4.2 ICT, IS and Medication Supplying Activities and Services:

The researcher asked the interviewees at the medication companies and distributors about their methods or the policies that they adopted in their work in supplying the market needs with medication and medicinal equipment. Moreover, the interviewers asked the same two questions that were asked to the interviewees at the Ministry of Health about two of the hypotheses in this study, which mentioned that the health sectors in Jeddah City lack information technology and communication systems to update knowledge and availability of medication. Moreover the Ministry of Health, pharmaceutical companies and suppliers have been unable to develop medication services; as a result they require an information system to provide real statistics on the size of medication prescribing and consumption. The outcome of the answers illustrated that some viewpoints were approximated; on the other hand some of them did not agree with the researcher’s hypotheses while others were in agreement.

The majority of the interviewees agreed on the method or the policies that they adopted in their work in supplying the market needs with medication and medicinal equipment. They have more than one way to evaluate the needs and the consumption of medication within the local market. Some of them are using the Ministry of Health’s regular reports and lists of medicinal needs and consumption about limited periods, as well as dealing with surveying companies. Furthermore, some companies have their own studies about the medication market.

One interviewee stated:

> The method that we use to know the market needs of the medication. Is to annually determine the target of the company. This target relies on early studies on the size of the company and the sales of the kinds of medication
on the markets and the ability to increase the quantum. Regarding your question about providing real statistics on the size of medication and consumption, there is a particular resource we deal with to get the information which is the IMS Company.

Another interviewee said:

We estimate the needs of the market for medication by virtue of the studies which are carried out by the specialists in our company.

Another added:

When we began working in medication trading, the estimate of customer needs of medication was realized through the experience of the team during visits to their locations, then with daily practice came the averages of consumption. Moreover, our company medication orders have become available via general agents of international medication companies and distributors.

Regarding the second part of the ICT, IS and Medication Supplying Activities and Services, some of the interviewees highlighted that they agree that there is no obligation dictate in the health sector to use a standardized health information system, moreover, there is not enough technology and there is no expertise in companies to deal with this subject. Moreover, there is not the interest nor the enthusiasm required by the executive of the authority sites which supervise the health information system on future activating and follow-up. Also, there is no information system nor programme to use for the control of prescriptions and medication consumption, as well as for collecting the data about the size of the number of prescriptions prescribed from physicians and which are received by the pharmacies to help in the future planning to develop medication services.

One stated:

I agree with you that there are some health sectors in Jeddah which lack information technology and communication systems to update knowledge and availability of medication, which is related to the lack of coordinating and updating by connecting with medication companies using modern communication means to update the news of the medication world.
Another interviewee stated:

I think there are some actions needed from the Ministry of Health and health sectors.

We have not got a legible policy in our company to evaluate market needs; we use all the resources available such as the invitation of offers of the Ministry of Health.

One of the interviewees emphasised:

I think the cause of this problem is that there is no information system, moreover, if we want to raise the services in this field, first we need to apply the Saudi Code of good practice in our vocation, then use the information which we provide from our society, but unfortunately the good practices are not applied in the health sector.

Another opinion said:

About the situation here in Jeddah, in my opinion the future of the technology on this side of the health services is looking to develop health careers. But now I agree with you that The Ministry of Health, pharmaceutical companies and suppliers have been unable to develop medication services; moreover, they need an information system to provide real statistics on the size of medication prescribing and consumption, in addition they need an expert to conduct accurate studies.

Another interviewee added:

I think that if there is not a comprehensive information system in our work this does not mean that there is no hard work in all health sectors, I know we need an active information system to take these services to the front, but the perseverance of individuals is not enough to do this alone, moreover, we are missing the spirit of a united team for such development.

6.4.3 The New Health Information System (HIS), the Ability of Linking and Developing Medication Services:

In this part of the interview with medication companies and suppliers, the question concerned
the ability of the link between the government and the private health sector to develop medication services. The majority of the answers were accepted to be part of any project for developing a health information system. They have the full arrangements for participation in any medication field on electronic governmental projects and they are ready from their side to provide all the software, hardware and technical requirements. Some of them indicated that they have their sources about their customers who are mainly doctors, pharmacists and medicine agents, thus they have their records available. On the other hand, some of the interviewees could not comment about the ability of the link between the government and the private health sector to develop medication services because they have no idea about it.

6.4.4 The Impact of Traditional Medication Prescribing in the Health Services and for Patients:

The researcher asked interviewees about the impact of traditional methods of medication prescribing and how this affects the health services in Jeddah. The answers differed; three of the interviewees agreed with the researcher's hypothesis; one of them had another opinion while one did not see any reason for the problems; the last one did not answer the question.

One of the interviewees stated that he had a different view:

Over the last few years people have good knowledge about medication and their alternatives; moreover, they refuse to take any other medication despite containing the same components.

Whereas another one stated:

I do not see any reason that a traditional way of prescribing medication can result in any problem.

Successively, the interviewees who agreed stated:

Yes, the traditional way which is used in prescribing medication affects the safety and services of medication prescribing, for many reasons are related to physicians and pharmacists.

Yes, this is true.

Yes, I agree with you that the traditional way of prescribing has impacted upon the safety and services of prescribing medication.
6.5 Summary:

This chapter has indicated the findings of semi-structured interviews with a number of key people who have a direct involvement in the overall aims and objectives of this research. The data was collected and analysed and the interviews conducted within this chapter clarified that all respondents indicated that they used basic communication means in their daily work, as well as having limited use of ICT, such as the Internet. Furthermore, they wanted to increase their co-operation and co-ordination with the Ministry of Health to overcome the difficulties they face. They pointed to the importance of establishing an information system to make the connection between them easier, while acknowledging a lack of cooperation and coordination among health sectors.

In the next chapter, Chapter 7, the outcome of Chapter 5 and 6 will be used to explain in detail the basis of the stages of the Soft System Methodology (SSM) which has been used in this study.
7. Systems Intervention

7.1 Introduction:

The first stage of Soft System Methodology (SSM) was based on the grounding of the previous Chapters 5 and 6 introduced the definitions of the hard system approach to problem solving, as well as an analysis of quantitative data using the operational research method and the analysis of the outcome of the qualitative data which was collected from the interviews. This chapter concentrated on the methodology of this approach which contains two kinds of activities. Checkland, (2006, p.163) claimed that these activities can be described in seven stages, from the 'real-world' which involves stages 1,2,5,6 and 7, and the ‘activities’ which involves people in the problem situation. Stages 3, 4, 4a and 4b are 'system thinking'.

Checkland's soft systems methodology is typically depicted as a seven stages process. Stages 1 and 2 can be grouped together and might be called the “expression phase”, the problem situation as unstructured, while Stage 2, the problem situation expressed (the stage at which, traditionally, rich pictures are developed). Stage 3 might be called the “naming phase” root definitions of the relevant systems. Stages 4, 4a and 4b are the “modelling phases”, the development of conceptual models. Stage 5 is the “comparisons phase”, Comparison of conceptual models with the real-world problem situation. Stage 6 the “change identification” phase identification of feasible, desirable changes and Stage 7 the “action phase”, taking action to improve the problem situation (Durant-Law, 2005, p. 15).

In a logical sequence, the application of the methodology will be presented from Stage 1 to Stage 7. The logical sequence of the application of SSM is shown in Figure 7.1. The usual general description of SSM is presented as a seven stages process (Checkland, 1975). In the late 1980s, the 1975 version seemed rather bald and in any case gave the impression that SSM is a seven-stage process to be followed in sequence (Checkland, 2005, p. 27).
**7.2 SSM Stage One: The Problem Situation (Unstructured):**

In Stage One, the problem situation is described in terms of the analysis undertaken in Chapter 5 and 6. The results of the questionnaire survey and interviews, these findings indicate a set of problem issues. Checkland, (1975) illustrated that stages 1 and 2 are an 'expression' phase during which an attempt is made to build up the richest possible picture, not of 'the problem' but of the situation in which there is perceived to be a problem.

In the analysis of questionnaires and interpretation of the interviews, a number of issues were identified during the empirical research. These issues were classified into four subject areas, all of which were grouped together into one main issue; the Lack of Health Information Systems (HIS), after which each area was sub-divided into a number of sub-issues and elements which were arranged accordingly, based on their relationship. Furthermore some of these elements were repeated in other areas according to the root of the problem. The elements were: (Lack of ICT, Support, Planning and Lack of Coordination). As shown in Figure 7.2, these areas are
the Professionals (Physicians and Pharmacists), the Beneficiaries (The General Public), the Competent Authority (The Ministry of Health) and the Providers of Medication Services. These issues will now be discussed in more detail.

Figure 7.2 The Real World of Problem Situations, the Participants' Perspectives and the Elements (Stage 1)
7.2.1 The Professionals (Physicians and Pharmacists):

The professionals (physicians and pharmacists) in the health sector in the real world have introduced significant evidence of the problem situation, as well as giving their perspectives on the issue. The elements focused on sub-issues which provide the concept about the system's intervention. The health information system (HIS) takes priority in the requisites of physicians and pharmacists. It is clear from the responses of questionnaires from physicians and pharmacists that the cause of a lack of information on patients and medication which is needed a result of deficiencies in the Health Information System (HIS). This is the main element of the problem. Further elements will provide evidence as to the root of the problem situation.

7.2.1.1 Lack of ICT:

7.2.1.1.1 Lack of Hardware and Software:

Around half of the responses from physicians and pharmacists indicated that respondents did not use a computer at their work, 51.2% expressed never, rarely and occasionally. Furthermore, 58.1% out of 383 physicians and pharmacists claimed they never or rarely used a computer to obtain patient and medication information. Whereas 52.4% out of 335 disagreed, and strongly disagreed, in their responses on whether or not pharmacies had an efficient electronic process in place to obtain critically needed medication when this is not immediately available in the pharmacy.

Questions 1 and 5, section five in Chapter 5, which were answered by physicians and pharmacists, indicated that approximately half of the participants who answered this question emphasised that most pharmacies are working without any technical programmes or equipment, moreover, all drug stocktaking operations are carried out in the traditional way. The result of the responses showed that 47.3% out of 345 respondents claimed they agreed and strongly agreed. Furthermore, the lack of hardware and software supplied by companies and distributors is fully complete without any technical or computerized use. The responses from physicians and pharmacists indicated that 30% out of 291 answered that they agreed, and strongly agreed, whereas 17.6% were neutral, which may imply that respondents were unsure or had no knowledge of ICT.
7.2.1.1.2 Lack of Information Accessibility:

Physicians and pharmacists were asked to support evidence pertaining to the lack of information accessibility. They indicated that the responses overall reflected the reality of the situation. For example, between 69.8% and 72.9% of physicians and pharmacists answered that they did not have any electronic links between their work locations and other health sectors such as hospitals, dispensaries, clinics, medication suppliers, pharmacies and the Ministry of Health. On the other hand 15.7% out of 196 of responses from physicians and pharmacists disagreed, and strongly disagreed, about the availability of the links between pharmacies, the Ministry of Health (MOH) and the Saudi Pharmaceutical Society (SPS) to develop medication services, whereas 19.6% were neutral, which may imply that respondents were unsure or had no knowledge of these links.

Other evidence regarding the lack of information accessibility came from responses from physicians and pharmacists about whether or not their work location is an information system member connected to the Ministry of Health, medication suppliers and other medical sectors. 46% out of 313 agreed, and strongly agreed, with the question while 13.7% of them were neutral, which may imply that respondents were unsure or had no knowledge of the issues.

7.2.1.1.3 Lack of Electronic Information Resources:

From an evaluation for physicians & pharmacists about their experience in searching through medical and pharmaceutical databases, 66.4% respondents answered that they had no experience, were still beginners or had an intermediate experience. On the other hand, regarding their experience in searching through electronic prescription systems, 77.8% respondents answered that they had no experience, were still beginners or had an intermediate experience. 68.2% out of 330 physicians and pharmacists disagreed, and strongly disagreed, about the availability of electronic resources for physicians to check drug interactions while prescribing, as well as the importance of medication and patient safety.

7.2.1.1.4 Lack of Information Services:

The Ministry of Health is unable to predict the availability of medication on the local market, as well as providing accurate statistics on medication consumption. 21.7% out of 231 physicians and pharmacists agreed, and strongly agreed, about this issue, whereas 20.4% were neutral, which may imply that respondents were unsure or had no knowledge. Moreover, 44.9% out of 313 physicians and pharmacists agreed, and strongly agreed, that useful written information on drugs is unavailable in the pharmacy to patients within the
community who do not speak Arabic or English, whereas 16.5% were neutral, which may imply that respondents were unsure or had no knowledge of the issue.

7.2.1.5 Lack of Technical Advice and Support:

37.8% out of 309 physicians and pharmacists agreed, and strongly agreed, that the Ministry of Health do not provide their work location with technical support, whereas 16.5% were neutral, which may imply that respondents were unsure or had no knowledge of whether or not they provide this. On the other hand, the same issue was raised with the Saudi Pharmaceutical Society. 26.3% out of 236 physicians and pharmacists answered that the Saudi Pharmaceutical Society do not provide their work location with technical support and advice, whereas 14.7% were neutral, which may imply that respondents were unsure or had no knowledge of whether or not they provide this.

7.2.2 The Beneficiaries (The General Public):

The general public provided their views to physicians and pharmacists on the lack of a Health Information System (HIS), and also expressed their responses on the causes which affected the process of developing the HIS project.

7.2.2.1 Lack of ICT:

7.2.2.1.1 Lack of Hardware and Software:

The general public provided answers on the lack of availability of computers and software which help physicians in their tasks. 87.4% out of 615 responses demonstrated that physicians still used paper prescription systems to prescribe medication, while 90.9% out of 609 responses illustrated that physicians still prescribed medication via handwritten prescriptions.

Questions relevant to the lack of hardware and software in pharmacies questioned all participants in the study. 40.6% out of 509 of the general public answered that they agreed, and strongly agreed, that pharmacies did not have an efficient electronic process in place to obtain critically needed medication when this was not immediately available in the pharmacy, whereas 13.8% were neutral, which may imply that respondents were unsure or had no knowledge of the issue.

As physicians and pharmacists were questioned on the means of ICT in pharmacies, the general public were also asked the same question. 52.9% out of 549 respondents agreed, and strongly agreed, that pharmacies work without any technical programmes or machines,
moreover, all drug stocktaking operations are carried out in the traditional way. Whereas 13.1% were neutral, which may imply that respondents were unsure or had no knowledge of the issue.

7.2.2.1.2 Lack of Information Accessibility:

84.5% out of 612 of the general public provided responses as always, often and occasionally in regards to whether patients were compelled to return to the physician or call them to ask about unclear medication doses.

Other questions the general public were asked evaluated the behaviour of pharmacists with patients when medication was not immediately available in the pharmacy. The responses reflected some of the difficulties facing the general public in regards to the lack of information accessibility, as well as the lack of HIS. 33.7% answered that the pharmacist advised patients to buy another brand of medication or similar, whereas 18.9% answered that the pharmacist requested patients to call the physician or return to write an alternative. Whereas 13.9% answered that the pharmacist called the physician to prescribe an alternative, whereas 27.0% answered that the pharmacist advised patients to visit another pharmacy.

7.2.2.1.3 Lack of Electronic Information Resources:

Emphasis was placed on the significance of electronic information resources for health services. The general public commented on the lack of availability of electronic information resources for physicians and pharmacists. 68.8% out of 511 responses from the general public disagreed, and strongly disagreed, about the availability of electronic resources for physicians to check drug interactions while prescribing as well as the importance of medication and patient safety.

7.2.2.1.4 Lack of Information Services:

The Health Information System (HIS) was introduced as a means to help the health sector to provide high quality services. In this study the general public spotted difficulties and problems faced as result of a lack of ICT and HIS. For example, participants answered questions regarding prescription services. Between 595 to 615 participants gave their opinion on elements regarding information services. 68.9% out of 610 faced problems with handwritten prescriptions, while 91.6% out of 612 faced difficulties when reading prescriptions. Moreover, 76.7% out of 613 were unable to read dose descriptions as these
were unclear from the prescription, whereas 56% out of 615 patients were unable to read dose descriptions as these were unclear from the pharmacist.

Moreover, the health information system provided updated medication information within the hands of health professionals and the general public. 73.7% out of 611 respondents considered that they had no opportunities of providing information, while physicians prescribing medication questioned whether they preferred the cheaper or more expensive option. 77.5% of respondents had no opportunities of providing information while physicians prescribing medication wrote an alternative medication (Brand Names or Generic Names).

Useful written information on drugs must be available in the pharmacy to patients within the community who do not speak Arabic or English as a part of the information services. 32% out of 483 of participants from the general public agreed, and strongly agreed, that this information service was not available, while 18.6% were neutral, which may imply that respondents were unsure or had no knowledge of the issue.

7.2.3 The Competent Authority (The Ministry of Health):

7.2.3.1 Planning:

As with any governmental project, health projects need full consideration in order to be successful. The planning is an important element for the Ministry of Health in making decisions on whether to establish a Health Information System; it is thus inevitable to lean on a group of assistant elements. In the current case the planning faced some difficult issues which contributed to delaying the completion of the developed picture of the Health Information System (HIS). The next sections will highlight these issues.

As mentioned previously in Chapter 6, between 1987 and 2000 the Ministry of Health established a small department in the main building called the computer unit, which gradually grew to become the main administration of computer departments. In the year 2000 the Ministry of Health had seriously started considering Information Communication Technology (ICT) and Information Technology (IT) projects to develop the quality of departments, as well as a Health Information System (HIS). In 2007- 2008 the Ministry of Health had a plan to develop health services in all government and private sectors. As a result they worked with all the hospitals in the country to evaluate the quality of health provision, Total Quality Management (TQM). Part of this programme was concerned with the Health Information System (HIS). On the other hand as the Chancellor of the Health...
Administration at the Ministry of Health indicated that issues of development are a part of their thinking in the Ministry of Health, they were planning to develop the health sector in the country. However, technology in this part of the developing world will take some time to be part of daily life.

7.2.3.2 Lack of ICT:

As mentioned in Chapter 6, interviewees from the Ministry of Health were questioned on the availability of ICT at the Ministry of Health. Respondents illustrated that there were ICT facilities; the Ministry of Health owned computer software, which the majority still used in their daily offices tasks, adding that ICT supplies are those which are used in any government office such as telephones, faxes and computers. Also the Ministry of health has a website which used for profiling. Hospitals and pharmacies, medication suppliers could renew their subscriptions at different authorization departments by visiting the websites at the MOH. In addition there was another means of communication available to citizens' services.

Some of the computer software is old and linked to the Ministry of Health and all other branches and is from the earlier generation of Windows software. For medication supplies, it served the administration in Jeddah and linked other small locations which are near to Jeddah, such as small towns or villages, in order to estimate the needs of medicinal supply at all health sectors in the Jeddah region. Moreover, it helps in order to collect data needed to know about medication and equipment. Managers are, however, worried about this when transferring the data to the new Health Information System (HIS). As they had spent a large amount of money on the old system, the risk will be great if it is not compatible with the new system.

On the other hand it is noticeable, as stated from the Project Manager of the Computer General Directorate at The Ministry of Health in Riyadh, that some of the government hospitals at the MOH and in the military sector, as well as some hospitals in the private sector, already have the facilities which enable them to prescribe medication by using an electronic base and can send directly to the internal pharmacies. However, as they still work with their locations, they are unable to know whether the medication is available at the local market. The general public who visit the majority of the health sector still face difficulties in knowing what physicians prescribe in their prescription and the dose that they should be taking, as they sometimes need to visit more than one pharmacy to find medication.
7.2.3.2.1 Lack of Infrastructure:

The infrastructure of ICT is available within different levels at all governmental and private health sectors. This depends on locations and financial appropriations. In the main cities opportunities to provide a quality level of infrastructure took priority in the planning and budgets. Moreover, the problem which emerged during planning the infrastructure concerned coordinating with other sectors who have a direct and indirect relation to ICT projects. Sometimes there is gap in establishing the infrastructure and ICT has competed one of them before the second.

As mentioned in Chapter 6, the discourse on the HIS at the government health sector is part of the current schedule; the question concerns the ability of the link between the government and the private health sector to develop the medication services. The current plan at the Ministry of Health as the Projects Manager mentioned completed the first stage of the infrastructure and established hardware at all branches of the MOH. Later on they will all be linked. In the future the Ministry of Health could link with the private sector but this will only be ready when the private sector completes their side of the development.

7.2.3.2.2 Lack of Hardware and Software:

The situation in the main medication supply administration in Riyadh, annually estimated the need for medication and all other medicinal supplies through the use of computer programmes, yet still purchase from the market via traditional tenders. The Department of Medicinal Supplying at the Directorate of Health Affairs in Jeddah, as with all other supply departments in the main governorates in the Kingdom of Saudi Arabia (KSA), have computer software linked by network to small branches. However, the private health sector follows its own procedures to supply medication.

7.2.3.2.3 Lack of Statistical Data:

As indicated in Chapter 6 statistical information was collected via the Department of Statistics at the MOH which deals with health affairs to collect figures, data concerning manpower, patients, medication, places and equipment in the government and private sector. However, statistical information still lacks details which are important for physicians and pharmacists, as well as for providers of health services, decision makers and researchers. The real situation reflects the real world.

The Department Director of the Statistics Department at the Directorate of Health Affairs, in Jeddah mentioned that general statistical information was published in the yearbooks.
Using software which was established by the MOH in all regions of the Kingdom, they are inputting all the statistical data that was collected from the departments at all the health sectors. The different health departments and administration sections send the data in paper form the employees input the data into the computers and send it to the main statistics administration at the MOH in Riyadh by using the leased lines.

7.2.3.2.4 Lack of the Implementation and the Workflow:

To place the Health information System (HIS) in the site of utilization, it is important to consider the implementation and coordination between departments. As illustrated by the project supervisor of Balsam Healthcare (BHC) it is important that the HIS is successful in the health sector and this can only be executed through cooperation and participation from all parties in the project. Support for the project will be guaranteed through a new generation of IT, as well as staff training. Practitioners need to attend and inform the service provider about the problems they are faced with when applying instructions during their tasks.

7.2.4 Providers of Medication Services:

The fourth pole in the real world of SSM is the medication providers such as companies, distributors, and suppliers. They clarified the problem situation regarding HIS.

7.2.4.1 Lack of ICT:

As highlighted in Chapter 6 the current status of Information Communication Technology (ICT) and The Health Information System at the Medication Companies and Suppliers was no better than the status of the governmental and private health sector. They provide services via a means of communication, such as the Internet through E-mail, faxes, mobiles and phones as well as through their representatives. Some of them provide selling services to their customers via home pages, while others use the Internet to search for new products or the latest research in the medical field as well as studying the international market.

Some of the medication providers own special IT networks and computer programmes for their tasks, such as administrative and financial software, warehousing of medication and medicinal equipment storage. However, these facilities are still below the expected desired level of the health services. Some of the providers agreed somewhat with the study questions and considered that the lack of ICT was a problem, expressing that there was no obligation dictate in the health sector to use a standardized health information system. Moreover, there was insufficient technology, as well as little expertise, in companies to deal with the subject, nor the interest nor the enthusiasm required within the executive of the authority sites which
supervise the health information system on future activation and follow up.

7.2.4.2 Lack of Statistical Data:

Most of the medication providers fail to acquire accurate information about the quantity of medication prescribing and consumption. They deal with society and market needs through traditional means to evaluate the situation. Some of these companies have more than one way to evaluate the needs and medication consumption on the local market. They use the Ministry of Health's regular reports and lists of medicinal needs and consumption about limited periods as well as dealing with surveying companies. Furthermore, some of them also deal with private companies to follow their own studies about the medication market.

Some of the providers emphasise that there is no information system nor programme to use for the control of prescriptions and medication consumption, as well as collecting the data about the size of the numbers of prescriptions which are prescribed from physicians and which are received by the pharmacies to help in the future planning of the medication service development.

7.3 SSM Stage Two: The Problematic Situation Expressed (Structured):

The richest possible picture (RP) will be brought out in this stage to express the problem situation. The analysis of the outcomes of Chapters 5 and 6 will build up the RP, as well as beginning the thinking of the "problem-solving" system and the "problem content" system.

Checkland (2006) clarified that the RP:

"It has been found most useful to make the initial expression a building up of the richest possible picture of the situation being studied. Such a picture then enables selection to be made of a viewpoint (or viewpoints) from which to study further the problem situation. Once that selection is made, of course, one or more particular systems, which will be part of a hierarchy of systems, are being defined as relevant to problem-solving" (Ibid: p.165).

As shown in Figure 7.3, the relationship between the elements in the problem-solving system and the problem - content system was adapted from Brember, (1985).
Figure 7.3 The Relationship between the Elements in the Problem-Solving System and the Problem - Content System (Adapted from: Brember, 1985, Figure 3, p. 64)

```
Problem - Solving System

Role: Problem Solving:
Problem Solver: Author as part of an action research intervention

Supervisor: (i) Janet Harrison
(ii) Fytton Rowland
(iii) Ian Murray

Resources:
Questionnaires.
Interviews.
Available literature.
Brain storming.
Research experience.

Constraints on Problem Solver:
Satisfy requirements for a higher degree (PhD).
Submit thesis within time limit.

Define Problem Content System and Uses

Checkland's Methodology

Problem - Content System

Problem-Owner:
In Jeddah, Saudi Arabia:
Physicians & Pharmacists.
The General Public.
The Ministry of Health.
Medication companies and suppliers.

Structure:
Hospitals, Community and Hospitals Pharmacies.
Departments at the Ministry of Health.
Offices of Medication companies and suppliers.

Process:
To perceive the value of the Health Information System (HIS)
To develop means of prescribing
To update information
To define systematization at the pharmacies
To define the problems which the patients face
To define the role of the Ministry of Health
To define the role of medications companies, providers and distributors
To highlight optimal information systems

Climate:
Governmental and Private Hospitals.
Private Dispensaries
Pharmacies at Governmental, Private Hospitals
and the community.
The Ministry of Health.
Medication companies and suppliers.

To Recommend Action, Learn about or Redefine
```

The analysis of the intervention introduced by Checkland, (2005) to illustrate the link between the “problem-solving” system and the "problem content" system was said to be:
It was found useful to think of the intervention structurally as entailing three roles:

1. The 'client' is the person or persons who caused the study to take place. The client's reasons for causing the intervention to be made.

2. The problem solver (it could be whoever is also 'client') to do something about the situation, and the intervention had better be defined in terms of their perceptions, knowledge and readiness to make resources available.

3. The 'problem owner'. No one is intrinsically a problem owner.

The 'problem solver' must decide who to take possible 'problem owners' to be. There will always be many possibilities. The list should include, but never be limited to, whoever is in the roles 'client' and 'problem solver', and this list is the best source of choices of relevant systems in the logic-driven stream of enquiry. It will be noted that making the problem solver' one possible 'problem owner' often means that the first relevant system looked at is 'a system to do the study'. The first model built is often a model of the structured set of activities which the problem solver(s) hope to turn into real-world action in doing the study. This is what Rodriguez-Ulloa (1988) means when he argues for seeing 'the problem solving system' as part of the problem content. This role analysis, now known as 'Analysis One' in SSM, is always relatively easy to do and is very productive, especially through the list of possible problem owners (Ibid: pp.45-48).

7.3.1 The Problem Solving System:

According to Checkland (2006) the role of the problem solver is it:

"Uses the systems methodology to take action to improve aspects of the problem-content system. There will be several potential occupiers of the roles, and there will be several possible ways of describing problem-content and problem-solving systems"

"The problem solver defines one or more problem owners and the problem content(s) associated with that ownership. The methodology uses to recommend or take action in the problem-content system, or to redefine it and/or its owner(s). And he uses the experience as a means of further developing both the methodology and the concept of a human
activity system. The problem-content and the problem-solving systems are not separable in the way that they are when the problems are those of natural science: they are linked parts of a single system" (op.cit: p.238).

As shown previously in Figure 7.3 the problem-solving system contains the "role of problem solver" (The Author). Other key roles include: the supervisors, occupied first by Dr. Janet Harrison who contributed her experience through the methodology, information science, and health informatics. Secondly, Dr. Fytton Rowland who contributed his interests and experience through communication and information studies. Thirdly, Ian Murray who contributed his interests and experience through electronic public information systems and the use of information communication technologies. Finally, Professor Checkland contributed his experience through the Soft System Methodology in his writings.

The "problem solving" system has two main resources: first it is related to research work, such as the research outcomes (questionnaires and interviews) and reviewing of the literature. The second resource is the author using his own skills such as his research experience of four years' full time work and brain storming. The constraints on the "problems -solver" include the satisfaction of the requirement for a higher degree (PhD) and thesis submission within the time limit.

7.3.2 The Problem Content System:

The problem content system is presented here in order to obtain an RP of the 'problem situation' without imposing a particular picture on it. According to Checkland, (1981) who stated that:

"The problem - content system has three elements which, structure, process and climate "The relationship between structure and process, the 'climate' of the situation, has frequently been found to be a core characteristic of situations in which problems are perceived" (Checkland, 1981, pp.164-166).

Questions can be based on the determination of these elements, for example:

7.3.3 Problem Owner:

1- Physicians & Pharmacists.

2- The General Public.
3- The Ministry of Health.

4- Medication companies and suppliers.

7.3.4 The Elements of the Structure:

1- Hospitals, Hospitals and community Pharmacies.

2- Departments at the Ministry of Health.

3- Offices of Medication companies and suppliers.

7.3.5 The Elements of the Process:

- To perceive the value of the Health Information System (HIS).
- To develop means of prescribing.
- To update information.
- To define systematization at the pharmacies.
- To define the problems which the patients face.
- To define the role of the Ministry of Health.
- To define the role of medication companies, providers and distributors.
- To highlight optimal information systems.

7.3.6 The Elements of the Climate:

1- Governmental and Private Hospitals.

2- Private Dispensaries.

3- Pharmacies at Governmental, Private Hospitals and the community.

4- The Ministry of Health.

5- Medication companies and suppliers.

7.3.7 The Rich Picture (RP) Expressed:

In the current stage, the researcher noticed that the rich picture illustrated the relationship between the parties of the problem situation and focused on its parts as well as upon different sides and viewpoints. Checkland (2005) highlighted that:

"The users of SSM will be observed throughout the work drawing pictures and diagrams as well as taking notes and writing prose. The
reason for this is that human affairs reveal a rich moving pageant of relationships, and pictures are a better means for recording relationships and connections than is linear prose. Representing root definitions pictorially is one example of the use of pictures is SSM, but the best known is the policy of representing the problem situation itself in the form of so-called 'rich pictures'. There is no formal technique or classic form for this, and skill in drawing is by no means essential (though it's not a hindrance!) in the production of pictures which are found to be very helpful" (op.cit: p.45).

Five rich pictures were designed here as shown in (Figures 7.4, 7.5, 7.6, 7.7 and 7.8). Firstly, an extensive picture which contains clipart of human figures, symbols of buildings, equipments and other things to clarify the picture. The other pictures reflect the real world of the problem situation from every side of the areas classified in this stage (the Professionals 'Physicians and Pharmacists', the Beneficiaries 'the General Public', the Competent Authority 'the Ministry of Health' and the Providers of Medication Services).

The land of the first RP is puzzle pieces which include a missing piece in the centre of the puzzle to represent the base of elements of the content of the HIS. Around the centre there are human figures of the problem owners and bubbles which bring out expressions concerning the problem and their needs to solve the problem. In the right of the picture there is a column of the picture key which contains figures, such as a pair of scissors, used to indicate the conflict area. Moreover, the cross points to the lack of resources within the HIS.

Above in the head of the picture, there is a horizontal column, in the middle of the column there is an influence of external perspectives represented by big eyes. This includes the Ministry of Health, the Ministry of Interior, the Ministry of Higher Education, the Saudi Food and Drug Authority (SFDA), the Saudi Association for Health Informatics (SAHI) and the Saudi Pharmaceutical Society (SPS).
We face difficulties with handwritten prescriptions and unclear dose description from prescriptions and pharmacists.

We need an electronic resource to check drug interactions while prescribing.

We need an efficient process when medication is unavailable at the pharmacies.

We are working with all the hospitals in the country to evaluate the provisions of health quality; we are concerned by the health information system (HIS).

We are pharmaceutical companies and suppliers and need an information system to provide real statistics on the size of medication prescribing and consumption.
Figure 7.5 The Rich Picture (RP) Expression for Physicians and Pharmacists

How can I acquire experience of medical, pharmaceutical database search & electronic prescription systems and when should I use the computer to obtain patient and medication information.

We have no electronic links between our work locations and pharmacies, other hospitals, dispensaries and clinics, medication suppliers and the Ministry of Health.

Medication which is supplied by the companies and distributors is fully complete without any technical or computerized use.

Our pharmacy is working without any technical programmes or machines, and all drug stocktaking operations are carried out in the traditional way.

We have no electronic links between our work locations and hospitals, dispensaries, clinics, medication suppliers and the Ministry of Health.

The Future Vision of the Physicians and Pharmacists for the Electronic Cooperation by Using the HIS

When will the ministry of health and the Saudi pharmaceutical society provide our work location with technical supporting ideas and advice?
Figure 7.6 The Rich Picture (RP) Expression for the Patients

For how long have physicians still been using paper prescription systems to prescribe medication?

High quality net and organization are required to link all government establishments, The Ministry of Health, hospitals, health centres, as well as connecting internal departments of every health centre and hospital to cover all services, and follow up with maintenance, development and training, as well as guaranteeing the security of patient.

I have no opportunities while the physician is prescribing medication as to whether I prefer the cheaper or more expensive option.

Useful written information on drugs is unavailable in the pharmacy to patients within the community who do not speak Arabic or English.

I have no opportunities while the physician is prescribing medication to write an alternative medication (brand names or generic names).

While medication is not immediately available in the pharmacy the pharmacist advises me to buy another brand of medication or similar, and also requests that I call a physician or return to write an alternative. sometimes he calls a physician to prescribe an alternative or advises me to visit another pharmacy.

The Future Vision of Patients for the Electronic- Cooperation by Using the HIS.
Some of the government hospitals at the MOH and in the Military sector, as well as some hospitals in the private sector, already have the facilities which enable them to prescribe medication by using the electronic base and to send it directly to the internal pharmacies.

We are planning to develop the health sector in the country, but technology in this part of the health services in the developing world will take some time to be a part of daily life.

The health sector, such as hospitals and pharmacies or medication suppliers, could renew their subscriptions at different authorization departments by visiting the websites at the MOH.

We are now working with old computer software linked to the Ministry of Health and all other branches, I am worried about when we transfer the data to the new HIS, we have spent a large amount of money on the current system, if it is not compatible with the new system it will be a heavy loss.

Our plan is now to complete the first stage of the infrastructure and establish hardware at all branches of the MOH.

The Ministry of Health had seriously started considering Information Communication Technology (ICT) and Information Technology (IT) projects to develop the quality of the works as well as the Information Health System (HIS).

Later on we will link all branches of the MOH by the HIS and in future we will link the private sector but this will be ready when they complete their side of the development.

The different health departments and administration sections send the data in paper forms and our employees input it into the computers and send it to the main statistics administration at the MOH in Riyadh by using the leased lines. All statistical information is published in the yearbooks and on the MOH webpage.
Figure 7.8 The Rich Picture (RP) Expression for the Providers of Medication Services

It is important to give success to the HIS in the health sectors; we could execute this through cooperation together and participation from all parties in the project.

I know we need an active information system to take these services to the front, but the perseverance of individuals is not enough to do this alone, moreover we are missing the spirit of the united team to develop.

The site has no option for our customers to purchase or to send any messages through E-mails. Our sales agents deal with our customers in their locations to provide them with our services.

Our workshops and warehouses are linked to each other through a modern IT system; this system feeds vital information about the logistic decisions such as distribution, maintenance, procurement and inventory operations and future forecasting.

The classic way which is used in prescribing medication affects the safety and services of medication prescribing; as a result many reasons are related to physicians and pharmacists.

Some health sectors in Jeddah lack information technology and communication systems to update knowledge and availability of medication. This is related to the lack of coordinating and updating by connecting with medication companies by using modern communication means to update the news of the medication world.

To develop medication services, they need an information system to provide real statistics on the size of medication prescribing and consumption; in addition they need an expert to conduct accurate studies.
7.4 SSM Stage Three: Root Definitions of the Relevant System:

According to Checkland (2005, p. 36) stage 3 is regarded as an axial juncture in the MSS. Root definitions and CATWOE are the source of the purposeful holons known as 'human activity system'. The modelling language is based upon verbs, and the modelling process consists of assembling and structuring the minimum necessary activities to carry out the transformation process in the light of the definitions of the CATWOE elements shown in Table 7.1.

"SSM provides a structured way of identifying and capturing different points of view, distilling those differences to the principle(s) involved rather than the effect (by the use of CATWOE and root definitions), and clarifying the pros and cons of the principle through the development of operational systems or processes (by the use of system modeling)" (Checkland, 2000, p. 804).

He also added,

"It is also important to realize that SSM is not just one thing: it is a process of thinking with, at each stage of the process, a portfolio of techniques that can be applied according to circumstances. Sometimes the techniques can be used on their own. Rich pictures, activity modeling, and information charts are frequently applied and valued techniques. Root definitions and CATWOE analyses are useful means of increasing the understanding" (Checkland, 2000, pp. 813 – 814).

Table 7.1 The CATWOE Mnemonic, Formulate Root Definitions by Considering the Elements CATWOE (Adapted from: Checkland, 2005, Figure 2.8, p. 35)

<table>
<thead>
<tr>
<th>The Elements of Root Definition</th>
<th>Formulate Root Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>C Customers</td>
<td>The victims or beneficiaries of T</td>
</tr>
<tr>
<td>A Actors</td>
<td>Those who would do T</td>
</tr>
<tr>
<td>T Transformation Process</td>
<td>The conversion of input to output</td>
</tr>
<tr>
<td>W Weltanschaltung</td>
<td>The worldview which makes this T meaningful in context</td>
</tr>
<tr>
<td>O Owner(s)</td>
<td>Those who could stop T</td>
</tr>
<tr>
<td>E Environmental Constraints</td>
<td>Element outside the system which it takes as given</td>
</tr>
</tbody>
</table>

7.4.1 The Problem Themes:

On the basis of the above analysis Stage 1 and Stage 2 produced an identification of the themes of the problem situation to be analysed, as well as allowed a relevant system to be discriminated for the situation. In the following, the problem themes from the RP are
highlighted and the root definitions are indicated for the Health Information System (HIS) as:

- ICT Means.
- ICT Information Accessibility.
- ICT Information Resources.
- ICT Infrastructure.
- ICT Services.
- ICT Supporting.
- ICT Implementation and Workflow.
- Planning Issues.
- Statistical Data.

The nine relevant systems suggested above can be accumulated into three problem themes which are outlined in more detail below:

7.4.1.1 Value System Issues Problem Theme:

This combines:
- ICT Services.
- Planning Issues.
- Statistical Data.

7.4.1.2 Technical Issues Problem Theme:

This combines:
- ICT Means.
- ICT Information Accessibility.
- ICT Information Resources.
- ICT Infrastructure.

7.4.1.3 Co-operation Issues Problem Theme:

This combines:
- ICT Supporting.
- ICT Implementation and Workflow.

7.4.2 Root Definitions:

7.4.2.1 Value System Issues Problem Theme:

In order to giving the value system of the governmental and private health sectors, they need to be partners in the electronic health services to give significance to strategic health planning.
To this end, the issue-based root definition of the value problem theme can be summarised in the following demands for the system to be:

The Ministry of Health owned value-system is to enhance the awareness and attitudes of the governmental and private health sectors, (Physicians and Pharmacists) and Providers of Medication Services towards HIS by achieving ICT in order to improve the health services, the future planning and the statistical information.

A CATWOE analysis of the value system issues is revealed in Table 7.2 as follows:

<table>
<thead>
<tr>
<th>The Elements of Root Definition</th>
<th>Formulate Root Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>C Customers</td>
<td>Society (the general public), the governmental and private health sectors (Physicians and Pharmacists), the Ministry of Health and Providers of Medication Services.</td>
</tr>
<tr>
<td>A Actors</td>
<td>The governmental and private health sectors (Physicians and Pharmacists), the Ministry of Health and Providers of Medication Services.</td>
</tr>
<tr>
<td>T Transformation Process</td>
<td>From limit in planning, statistical data and traditional prescription services to general planning, plenitude of data quantities and electronic prescription services by using an electronic health information system.</td>
</tr>
<tr>
<td>W Weltanschauung</td>
<td>The governmental and private health sectors, the Ministry of Health and Providers of Medication Services, their values towards Health information system are helpful in a future vision of strategic planning, the ICT of health services and the base of statistical data.</td>
</tr>
<tr>
<td>O Owner(s)</td>
<td>The Ministry of Health</td>
</tr>
<tr>
<td>E Environmental Constraints</td>
<td>Changes in the general form, awareness, attitudes, society, tradition, technology, planning, services, supporting.</td>
</tr>
</tbody>
</table>

The root definition for the value system problem is effectively proved to be constructed.

7.4.2.2 Technical Issues Root Definition:

Any health information system must provide a high quality technical means to meet the users' needs and advanced services in this new age of ICT-led developments. The issue-based root definition of the technical issues can be identified in the following statement:

The system must be:

A system owned by The Ministry of Health to improve the ICT ability by means of increasing infrastructure, hardware, software, information resources and training, in order to obtain improved access to the health information system.
A CATWOE analysis of the technical issues is revealed in Table 7.3 as follows:

Table 7.3 Formulate Root Definitions of the Technical Issues by Considering the Elements CATWOE

<table>
<thead>
<tr>
<th>The Elements of Root Definition</th>
<th>Formulate Root Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>C Customers</td>
<td>The society (general public), the governmental and private health sectors (Physicians and Pharmacists), the Ministry of Health and Providers of Medication Services.</td>
</tr>
<tr>
<td>A Actors</td>
<td>The governmental and private health sectors (Physicians and Pharmacists), the Ministry of Health and Providers of Medication Services.</td>
</tr>
<tr>
<td>T Transformation Process</td>
<td>Moving from traditional health information services to a technological health information system.</td>
</tr>
<tr>
<td>W Weltanschaulung</td>
<td>ICT is a target to gain a high standard health information system.</td>
</tr>
<tr>
<td>O Owner(s)</td>
<td>The Ministry of Health</td>
</tr>
<tr>
<td>E Environmental Constraints</td>
<td>Discernment, financial supporting, planning, statistical data infrastructure, facilities.</td>
</tr>
</tbody>
</table>

Currently the root definition for the technical problem has effectively proved to be constructed in a realistic form.

7.4.2.3 Co-operation Issues Problem Theme:

Co-operation among the Ministry of Health, Providers of Medication Services, the Saudi Food and Drug Authority, the Saudi Association for Health Informatics, the Saudi Pharmaceutical Society, the Ministry of Higher Education and The Ministry of Interior is essential for an active HIS and to develop health services. There are hundreds of health service sites in the kingdom of Saudi Arabia. The issue-based root definition of the cooperation theme in the implementation, supporting and workflow can be summarised in the following need for the system to be:

(The Ministry of Health owned system is to improve co-operation among itself and the other sectors, such as Providers of Medication Services, Saudi Food and Drug Authority, Saudi Association for Health Informatics, Saudi Pharmaceutical Society, the Ministry of Higher Education and The Ministry of Interior, by establishing HIS and the sharing of information resources by the implementation, supporting and workflow. This is in order to achieve the health information system and health services that satisfy the demands of the society in KSA.

A CATWOE analysis of Co-operation issues is revealed in Table 7.4 as follows:
### Table 7.4 Formulate Root Definitions of the Co-operation Issues by Considering the Elements CATWOE

<table>
<thead>
<tr>
<th>The Elements of Root Definition</th>
<th>Formulate Root Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>C</strong> Customers</td>
<td>The society (general public), the governmental and private health sectors (Physicians and Pharmacists), and Providers of Medication Services.</td>
</tr>
<tr>
<td><strong>T</strong> Transformation Process</td>
<td>Limit in support to construct a health information system to system Implementation and Work flow by supporting the budgets, ICT, special educating programme and information security.</td>
</tr>
<tr>
<td><strong>W</strong> Weltanschulung</td>
<td>The Ministry of Health, Providers of Medication Services. The Saudi Food and Drug Authority, the Saudi Association for Health Informatics, the Saudi Pharmaceutical Society, The Ministry of Higher Education. The Ministry of Interior. Supporting the HIS and the health sectors is a target to gaining a high standard of health services.</td>
</tr>
<tr>
<td><strong>O</strong> Owner(s)</td>
<td>The Ministry of Health.</td>
</tr>
<tr>
<td><strong>E</strong> Environmental Constraints</td>
<td>Discernment, financial supporting, planning, statistical data infrastructure, facilities. education and training.</td>
</tr>
</tbody>
</table>

The root definition for co-operation issues is effectively proved to be constructed.

### 7.5 SSM Stage Four: Building Conceptual Models:

The root definitions for all the situation problems were illustrated to the owners. These definitions will provide satisfaction. The SSM exhibits in each stage a brick in the improvement of the problem building body. According to Checkland, (2006, p. 169) in stage 4, a model of the activity system is needed to achieve the transformation described in the definition. The model which is built will accomplish what is defined in the root definition. The definition is an account of what the system is; the conceptual model is an account of the activities which the system carries out in order for the system to be named in the definition.

The step from root definition to conceptual model is the most rigorous in the whole methodology, the nearest to being 'technique'. The modelling 'technique' will be described, after an illustration to help clarify the above points (Ibid: p. 170).

The relationship between root definitions and conceptual models was taken to be based only on an instrumental 'logic'. Here it is argued that root definitions define and induce
dispositions. The dispositions root definitions define are expressed in terms of conceptual models, while the dispositions they induce are the source of the effects they have on the problem-solving practice (Checkland & Tsouvalis, 1997, p. 153).

The purpose of the conceptual model (CM) is notionally to accomplish what has been defined in the root definition. A root definition, being a description of purposeful human activity conceived as a transformation process, always embodies a particular world-view. The relationship between a root definition and a conceptual model in SSM is therefore a relationship between a 'being' and a 'doing' or, between a 'schema' and the 'performance' of that schema. (Ibid: 158). A conceptual model drawn for each root definition and the drawing up of three root definitions and conceptual models becomes an iterative process of debate and modification that moves towards agreed conceptual models (See Figures 7-9 -7-10 and 7.11). The basic activities selected for each root definition in this study are as follows:

A) Value System:

- To increase the value of the Health Information System (HIS) within the Competent Authority, the Ministry of Health.
- To increase the value of the Health Information System (HIS) within the Professionals (Physicians and Pharmacists) at the Governmental and Private Health Sectors.
- To increase the value of the Health Information System (HIS) within Society (the General Public).
- To raise the awareness of the decision-makers and the health sectors towards the value of statistical data and information for the preparation and for the future planning in HIS projects.
- To review the attitudes of Decision-Makers at the Ministry of Health towards the preparation of the well-planning during the operations of establishing the (HIS).
- To develop health information services with a new generation of technology for the Health Information System (HIS).
- To change traditional dealing behaviour within Professionals (Physicians and Pharmacists) at the Governmental and Private Health Sectors towards Patients.
- To establish Health Information System having future dimensions with other sectors.
B) Technology System to Establish the System:

- To improve Patient care.
- To bring the idea of the Health Information System (HIS) out of the drawers into the reality.
- To meet the pressing need, and to increase awareness towards using the ICT in health services.
- To develop the ICT infrastructure.
- To improve the electronic link between the health sectors and access to health information.
- To use technology-based intervention in information access.
- To improve ICT capability.
- To provide medication information recourse to health sectors, and the reduction of a proportion of medication errors via ICT.

C) Co-operation System:

- To support HIS by supporting ICT.
- To develop new educational programmes concentrating on electronic health information systems to support health professionals.
- To exchange views and experiences in health and medication information and services.
- To improve the efficiency of exchanging information resources.
- To protect citizen data.
- To take the saying, prevention is better than cure, health information is better than cure.
- To satisfy society by providing health and medication information.
- To activate the ICT Implementation and Workflow.
Figure 7.9 Conceptual Model of the Value System

To Increase the Value of the Health Information System (HIS) within

The Competent Authority
the Ministry of Health

The Professionals
(Physicians and Pharmacists)

Society (The General Public)

Raising Awareness Towards the Value of Statistical Data

Reviewing Attitudes Towards Planning (HIS)

Developing Health Information Services

Changing the Traditional Dealing Behaviour

HIS Having a Future Dimension

To monitor  To control

To define performance measure
Figure 7.10 Conceptual Model of the Technology System

To Improve Patient Care

To Bring HIS Out of the Drawers
To Meet the Needs and to Increase Use of ICT

To Develop the Infrastructure

To Improve Sector Linking and Information Access
To Use Technology-Based Intervention Access

To Provide Patient and Medication Information within Recourse to Reducing Errors
To Improve ICT Capability

To monitor

To control

To define performance measure
Figure 7.11 Conceptual Model of the Co-operation System

To Support HIS by Supporting ICT

To Activate ICT Implementation and Workflow

To Improve Information Resources

To Exchange Views and Experiences

To Develop New Educational Programmes

To Protect Citizen Data

Health Information Better than Cure

To Satisfy Society by Providing Information

To monitor

To control

To define performance measure
7.6 Stage Five: Comparison of Conceptual Models and the Real World:

In Stage 5 a comparison was made between the conceptual models (Stage 4) and the real world (Stage 2). This was achieved by listing the elements of the conceptual model (A, B and C) and writing down the real world mechanism as shown in (Tables 7.5, 7.6 and 7.7). These tables show how drawing up an agenda at the end of this stage is based on the structured way of making comparisons. The aim of the comparison stage is to prepare the grounding for discussing the problem situations where an agenda is needed, thus the final output of this stage is the production of an agenda.

Brember, (1985, p. 60) indicated that,

"The essence of Checkland’s methodology is to build a conceptual model within certain guidelines, then compare this with the real world. Discrepancies between the model and reality may highlight problems and their solutions and these discrepancies can then be debated by managers and researchers"

The reason why conceptual models (CMs) ought to be regarded as ‘whats’ rather than ‘hows’, has to do with the aims of the comparison stage. Illustrated by Checkland and Tsouvalis, (1997, p. 158) in order for the comparison stage to produce as effective as possible outcomes which might change the way things are now done (better ‘hows’) or introduce new activities or a new version of a whole system (a new ‘what’), a conceptual model CM should define a particular system at a what-level, since the existing activities of the real-world situation with which the conceptual model CM will be compared belong to the ‘how’ level. The matrix technique often used in this stage of the methodology has the purpose of bringing these two levels together (the what-level of the conceptual model CM and the how-level of the real world activities) and has proved an invaluable aid in SSM applications so far.

The accepted agenda marked by "yes" in the table provides a series of topics for discussion in the next stage. What is not necessary or admissible as a part of the agenda is marked by "no" and will not be put forward for further discussion.
Table 7.5 Agenda to Change the Value System

<table>
<thead>
<tr>
<th>Activity in Conceptual Models (Stage 4) Required Output in Systems World</th>
<th>Present in Real World Situation (Stage 2)</th>
<th>Comments on Real World Situation (Stage 2)</th>
<th>Add to Agenda for Debate?</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1. To increase the value of the Health Information System (HIS) within the Competent Authority of the Ministry of Health</td>
<td>Partially</td>
<td>The value of the Health Information System (HIS) at the Ministry of Health is a major part of the national health system.</td>
<td>Yes</td>
</tr>
<tr>
<td>A2. To increase the value of the Health Information System (HIS) within the Professionals (Physicians and Pharmacists) at the Governmental and the Private Health Sectors.</td>
<td>Partially</td>
<td>The value of the Health Information System (HIS) for Physicians and pharmacists is a beneficial solution for most problems that are related to the links between their work locations and other health sectors such as hospitals, dispensaries, clinics, medication suppliers, pharmacies and the Ministry of Health.</td>
<td>Yes</td>
</tr>
<tr>
<td>A3. To increase the value of the Health Information System (HIS) within Society (the General Public).</td>
<td>Partially</td>
<td>The value of the Health Information System (HIS) for society is to solve the difficulties facing the general public as a result of a lack of information accessibility and lack of HIS. In addition, availability of an information system will enable easy access to patient information at any place.</td>
<td>Yes</td>
</tr>
<tr>
<td>A4. To raise awareness of decision-makers and the health sectors towards the value of statistical data and information for the preparation and for future planning in HIS projects.</td>
<td>Partially</td>
<td>Raising the awareness of the decision-makers and the health sectors towards the value of statistical data and information to help in future planning, as well as give to the current health situation important details for physicians and pharmacists as well as health service providers.</td>
<td>Yes</td>
</tr>
</tbody>
</table>
### Activity in Conceptual Models (Stage 4)

#### Required Output in Systems World

<table>
<thead>
<tr>
<th>Activity</th>
<th>Present in Real World Situation (Stage 2)</th>
<th>Comments on Real World Situation (Stage 2)</th>
<th>Add to Agenda for Debate?</th>
</tr>
</thead>
<tbody>
<tr>
<td>A5.</td>
<td>Partially</td>
<td>Reviewing the attitudes of the Decision-Makers at the Ministry of Health towards the preparation of the well-planning during the operations of establishing HIS.</td>
<td>Yes</td>
</tr>
<tr>
<td>A6.</td>
<td>Partially</td>
<td>The new generation of technology in the Health Information System (HIS) produces an affirmative effect on health information services.</td>
<td>Yes</td>
</tr>
<tr>
<td>A7.</td>
<td>Partially</td>
<td>The traditional behaviour of professionals (Physicians and Pharmacists) at the Governmental and the Private Health Sectors towards patients will change for the better with an electronic health information system.</td>
<td>Yes</td>
</tr>
<tr>
<td>A8.</td>
<td>NO</td>
<td>The health information system must be flexible while established, as well as have a future vision to be part of a larger system within other systems.</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Table 7.6 Agenda to Change the Technology System

<table>
<thead>
<tr>
<th>Activity in Conceptual Models (Stage 4) Required Output in Systems World</th>
<th>Present in Real World Situation (Stage 2)</th>
<th>Comments on Real World Situation (Stage 2)</th>
<th>Add to Agenda for Debate?</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1. To improve patient care.</td>
<td>Partially</td>
<td>The abiding emblem in health services is patient care, to improving this care must be achieved by using IT and ICT under the main name of the electronic services, the HIS.</td>
<td>Yes</td>
</tr>
<tr>
<td>B2. To bring the idea of the Health Information System (HIS) out of the drawer into reality.</td>
<td>Partially</td>
<td>It is valuable to plan and study how the health services will change; however the target from all developmental steps is to implement the ideas.</td>
<td>Yes</td>
</tr>
<tr>
<td>B3. To meet pressing needs, and to increase awareness towards using the ICT in health services.</td>
<td>Partially</td>
<td>There are pressing needs in all health sectors to use a high quality of ICT to improve the health services and care.</td>
<td>Yes</td>
</tr>
<tr>
<td>B4. To develop the ICT infrastructure.</td>
<td>NO</td>
<td>The ICT infrastructure in Jeddah and in KSA generally need redeveloping in all Governmental and Private sectors, especially in health sectors to provide distinguished services.</td>
<td>Yes</td>
</tr>
<tr>
<td>Activity in Conceptual Models (Stage 4) Required Output in Systems World</td>
<td>Present in Real World Situation (Stage 2)</td>
<td>Comments on Real World Situation (Stage 2)</td>
<td>Add to Agenda for Debate?</td>
</tr>
<tr>
<td>---</td>
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<td>---</td>
</tr>
<tr>
<td>B5. To improve the electronic link between the health sectors and access to health information.</td>
<td>NO</td>
<td>Improve links between health sectors via ICT transferring of patient information easier, faster and secured.</td>
<td>Yes</td>
</tr>
<tr>
<td>B6. To use technology-based intervention in information access.</td>
<td>NO</td>
<td>Health System containing a group of health service systems needs an information system which could enable the health sector to access patient information easily at any place, and therefore, to use ICT in information access requires a change in the mindsets as well as cultivating skills for all staff.</td>
<td>Yes</td>
</tr>
<tr>
<td>B7. To improve ICT capability</td>
<td>NO</td>
<td>Some stages during the establishing and developing of ICT technology must be antecedent to gaining the capability, such as managing the infrastructure, increasing the awareness and the training.</td>
<td>Yes</td>
</tr>
<tr>
<td>B8. To provide medication information recourse to health sectors and reduction of the proportion of medication errors via the ICT.</td>
<td>NO</td>
<td>Prescriptions must be computerized and an electronic prescription system is required to reduce bad handwritten prescriptions from doctors, also the availability of an information system is important to avoid errors.</td>
<td>Yes</td>
</tr>
</tbody>
</table>
### Table 7.7 Agenda to Change the Co-operation System

<table>
<thead>
<tr>
<th>Activity in Conceptual Models (Stage 4) Required Output in Systems World</th>
<th>Present in Real World Situation (Stage 2)</th>
<th>Comments on Real World Situation (Stage 2)</th>
<th>Add to Agenda for Debate?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>C1.</strong> To support HIS by supporting ICT.</td>
<td>Partially</td>
<td>The success of HIS is contingent on the level of ICT support; the co-operation between the decision makers and their partners in technology is required for success.</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>C2.</strong> To develop new educational programmes concentrating on electronic health information systems to support health professionals.</td>
<td>Partially</td>
<td>Educational establishments such as colleges, institutes and universities are one of the faces of co-operation. They could provide a new generation of health specialists with various programmes of electronic health information systems and support by ICT training courses.</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>C3.</strong> To exchange views and experiences in health and medication information and services.</td>
<td>Partially</td>
<td>The interested parties in the health issues, such as the Ministry of Higher Education, the Saudi Food and Drug Authority (SFDA), the Saudi Association for Health Informatics (SAHI) and the Saudi Pharmaceutical Society (SPS), all of which must be welcomed by the Ministry of Health to exchange views and experiences in issues of health information, medication, and services.</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>C4.</strong> To improve the efficiency of exchanging information resources.</td>
<td>NO</td>
<td>ICT must facilitate the channels of co-operation in exchanging and transforming information resources.</td>
<td>Yes</td>
</tr>
<tr>
<td>Activity in Conceptual Models (Stage 4) Required Output in Systems World</td>
<td>Present in Real World Situation (Stage 2)</td>
<td>Comments on Real World Situation (Stage 2)</td>
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</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td><strong>C5.</strong> To protect citizen data.</td>
<td>NO</td>
<td>The co-operation between governmental sectors has multidimensional faces, one of them is the protection of citizen information taking priority with the governmental sectors; at the top of those sectors is the Ministry of Interior.</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>C6.</strong> To take for the saying “prevention is better than cure”, health information is better than the cure.</td>
<td>Incompletely</td>
<td>The ICT assists professionals in their daily work. the warning automation system must be available to warn about medication overlap, as well as errors and side effects of medication to warn patients to make allergy tests before prescribing.</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>C7.</strong> To satisfy society by providing health and medication information.</td>
<td>NO</td>
<td>Part of the co-operation between governmental sectors and society is to satisfy the beneficiaries by providing the source which could indicate the nearest place available for medication for patients as they need it and must also provide descriptions of the medication as well as prices.</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>C8.</strong> To activate the ICT implementation and workflow.</td>
<td>Partially</td>
<td>A high quality and organized net is required to link all government establishments, The Ministry of Health, hospitals, health centres, as well as to connect internal departments of every health centre and hospital to cover all services and follow up with maintenance, development and training, as well as to guarantee the security of patient information.</td>
<td>Yes</td>
</tr>
</tbody>
</table>
7.7 Stage Six of SSM: Change Identified:

Stage 5 provided a clear vision of the comparison between real world activities (Stage 2) and a conceptual model representation (Stage 4). Emanating from this comparison, the 'agenda for change', leads to the identification of elements that can be gained in terms of their systemic desirability and cultural feasibility.

The purpose of the comparison in Stage 5 is to generate a debate with people concerned at the problem situation of Stage 6. Stage 6 defined possible changes which simultaneously meet two criteria: that they are arguably desirable and at the same time provide a feasible history of the situation under examination. (Checkland, 2006 p. 164) The purpose of Stage 6 is to use the comparison between conceptual models and 'what is' to generate discussion of changes of any or all of the three kinds 'in structure, in procedures, in attitudes' which will be discussed in Stage 7. The discussion should be with people at the problem situation who care about the perceived problem and want to do something about it (Ibid: p.180).

Stage 6 saw an accommodation developing over changes that are desirable, and feasible, desirable in terms of the systems models and feasible, given the history of the situation, the power structure and prevailing attitudes. When accommodations are found, action can be taken to improve the problem situation (Jackson, 2000, p. 56).

The agenda was debated at this stage with actors working in the system, along with clients, problem-owners and the problem-solver, as identified earlier in this chapter. Possible changes or future plans will be discussed in terms of feasibility and desirability. The tables below (Tables 7.8, 7.9 and 7.10) show the activities on the agenda for change and indicate whether each activity is systemically desirable and/or culturally feasible.

7.7.1 Value System Changes: Systemically Desirable:

Establishing a Health Information System is an important national project, the value system is a result of an exigent demand in the Saudi health system. The need for patient and medication information resources must be recognised by all stakeholders such as the Ministry of Health and the other Governmental and Private Health sectors. The value of the professionals who use the Health Information System in their interventions with the health service sectors to serve the Beneficiaries (the General Public) should be acknowledged. Finally, it is important to start with all the educational sectors, whose interest in health education should include courses
in their curriculum programmes in health informatics and health information systems. In addition training, programmes for all health professionals is required to encourage them to use the systems.

7.7.2 Value System Changes: Culturally Feasible:

There is a slackening in the awareness of the value system change. The concentration on the framework of the buildings, the level of the health services and the medicinal equipments is taking priority in the health system at the expense of the Health Information System. There is a gap in awareness in most of the health sectors about the importance of the ICT in their decision making in the short and long-range. The optimum use of Information Technology in the long-term will reduce the errors, spending and treatment expenses, while increase the level of successful health services.

<table>
<thead>
<tr>
<th>Activities in Conceptual Models that are Included in the Agenda for Change</th>
<th>Systemically Desirable</th>
<th>Culturally Feasible</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1. To increase the value of the Health Information System (HIS) within the Competent Authority the Ministry of Health.</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>A2. To increase the value of the Health Information System (HIS) within the Professionals (Physicians and Pharmacists) at the Governmental and the Private Health Sectors.</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>A3. To increase the value of the Health Information System (HIS) within Society (the General Public).</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>A4. To raise the awareness of the decision-makers and the health sectors towards the value of statistical data and information for the preparation and for the future planning of HIS projects.</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>A5. To review the attitudes of the Decision-Makers at the Ministry of Health towards the preparation of good-planning during the establishment of operating HIS.</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>A6. To develop health information services with a new generation of technology, as the Health Information System (HIS).</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>A7. To change the traditional behaviour of Professionals (Physicians and Pharmacists) at the Governmental and Private Health Sectors towards Patients.</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>A8. To establish a Health Information System having a future dimension with other sectors.</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
7.7.3 Technology System Changes: Systemically Desirable:

The biggest necessity to the systematically desirable changes for the technology system is to improve the health system and services. ICT will help the HIS to provide better information resources at the hands of the health professionals. Moreover, to make the ICT capability and uses successful, the infrastructure must be established and managed in order to take maximum advantage of the ICT and HIS infrastructure. All professionals within all health sectors must be trained to use the technological systems efficiently, effectively and with efficacy to improve a safe health service within all governmental and private health sectors.

7.7.4 Technology System Changes: Culturally Feasible:

The Kingdom of Saudi Arabia is a rich country. Since the beginning of its foundation within the period of King Abdul Aziz al-Saud, the beginning of a new generation of development began in the country. Periodically, the Fifths' Plans in the country took consideration of the importance of communication at the development stages. There was no budget problem. Three decades have passed since the country entered into the Information Technology era. The health sectors took the opportunity of expanding the budgets to make the decision makers deliver the best services. The problems with the implementation of ICT and HIS are at the planning, cooperation and the coordination stages. These problems lead to a lack of health information resources needed in the health systems future planning, a shortage in medication services and physicians still making their treatment decisions for their patients with a high level of health risks and errors.
### Table 7.9 Technology System Theme

<table>
<thead>
<tr>
<th>Activities in Conceptual Models that are Included in the Agenda for Change</th>
<th>Systemically Desirable</th>
<th>Culturally Feasible</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1. To improve patient care.</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>B2. To bring the idea of the Health Information System (HIS) out of the drawer into reality.</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>B3. To meet pressing needs, and to increase awareness towards using the ICT in the health services.</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>B4. To develop ICT the infrastructure.</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>B5. To improve the electronic link between the health sectors and access to health information.</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>B6. To use technology-based intervention in information access.</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>B7. To improve ICT capability</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>B8. To provide medication information recourse to the health sectors and a reduction in the proportion of medication errors via ICT.</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

#### 7.7.5 Co-operation System Changes: Systemically Desirable:

Cooperation is systemically desirable in health issues as it is important to impart the quality and privilege to the health services. The cooperation will be successful and useful whenever it is between two groups, firstly, the executive services' sites, the Ministry of Health, the Governmental and Private Health Sectors and the Suppliers of Medications, the secondly the sites which are developing, guiding and supervising, such as the Ministry of Higher Education, the Saudi Food and Drug Authority (SFDA), the Saudi Association for Health Informatics SAHI and the Saudi Pharmaceutical Society (SPS). Cooperation among these groups is highly desirable for the benefit of the whole society.

#### 7.7.6 Co-operation System Changes: Culturally Feasible:

In spite of all the circumstances concerning for stockholders, it is noticeable that the practical sites in the health sector and the theoretical sites coexist in an environment which lacks cooperation between each other. The outcome of the cooperation may not always be equal in the benefits for all partners to the short-term but will be useful in the future. For example, the financial expanding of ICT is highly-priced in the initial period but in the long-term, the outcome will be feasible.
Table 7.10 Co-operation System Theme

<table>
<thead>
<tr>
<th>Activities in Conceptual Models that are Included in the Agenda for Change</th>
<th>Systemically Desirable</th>
<th>Culturally Feasible</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1. To support the (HIS) by supporting the (ICT).</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>C2. To develop new educational programmes concentrating on electronic health information systems to support the health professionals.</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>C3. To exchange views and experiences in health and medication information, and services.</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>C4. To improve the efficiency of exchanging information resources.</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>C5. To protect citizen data.</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>C6. To follow the saying (prevention is better than cure), health information is better than cure.</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>C7. To satisfy society by providing health and medication information.</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>C8. To activate the ICT Implementation and Workflow.</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

7.8 Stage Seven of SSM: Action to Improve the Problem Situation:

In the final stage 7, action is recommended to improve the problem situation, the last stage of SSM involves taking action based on stage 6. Checkland, (2006 p. 164) illustrated that this stage will define 'a new problem' and it too may now be tackled with the help of the methodology. Stage 7 takes action to improve the problem situation, to change it and to enable the cycle to begin again. Checkland, (2000, p. S19). Three kinds of change are possible: changes in structure, in procedures, in attitudes. Structural changes are changes made to those parts of the reality which in the short term, in the on-going run of things, do not change (op.cit: p.180).

Stage 7 the conclusion of the methodological cycle, does not see a 'solution' to the original problem but merely the emergence of another different problem situation. Problem resolving, for Checkland, is a never-ending process in which participant attitudes and perceptions are continually tested and changed and they come to entertain new conceptions of desirability and feasibility. A significant feature of SSM was emphasized by Jackson (2000, p. 56).

A plan of action to improve the problem situation is one of the results of this research. An action plan to overcome the problem situation was thus designed. This includes three main themes:
Chapter - 7  Systems Intervention

1- Value System change

2- Technology System change

3- Co-operation System change

7.8.1 Change in Structure:

The structure of the current Health System (HS) should be modified in order to add ICT to integrate the Health Information System (HIS). This will help to encourage the partners in health issues to understand the new era of ICT, thereby increasing their awareness of the importance of the health services and patient and medication information resources needed in this area. The structure should allow the directors of the health sectors and ICT professionals to be represented at the strategic planning, HIS selecting, budgeting meetings and the allocation of resources.

These changes can be achieved by convincing the partners in health service administration of their usefulness and explaining the short and long-term benefits of the above changes, together with their impact on the welfare and the care safety of the patient.

7.8.2 Change in Procedure:

Procedural changes are changes to the dynamic elements: the processes of reporting and informing, verbally or on paper, all the activities which go on within the (relatively) static structures. (Checkland, 2006 p.180). The change in procedures should start from the Ministry of Health, based on placing a preconception upon the value of the information in health services. This will be based on the correct numbers collected from statistical resources about the real world of the health services, locations needs, problems and errors as well as the situation of the medication market and providers.

The Ministry of Health could start the change in the main cities, such as Riyadh and Jeddah, with a sample of HIS linked to other health sectors to evaluate the size of the uses and the errors which occurred at the beginning of the project. The expansion can be achieved by ensuring user satisfaction and presenting a written report to the decision makers.

7.8.3 Change in Attitude:

Attitude Changes, these include not only changes in attitudes, such as those sampled in the 'attitude surveys' beloved of behavioural scientists, but also many other crucial, but intangible characteristics which reside in the individual and collective consciousness of human beings in
groups. (Ibid). Attitudes represent an important element in any change, especially with regard to decision-maker’s attitudes. For partners in the health system, there is a need to change the decision-making attitude towards ICT.

This can be achieved by encouraging users to attend ICT seminars, lectures and training courses. Personal meetings with ICT professionals may also be advisable. The other attitudinal change that needs to take place is to convince health sector staff to use ICT resources. This can be achieved by changing the attitudes of health sector staff towards ICT.

Giving physicians and pharmacists an opportunity to share their perceptions and experiences of their system problems is another important issue that needs to be achieved. Finally, partners in the health system ought to be aware of the impact of information upon the quality of healthcare.

7.9 Summary:

This chapter applied a soft systems approach to examine data collected via questionnaires, interviews and the researcher’s experience in order to obtain a rich picture. Major issues in the Health Information System (HIS) within the Saudi Health System have been identified and represented using SSM. For each relevant system, a root definition of the proposed system was formulated and its elements were checked via CATWOE analysis. Conceptual models for each of the relevant systems were drawn up and an agenda for change devised, identified from those actions that were systemically desirable and culturally feasible. These actions included changes to the Health System of the Ministry of Health and other Governmental and Private Health Sectors, technological changes to improve ICT provision and cultural changes to improve decision-making for the providers of health services. The next chapter will discuss the results of the systems intervention in the light of these threads, which are picked up once more and discussed in context with wider findings.
8. Discussion

8.1 Introduction:

This chapter will discuss the results of the systems intervention in the light of the issues examined in previous chapters. Problem issues arose from stage 1 of the SSM, which was based on the results of the analysis of the questionnaire and interview survey. This chapter will demonstrate the multidimensional nature of the problem situation by evaluating different viewpoints; from these stakeholder perspectives, a holistic understanding will be provided of the main problem elements of the Health Information System (HIS) and its place in the wider Saudi health system, as well as a comparison of the NHS health system in the UK.

Furthermore, the discussion will take into consideration the results of Chapter 7 and the objectives of this research, which were designed to illustrate the purpose of the concept of advanced accomplishments in health sector services in Jeddah through the use of information systems for pharmacies and medication. The objectives stated in Section 1.4 of Chapter 1 were as follows:

1) To evaluate the proportion of the used methods by the physician to prescribe medication and illustrate how physicians receive information to update their practice.
2) To define the used system at the pharmacies to receive the prescriptions from the health sectors and the current situation of the systematization of dispensing and supplying of medication.
3) To investigate the problems, which the patients face with the current method of medication prescribing.
4) To clarify the role of the Ministry of Health (MOH) in developing a pharmacy system and a medication prescribing method.
5) To clarify the role of local pharmaceutical companies, providers and distributors in medication supplies and the information systems they use to supply the health sectors.
6) To highlight the optimal information systems, which ensure the methodology of pharmacies and medication information systems, in developing health service sectors.

To facilitate effective discussion, use was made of the initial research objectives to provide a clear direction whilst, at the same time, assisting in determining the success of the research in relation to these objectives.
As mentioned in Chapter 7, a group of elements which related to the problem issue will be discussed in more detail in this chapter. These elements will be under:

A) Internal and External Changes:

- Strategic Planning at the Ministry of Health.
- Training and Qualifying.
- Co-operation and Co-ordination with other Governmental and Private Health Sectors.

B) Technology Element:

- Infrastructure, Hardware and Software.

C) Contribution to the Systems Methods

A roadmap of the discussions leading to the fulfillment of the research objectives is shown in Figure 8.1.
### Figure 8.1 Roadmap of Issues Discussed

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8.2 Internal and External Changes:

The internal changes in the Saudi health system should pass within a logical sequence; this sequence at the Ministry of Health should start with studied strategic planning relying on a base of statistical data. The strategic planning must take into considerations the importance of co-operation and co-ordination with other governmental and private health sectors.

The results which arose in Chapters 5 and 6 from the analysis of the questionnaire and interview survey, as well as the outcome of the stages in Chapter 7 from the systems intervention, are shaping the ideas which will help to discuss the two points of internal and external changes.

8.2.1 Strategic Planning at the Ministry of Health:

It is noticeable from Saudi development plans that there are planned stages for the general health system, despite abbreviated intimations indicated in these plans and in the Ministry of Health publications and year books about information technology in health system programmes. Moreover, the website of the MOH provides information on the Ministry’s vision for future plans or projects employing IT within its services. Most of the topics which are dealt with indicate that the website tends to lean towards news stories related to routine works. On the other hand, the reports which are published in local newspapers focus on issues which are relevant to health services, most of which concern the shortages of using information technology which is deemed to be one of the success elements of world health systems.

In the findings of his thesis Alyemeni, (2003) pointed out that there is a general agreement on the importance and feasibility of having healthcare information resources available to healthcare professionals in Saudi Arabia. Interested policy makers in Saudi Arabia should have an initial action plan to build upon and enhance the planning for healthcare information access and utilization in Saudi Arabia.

The findings of the questionnaires and the interview analysis in this study have clarified the problem issues. Strategic planning is a major player which all other elements emanate from. As the researcher has indicated in Chapters 6 and 7 the Ministry of Health are planning to develop the health sector in the country, although technology will take some time to be a part of daily life. Furthermore, as the Project Manager at the Ministry of Health indicated in Chapter 6 the plan is now to complete the first stage of the infrastructure and establish hardware at all branches of the MOH. At a later stage they will be linked. In the future there could be links with the private sector. However, this will only be ready once their side of the development will
be completed. Advocating this opinion, the majority of participants from physicians and pharmacists illustrated that they have no electronic links to other health sectors.

Figure 8.2 Current Project of the Electronic Health System Example at the Directorate of Health Affairs in Jeddah

Source: Manager of Information Technology at the Directorate of Health Affairs in Jeddah 2006.
On the other hand, haphazard works without any harmonious plan between the concerned sectors will disperse the efforts of development. The Directorate of Health Affairs in Jeddah for example is working to achieving electronic health services through an individual vision as shown in Figure 8.2 above. A team of physicians, computer engineers and programmers are working together with a contractor, a national company, on the current project. The problem here originates with the independency of planning. However, the other directorates in the Ministry of Health in other cities and other governmental and private health sectors will be out of the main target of HIS which is planned for the Jeddah directorate.

This study supports the research of Al-Zahrani, (2001) cited in Chapter 3, which investigated system requirements for computer networks in Saudi Hospitals. Al-Zahrani focused on the lack of a steering group charged with responsibilities for planning, monitoring and co-coordinating the required activities among Saudi University hospitals. Furthermore, he emphasized the importance of training, which showed in the findings that clinicians and computer staff already have the basic competence and skills required to adopt computer-based technology and also pointed out the role of co-operation, stating that Saudi Universities are working independently to establish their own computer network system, thus not taking advantage of the synergies that co-operation would bring.

To compare this side of the planning with the NHS in the United Kingdom (Bradshaw and Urquhart, 2005, p.2) illustrated in their study on strategic planning for health information systems in the NHS in the UK that the history of investment in hospital information systems in the UK has been mixed, with some small scale successes, but also some instances of large investment failures and abandoned systems. The Wanless report (2002) on spending priorities for the National Health Service (NHS) noted the poor record of investment in ICT and the need for significant investment. The National Programme for Information Technology (NPfIT, 2004) took a centralised approach to IT development in the UK NHS, with Local Service Providers being responsible for a regional cluster. It considered the earlier background to the current round of planning and implementation within one large NHS hospital, as well as how theoretical frameworks contributed to judging whether strategic planning was successful or not.

In a circular on the new information management and technology strategy for the NHS, (Langlands, 1998, pp. 3-4) highlighted that the modern and dependable NHS needs accurate and instantly accessible information, as well as the benefits of new high-speed, high-capacity information and communication network. Information for Health is the Government’s strategy to ensure that the NHS exploits the full potential of these developing technologies in the drive...
to transform the delivery of health services, improve the health of the nation and the quality of patient care. Over time, the strategy will deliver:

- Lifelong Electronic Health Records for every person in the country.
- Round-the-clock on-line access to patient records and support on best clinical practice, for all NHS clinicians.
- A National Electronic Library for Health to keep doctors, nurses and other clinical professionals up-to-date with the latest clinical research and best practice at the time they need it.
- Integrated care for patients through GPs, hospital information across the NHS information highway and community service sharing.
- Fast and convenient public access to information, advice and care through online information services and telemedicine.
- More effective use of NHS resources by providing NHS planners and managers with the information they need.

The national strategic programme is concerned with major developments in the deployment and use of Information Technology (IT) in the NHS. It aims to connect delivery of the NHS Plan with the capabilities of modern information technologies to:

- Support the patient and the delivery of services designed around the patient, quickly, conveniently and seamlessly.
- Support staff through effective electronic communications, better learning and knowledge management, cut the time to find essential information (notes, test results) and make specialised expertise more accessible.
- Improve management and delivery of services by providing good quality data to support National Service Frameworks (NSFs), clinical audit, governance and management information. The programme focuses on the NHS but also intends to take forward in parallel developments in Social Care IT so that the two services are integrated as local communities are ready (The Department of Health-NHS, 2002, p. I).

8.2.2 Training and Qualifying:

Training and qualifying professionals within the health sector is required to improve the quality of the health services. The analysis of the findings of the questionnaires and interviews
indicated that 257 (66.4%) physicians & pharmacists evaluated their experience of the medical and pharmaceutical database searching ranged between having no experience, to beginner and intermediate. Moreover, their responses differed in regards to their experience of electronic prescription systems, with 301 (77.8%) responding that they had no experience, to beginner and intermediate. These findings support the study of Mohamed and Al-Dogaither, (2004, p.35) cited in Chapter 3, which assessed patient satisfaction with pharmaceutical services that had reduced prescription delay as a result of the introduction of computer-based prescription writing and by providing each pharmacy with trained technicians.

As highlighted in Chapter 7 in stage 5 within the agenda for change Co-operation system to active in the conceptual models. Educational establishments such as colleges, institutes and universities are one of the faces of co-operation that provides the new generation of health specialists with various programmes of Electronic Health Information Systems and support by ICT training courses. The findings in Chapter 5 illustrated the lack of co-operation between the partners of the health system. It pointed out that 146 (37.8) out of 309 physicians and pharmacists agreed, and strongly agreed, that the Ministry of Health did not provide their work location with technical supporting ideas, whereas 64 (16.5%) were neutral, which implies that they were unsure, or did not have any ideas on whether or not they provided them. On the other hand, in regards to the Saudi Pharmaceutical Society, 102 (26.3%) out of 236 of physicians and pharmacists responded that the Saudi Pharmaceutical Society did not provide their work location with technical supporting ideas and advice, whereas 57 (14.7%) were neutral, which implies that they were unsure or did not have any knowledge on whether or not they provided them.

The Recommendations introduced by Yeoman and et al., (2004, pp. 62–63) in the final report of assessment of the South West Information for Clinical Effectiveness - Rural (SWICE-R) in the UK, highlighted that the thrust of recent government policies for health and social care stress the importance of workplace learning, better training for social care staff, and clinical governance. To help the NHS and social service organisations meet government targets, support services need to be put into place. This evaluation of the South West Information for Clinical Effectiveness - Rural SWICE-R and SWICE aimed at assessing whether electronic information resources provided met the needs of staff and whether the services were starting to have an impact on patient care and professional practice. To use these specialised information services, training is required by most staff and the evaluation also assessed whether the training and support services were effective.
The information skills training programme has succeeded in giving more confidence to many potential users and the Somerset county programme (the main focus of the evaluation work) is widely praised by the social care staff interviewed. Although there has been a policy emphasis on e-learning, and the ECDL, for example, may be supported by learning packages, an e-learning approach does not seem appropriate for promoting, supporting and training for the SWICE and SWICE-R resources, as the users need (and appreciate) personal support to help them realise how the resources might help their education and practice.

In 1999 NHS Executive – Information Policy Unit adopted a strategy to support Information for Health named as (Working together with Information) between 1999 and 2005. It was a national strategy to help NHS staff to develop the knowledge, skills and expertise needed to make better use of information and information technology. It was an Education, Training and Development (ETD) strategy to support the implementation of Information for Health in the NHS. It emphasised the importance of good information management for the benefit of parents/clients, thereby helping to provide the best possible care. The strategy provided a starting point for Education, Training and Development (ETD) activity that needed to be commissioned to support information management and related culture change processes in the NHS over six years. The strategy helped to ensure that staff acquired the information management skills that were required to support national service developments, for example those in primary care, and implementation of strategic initiatives such as Clinical Governance and National Service Frameworks. The strategy was linked to other ETD related policy initiatives, such as Continuing Professional Development (CPD), the NHS Learning Network, the ‘Learning Zone’ and NHS Leadership and Management Development programmes. Links with other resources, such as the Department for Education and Employment’s (DfEE) (NHS Executive – Information Policy Unit, 1999, p. 4)

There are many important changes in the way in which information and technology are being delivered within a modernised NHS. It is intended that Health Informatics staff be fully engaged in this process. For this to be the case there needs to be the right staff, in sufficient numbers with the right skills. The Department of Health-NHS, (2002, pp. 2-3) emphasized that all staff working in the NHS need a level of competence in Health Informatics. Basic IT skills underpin the effective use of information technology in daily use to support many health care practices. To this end the European Computer Driving Licence (ECDL) has been adopted as the referenced standard for NHS staff covering the basic use of information technology.
Healthcare professionals increasingly recognise that collecting and using information effectively is a fundamental part of their professional practice. The skills and knowledge needed to do this are set out in the document Learning to Manage Health Information; a theme for clinical education appears in CPD guidance and benchmark statements for each profession to underpin the education and training of health professionals.

This strategy recognises this theme and the importance of appropriate skills and knowledge for users of technology and health information, but is primarily concerned with those staff for which Health Informatics is their whole role or a major part of their role. These staff need highly developed specialist skills and knowledge to carry out their work.

It is based on the following system of underpinning values:

- That the effective use of information and technology in a health care setting does contribute directly and indirectly to improved patient care. There is increasing testimony from national and individual audits of organisational performance that inadequate technology and problems with the collection of, and access to, information of a quality that can be reliably used to inform patient care decisions, is a direct contributor to failures in health care delivery.

- That training and development in Health Informatics skills and knowledge does contribute to the effectiveness of the NHS workforce to utilise the investment in new information technology to directly benefit the delivery of patient care.

- That recruitment and career development of a specialist Health Informatics workforce in line with the emerging health professional framework for the NHS will enable them to make the best possible contribution, individually and collectively to improving health and patient care.

8.2.3 Co-operation and Co-ordination:

Co-operation and co-ordination between parties of the issue, such as the Ministry of Health and other governmental and private health sectors, in addition to medication suppliers, the Ministry of Higher Education, Saudi Food and Drug Authority (SFDA), Saudi Association for Health Informatics (SAHI) and Saudi Pharmaceutical Society (SPS), plays a key role in the activation of the integration of the health information systems picture. The majority of responses from medication companies and suppliers in the interviews accepted to co-ordinate and co-operate and to be a part of any project for the development of a health information system. As mentioned in Chapter 6 some of them have the full arrangements for participation in any medication field on electronically governmental projects and are ready from their side to
provide all software and hardware and technical requirements. Seeley and Urquhart, (2007, p. 1) mentioned that:

"The development of reliable, usable and transferable information/knowledge into a system that requires the co-operation of a wide range of professionals, including healthcare providers, planners and policy-makers, is difficult to implement. In order to turn strategy into results at organisational and macro-organisational level"

In a shortened version of a study about improving stakeholder cooperation in UK public health, Carruthers, (2007, pp. 1-4) illustrated that all healthcare organizations have stakeholders. Stakeholder theory views cooperation as exemplifying mutual acceptance among all stakeholders of each other's right to participate in the problem domain, as well as the capacity to participate. Incorporating a stakeholder theoretical approach into modelling interorganizational marketing relationships makes strategies more realistic and better able to adapt and influence changes in the external marketing environment. There should be an acknowledgement by both stakeholders that there is a need to work together cooperatively and that co-operation cannot simply be imposed upon stakeholders through a government mandate (exigency). The stakeholder cooperation approach can make a legitimate contribution to this improvement, and the "guiding" recommendations should encourage managers to think strategically about how to maintain and enhance the nature of their interorganizational relationships.

8.3 Technology Element:

The technology element is the tool which is needed for the implementation of the HIS project. This study explored that the element of ICT in the health services should take its place within a wide section of health sectors and in other sectors which could provide services to support the health system. The infrastructure for communication needs more improvement and the Ministry of Health, as well as other governmental and private health sectors, need to develop the infrastructure of the buildings to accept the changes once they have established a new system with new technology or have taken this into their consideration.

In Chapter 7 the root definition indicated that any health information system must provide a high quality technical means to meet users needs and advanced services in this new age of ICT-led developments. The results of the questionnaires survey show that a lack of information technology use in health sectors has affected health services. Weaknesses in the existing system were also represented by a lack of information technology use in health sectors, such as the link
via electronic systems to other health sectors and between pharmacies, the Ministry of Health and the Saudi Pharmaceutical Society to develop medication services. The majority of physicians and pharmacists emphasized that their workplace is not an information system member that is linked to the Ministry of Health, medication suppliers and other medical sectors. In addition, pharmacies work without any technical programmes or machines; all drug stocktaking operations are carried out manually and the system used by companies and distributors is also manual and completed without any technical or computerized use.

To draw a vision of IT in the health system, modules which are applied in other countries need to be seen. Some of the main elements highlighted by Wright, (2002, pp. 10-11) on the Wanless’s vision of the NHS in 2022, were identified in the Interim Report as key to a high quality service and emphasized that the importance of ICT indicated:

- Safe, high quality treatment.
- Fast access.
- An integrated, joined-up system.

These principles would mean in practice in a future NHS:

- Patients fully involved in decisions about the prevention, treatment and management of illness, with the principle of “informed consent” to treatment being replaced by a concept of “informed choice”.
- Individuals taking more responsibility for their own health, with information and interactive advice available via the internet and digital TV.
- The NHS able to recruit and retain well-motivated staff, able and willing to develop their skills and take on new, more challenging roles.
- Use of modern and integrated ICT (information and communication technology), permitting access to electronic health records, use of electronic prescribing and booking of appointments at patients’ convenience.
- Consistently high quality care, in appropriate settings, with smooth integration between different types and settings of care.
- Ready access to health professionals in both primary and secondary care.

In the area of ICT the ways of closing the gap between the current services provided by the NHS and the ideal service described in the Report included:
Ensuring that all NHS staff are able to spend 10% of their time in "clinical governance" activities, so that they are able to monitor and develop the quality of the services they provide.

- Reducing waiting times for hospital treatment, firstly (in line with the NHS Plan) to three months for out-patient appointments and six months for in-patient care by 2005-06, and to three months for both in-patient and out-patient services by 2008-09, and then to two weeks for both in-patient and out-patient services by 2022-23.

- Replacing one third of the hospital and community health service estate over the next 20 years; upgrading or replacing the entire primary care estate over the next 10 years; replacing equipment every eight years; and doubling current expenditure on ICT.

### 8.3.1 Infrastructure, Hardware and Software:

This area of the issue previously illustrated that the plan is now to complete the first stage of the infrastructure and establish hardware at all branches of the MOH. The IT Manager at the IT Center in the MCH mentioned in Chapter 6 that the software which is used at the majority of the largest governmental and private hospitals in Jeddah, such as the Maternity and Children's Hospital (MCH) is a semi-integrated system, linking all departments to each other including the pharmacy, which receives orders from the physicians to prepare medication for patients. However, the answers from the questionnaires clarified the lack of ICT use in the health sector and highlighted the difficulties and problems patients face with traditional methods which are dealt with in the health services.

In the United Kingdom healthcare reform is high on the policy agenda, and eHealth activities are recognised as a key necessary component. However, the goal to provide an integrated IT infrastructure and systems for all NHS organisations in England by 2010 continues to present significant challenges. The National Programme for IT is a large, complex programme within the NHS, one of the world's largest organisations, itself undergoing radical change to deliver better healthcare for people. A key challenge is to introduce modern information technology and the business changes necessary to exploit it fully without impacting the safe delivery of care. The Programme has set ambitious and challenging targets to deliver systems to provide defined benefits and believes it is better that there should be delay to the implementation of a system to get it right for patients and clinicians, rather than deploying it rapidly and getting it wrong. Significant focus is also being placed on ensuring that NHS organisations can and do play a full part in implementing the programme system and can make the best use of the programme's systems to improve services (European eHealth Research Area, 2007, p.75).
Chapter – 8

Discussion

Meeting the challenges of delivering healthcare in the 21st century requires much improved IT-enabled business systems based on a new IT infrastructure, irrespective of whether care is delivered through the NHS or otherwise, and irrespective of the method used to fund the healthcare system. These improvements need to build on what is already in place and to facilitate the sharing of knowledge, information and workflow across care communities and to include patients and their carers. Such an informatics infrastructure is critical to the successful implementation of Government healthcare policy, and in particular is fundamental to:

- The development of choice and contestability in the healthcare system, ensuring that money follows patients and where possible improves quality, efficiency and innovation within a framework of evidence-based commissioning.

- The engagement of patients, their carers, and the public in the prevention of disease and the management of their own health.

- Applying managed care principles to improve the quality of treatment for chronic disease, to avoid expensive emergency interventions and to improve quality of life and economic productivity.

- Enabling the use of new technologies to deliver care closer to patients, and to enable them to remain in their own community for as long as possible.

- Restructuring of the healthcare workforce and other resources to cope with the impact of demographics on both the demand and supply side of healthcare.

This is not easy to do in a complex adaptive system such as the English NHS, and is bound to cause some disruption (BCS HIF Strategic Panel, 2006, p. 6).

Table 8.1 National Systems and Services at end June 2008

<table>
<thead>
<tr>
<th>Activity</th>
<th>Progress Made</th>
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<tbody>
<tr>
<td>Providing IT infrastructure and broadband for the NHS</td>
<td>32,000 connections</td>
</tr>
<tr>
<td>A central email and directory service for the NHS</td>
<td>360,000 users</td>
</tr>
<tr>
<td>An individual electronic NHS Care Record for every patient in England</td>
<td>486,000 users registered for access to the Spine</td>
</tr>
<tr>
<td>Electronic booking service offering patients greater choice of hospital or clinic</td>
<td>8,652,000 bookings</td>
</tr>
<tr>
<td>To make prescribing and dispensing safer, easier and more convenient for patients</td>
<td>89,834,000 prescriptions</td>
</tr>
<tr>
<td>Capture, store, display and distribute static and moving digital medical images</td>
<td>640,764,000 images stored</td>
</tr>
<tr>
<td>To support commissioning through Payment by Results in the Secondary Uses Service</td>
<td>1,000,019,000 records stored</td>
</tr>
</tbody>
</table>

Health Informatics Review: Report 2008
In the plan of the use of ICT in the prescriptions The Department of Health, (2002, p.12) mentioned that in developing a National Prescriptions Service, the Electronic Transfer of a Prescriptions project has created partnerships from the private sector through three consortia who have agreed to deliver pilots trials. Three were started in June 2002. The pilots were run at the end of 2002. The pilots were supported by a formative evaluation programme. Designed to run in parallel with the pilots, changes were recommended as they proceeded to minimise any delay between the conclusion of the pilots and the delivered evaluation in March 2003.

It was anticipated that the trials would continue to grow and involve a sizeable number of GPs and pharmacists with a natural migration into rollout. This project created greater connectivity to NHSnet for Pharmacists allowing the access to the benefits that this service provides. In parallel the Prescription Pricing Authority will have re-engineered their systems to ensure that they prescribe electronically. The National Prescriptions Service was 50% implemented by 2005 and should be fully implemented by 2006/7.

The report which was introduced to The Institute for Public Policy Research (IPPR) in the UK by Bend, (2004, p.85, pp. 87-88) mentioned the role of successful change management in the health services by using the ICT, and claimed that public value is unlikely to be delivered simply by the procurement of hardware and software, but is likely to depend on successful management of positive change that is facilitated by that technology. In the past however, projects have simply bolted on new technology without paying sufficient attention to change management. In order to avoid the suboptimal outcomes, those are likely to be the result of ignoring the need to manage change effectively:

* Given that the level of success of the National Programme for IT in the NHS (NPfIT) is yet to be determined so, in the case of future projects, while ensuring centrally set standards, decisions about the appropriate level of central control over procurement and implementation must be made on a case by case basis.

* All projects must ensure, as part of bids for funding, that sufficient capacity exists to accommodate the change management processes associated with the introduction of new ICT systems. In particular this should include:

  > An assessment of the likely needs in terms of time and skills for clinicians, managers, patients, those with specialist ICT skills and others.
An estimate of the likely cost of the change process, to be taken into account alongside the cost of hardware and software when decisions about the project are being made.

He added, in the past, that funding for ICT projects seems to have been too low. The response to the Wanless' report has been a large increase in spending on ICT. The challenge for the future, in the context of considerable competition for public resources, is to ensure that projects are given funding commensurate with the amount of public value that they are likely to deliver. In order that this is the case:

- Decisions over the funding of future ICT projects must be taken into account, so far as is possible given the scarcity of evidence, an estimate of the level of benefit likely to be delivered by those projects.

- Conduct as soon as possible the planned survey of local NHS ICT budgets in order to ascertain whether more funds are required, both in order to support the implementation of NPfIT and for other ICT related projects.

- Plans for all new projects should contain, as a matter of course, an assessment of the likely costs of implementation of that project as well as of the necessary hardware and software.

8.4 The Contribution of the Systems Intervention to the Study:
This research study provided the first systems intervention for the health system in Jeddah in KSA. It draws on similar studies applied to health information systems in parts of the developed world. The use of SSM allowed not only understanding of the issues, but also led to the provision of a proposed vision to improve the existing problem situation. Checkland's soft system methodology (SSM) has been used in different sectors, including health. This was indicated by Jacobs, (2005) in his study on the role of SSM in the UK health system, as well as Bell and Christina, (2006) who referred to systemic intervention by using the SSM in their study in the UK NHS. Moreover, Hughes (2007) used SSM to study how health informatics practitioners in England's NHS view their personal and professional development.

The information gathered during the fieldwork was presented as stage 1 of the SSM. Four perspectives were taken as a set of problem issues, the Professionals 'Physicians and Pharmacists', the Beneficiaries 'the General Public', the Competent Authority 'the Ministry of Health' and the Providers of Medication Services. Stage 2 of the SSM, the rich pictures, reflected upon the real life situation in the four areas of the study in pictorial form. In Chapters 5 and 6, more detail about the nine relevant systems originally identified was given. These nine
systems were reclassified into three, value system issues, technical issues, co-operation issues. Stage 4 of the SSM, the conceptual models identified the activities of the model.

The important part of SSM concerned the comparison process between the conceptual models and the real world, which related to Stage 5 of SSM. This comparison helped to explore the debate concerning the problem situation. The main outcome of the SSM application related to the improvement of the problem situation and the change identified through the implementation of an action plan, both within the Ministry of Health, governmental and private health sectors and the medication suppliers. The action plan consisted of change in structure, change in procedures and change in attitude.
9. Conclusion

9.1 Introduction:

This chapter will link the aims and objectives of the study to the major findings. It will reflect the hypotheses and research questions as well as present conclusions, recommendations and suggestions for future work that may be derived from the study. As a final point a number of recommendations will be provided as part of an action plan for the implementation of ICT within the MOH and the other governmental and private health sectors. Some suggestions will be provided as to possible future research in this area.

9.2 Conclusions:

The research presented Checkland's SSM which was used in a comprehensive research study to investigate ICT in combination with health information in Jeddah in Saudi Arabia. The advantages of the use of SSM are not only to learn and understand about the issues under investigation, but also, to produce a plan of action to improve the problem situation.

In order to test these objectives, the study employed two complementary assessment tools: the first, health staff and the general public survey to test the degree of satisfaction within health services and the availability of ICT, as well as the problem with the current method of prescribing medication and the difficulties with handwritten prescriptions. Secondly interview questions were designed for officials at the Ministry of Health, as well as officials of the suppliers of some a demonstration medication companies. With regards to the survey, 1005 questionnaires were distributed to governmental and private health sectors. The questionnaire concentrated on the availability of ICT services within each sector, attitudes of staff towards the use of ICT and the problems which physicians, pharmacists and the general public face.

As indicated in Chapter 6, a total of fifteen interviews were conducted, eight of which with were the directors of the departments at The Ministry of Health in Riyadh and at the Directorate of Health Affairs in Jeddah, as well as six interviews carried out with the marketing directors of medication companies and suppliers, two of which were at the head offices in Riyadh and four were at the branches in Jeddah. In addition, one interview was carried out with the supervisor of the project of the Health Information System in Jeddah at the Balsam Healthcare Corp. Ltd. (BHC). These interviews covered major issues such as the current status of Information Communication Technology (ICT) and the Health Information System (HIS),

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The ICT and medication supplying activities and services, the new Health Information System (HIS) and the ability to link and develop medication services and the impact of the traditional way of medication prescribing on health services and patients. The two investigative tools represented a comprehensive package that examined the main issues of this study.

9.2.1 Hypotheses Testing and Research Questions:
The findings of the questionnaire survey and interviews confirm the hypotheses of the study; the first hypothesis (H1) emphasised that health sectors in Jeddah City lacked information technology and communication systems to update knowledge and availability of medication.

The answers to the hypothesis question came from the findings of the questionnaire surveys and interviews and indicated in Chapter 5 that the majority of participants confirmed that there was a lack in the availability of electronic information resources for physicians to currently check drug interactions while prescribing medication and patient safety. Moreover, they confirmed that they did not have any opportunity to use the computer in order to obtain patient and medication information. In addition they did not have in their work location any electronic system connected to other health sectors.

On the other hand, the interviewees supported the first hypothesis (H1) in their responses, which clarified in Chapter 6 that there are difficulties facing people who need to know what physicians prescribe in their prescription and the dose that they should be taking. Moreover they confirmed that in Jeddah there is dissimilarity within the health sector as to ICT use, although most locations have computers for office tasks. Their responses mentioned that the largest private hospitals used ICT for patient admittance, reservation and file records as well as to send prescriptions to the internal pharmacy. They also indicated that recently the MOH started using ICT at several hospitals in its locations.

Testing and answering the questions of the second and third hypotheses were assessed in Chapters 5 & 6 from the findings of the questionnaire surveys and interviews. The answers supported the hypotheses as to the regular use of traditional methods of prescribing medication in Jeddah City, which had led to defective medication services. Furthermore, health professionals and patients in Jeddah City emphasised the problems and disadvantages of the current method of medication prescribing and prescriptions. The questions focused on the paper prescription system, which used the handwritten method for prescribing medication as well as the difficulties, and the problems, which patients faced with it.
The responses of the interviewees in Chapter 6 confirmed the Questions of the (H2 & H3). Participants confirmed that there were problems with the handwritten prescription method; in addition there was no control on the repetition of the medication or on the way of selling it. Furthermore, the interviewees mentioned that the role of the new Information Technology (IT) would help to reduce the defects, which they faced in the current procedure in medication prescribing. They indicated that the picture had changed for people who use electronic prescriptions in hospitals as the new system. Moreover, they illustrated that the method to solve the problems must begin with the electronic system. This must be established in all health sectors via the use of computer systems in all departments for all people who work in hospitals and clinics and link them to pharmacies to consider that the high percentage of problems will disappear.

The final hypothesis received responses from the questionnaire surveys and interviews by confirming that the Ministry of Health, pharmaceutical companies and suppliers have been unable to develop medication services; as a result they require an information system to provide real statistics on the size of medication prescribing and consumption.

Participants answered in Chapter 5 that most pharmacies do not have an efficient electronic process in place to obtain critically needed medication when this is not immediately available in the pharmacy. In addition they worked without any technical programmes or machines moreover all drug stock taking operations are carried out in the traditional way and medication, which is supplied, by companies and distributors is fully complete without any technical or computerized use.

On the other hand their responses emphasised that the Ministry of Health is unable to predict the availability of medication on the local market nor provide accurate statistics on medication consumption. Moreover they confirmed that there is no connection between the Ministry of Health, the Saudi Pharmaceutical Society and health sectors such as hospitals, and pharmacies to develop medication services.

The findings from the questionnaire surveys and interviews employed the Soft System Methodology (SSM) as indicated in Chapter 7. The process of implementing the SSM ensured a greater understanding of the issues that correspond to the identified problem themes. The hypotheses and the answers of questions were presented in the rich pictures (RP) and reflected conceptual models for each of the relevant systems which included changes to the Health System of the Ministry of Health and other Governmental and Private Health Sectors,
technological changes to improve ICT provision and cultural changes to improve decision-making for the providers of health services.

9.2.2 ICT within the Health Sectors:
The initial objective of this study was to examine the methods used by physicians to prescribe medication and how this information is updated in regards to new medication products. It was also to realize the current situation of the systematization of the supply system for prescriptions at pharmacies and to investigate the problems which patients face with the current method of medication prescribing. The principal source of information used to achieve this objective was literature based. This review revealed the similarities of the problems which the health sectors face and the differences in the role and use of ICT in the study issue. The literature illustrated the experiments carried out in developed countries such as the United States, the United Kingdom and Finland and those experiments carried out in developing countries, such as Brazil and Taiwan, as well as highlighting the role of using IT in the medication and pharmacy services in Saudi Arabia. The findings in Chapters 5 and 6 presented the benefits of ICT use, as well as its lack in the health service, the need to solve the problems of medication prescribing, the difficulties with handwritten prescriptions and the maladministration of the systematization of the supply system for prescriptions at pharmacies.

9.2.3 ICT at the MOH and at the Medication Suppliers:
The second objective of this study was to investigate the role of the Ministry of Health (MOH) in developing a pharmacy system and a medication prescribing method, as well as to define the role of local pharmaceutical companies, providers and distributors in medication supplies and the information systems they use to supply the health sector. The principal source of information used to achieve this objective were interviews with officials at the Ministry of Health and medication suppliers. This study concluded that all respondents indicated that they used a basic means of communication in their daily work, as well as a limited use of ICT, such as the Internet. Furthermore, respondents wanted to increase their co-operation and co-ordination with the Ministry of Health to overcome the difficulties they face which pointed to the importance of establishing an information system to make links easier, while acknowledging a lack of cooperation and coordination among health sectors. In Chapter 7 the SSM focused on ICT and the co-operation and co-ordination as elements needed to solve the problem issues within the co-operation between the Ministry of Health and other Governmental and private health sectors.
9.2.4 Systemic Improvement:
The third and final objective of this research study related to identifying the change processes required to bring about systemic improvements in the Saudi Health System (SHS) at the Governmental and private health sectors. In addition, it highlights the experiment of the health information system of the NHS in the UK which ensures pharmacies and medication information systems are used in developing health service sectors. This was achieved by using a set of research methods that provided rich data and information to form a road map. The use of SSM as the methodology helped to ensure a deeper understanding of the issues that related to the identified problem themes and assessed the changes required to improve the problem situation at three levels: value system issues; technical issues and issues associated with co-operation.

To conclude, the aim of the study in regards to the role, impact and the use of ICT, was placed within a wider context of issues that relate to the value of the system of health strategic planners, the health sector decision makers and the medication suppliers which place them on the co-operation target to improve the Saudi health system by establishing a Health Information System. In this respect, the role of SSM has moved towards providing content for organisational learning. The change should demonstrate internal and external changes, such as within the Ministry of Health and within other governmental and private health sectors in planning and co-operation to develop the infrastructure, ICT use, training and performance.

9.3 Research Limitation:

There are several limitations of this study, which are likely to have influenced the stages of research preparation as well as the outcome of study. These limitations were first, related to design and the language of the questionnaire in addition to the distribution technique. A second limitation was related to the researcher who was not able to undertake the interview with the study interviewees as expected. These limitations restricted the study implementation period.

- Designing the questionnaire for three groups of participants in an understandable form and a comprehensive coverage relevant to the subject moreover in order to save participant time this required extra time from the researcher in formulating the questions.
- The initial questionnaire was written in English and as the researcher mentioned in Chapter 4 (4.3.4) the questionnaire was translated into Arabic for the purpose of permitting respondents with little or no knowledge of English to respond. This led to the researcher taking extra time to produce the questionnaire in an uncomplicated and acceptable form.
As mentioned in Chapter 4 (4.3.6) during the pilot study the researcher observed that physicians and pharmacists were busy in their work, and as a result their answers were to prove unreliable and provide precipitated answers since participants did not have enough time to respond. Similar observations were noticed with the general public "patients" since it was not suitable to distribute the questionnaire to them in the waiting areas and as a result contributed to making their responses weak or the non-guarantee of their return. As a result, the researcher implemented a daily work plan to manage time by using a map of Jeddah to classify areas by dividing the population and the health sector locations, according to regions.

The second limitation concerned interviews which were conducted and designed for the two groups of interviewees. Their locations were part of these limitations, which placed pressure on the time factor, as the first group were in Jeddah City while the second were in Riyadh City.

As the researcher previously indicated in Chapter 6 (6.1) certain obstacles were presented in regards to carrying out the interviews as required. In spite of all the limitations Semi-structured interviews were conducted and designed for the two groups by arranging another visit to those interviewees who had cancelled their appointments. Moreover for interviewees who had requested they obtained a copy of the questions to read before they responded to them. Moreover, the researcher had written the answers by hand for those interviewees who had refused to give permission for their interviews to be recorded.

This study is limited to major hospitals, dispensaries (Primary Health Care Centres), clinics and pharmacies in one city in Saudi Arabia. Similar studies may explore other cities in the same country. Moreover, other comparisons of implementation of Information Technology use in different countries will help find other factors that affect health services and present solutions in solving medication errors and health information system problems.

9.4 Recommendations:
There are a number of considerations which could be made to the Saudi Health Information System (SHIS) to increase its usefulness and applicability. These considerations are suggested to enable the health system to improve its goals:

- The majority of the governmental sectors employ computers and networks in their work, in spite of the differences in financial possibilities, infrastructure, equipment, qualification of manpower and the targets of its use. However, the use of ICT is important, but introducing this aim is most important and will provide value within society. The Ministry of Health
should reformulate the definition of the health system by recognising the value of ICT for the purpose of delivering a comprehensive HIS. The Ministry of Health should also introduce the role of the HIS in a clear form through the use of ICT. It should be in the main level of the Ministry’s formation framework. Furthermore, clarification is required to highlight the system’s aims, the dimensions of the services, the geographical range of the project, the stages of implementing and the tasks to perform. The Ministry of Health should illustrate the efforts required for developing the health sectors and the medical services and illustrate the role of Information Technology (IT) within this development.

• Saudi development plans are being implemented in structural and short range stages; they are planned for five years and each plan will review the projects which have already been carried out, as well as future projects in process. The planning for HIS should be within a strategic plan which includes long range planning. This planning should be within applicable stages where each stage will have a positive effect which is to be visible and real, as well as taking ICT into consideration.

• During the planning for establishing the HIS, the Ministry of Health should take into consideration all other health sectors, such as governmental sectors that were established as non-subordinating managerially from the Ministry of Health, for example, King Faisal Specialist Hospital and Research Centre, the universities’ hospitals and the Saudi Airlines Medical Services Centre. Also, the military health sectors, such as the hospitals of the National Guard Health Affairs, the Security Forces Hospitals Programme and at the Armed Forces Hospitals.

• Pharmaceutical and health informatics. In addition, it should take into consideration the sectors which provide services related to the health system, such as the pharmaceutical and drugs companies, the suppliers and providers of medication and medical equipment, along with the societies, the authorities and associations of food, drugs. All of these should be partners of the health system and support the system database.

• To have success and integration as a reality in the Health Information System (HIS) will need co-operation to make every effort between numerous parties, along with the governmental and private health sectors who perform a primary role and provide direct health services, such as the hospitals, clinics, primary health care centres and pharmacies. There are also other sectors performing an aide role, such as pharmaceutical and medication societies, the Ministry of Higher Education "health colleges, departments and institutes", Saudi’s Mail, the Ministry of Municipal Affairs and the Ministry of Interior. For
example, the Ministry of Interior has the full possibility to support the database of the HIS
by holding the correct citizens' names in Arabic and English, moreover their information
such as blood type, finger prints and addresses...etc. This information will be helpful in the
event of an emergency or in unknown cases. On the other hand, the Ministry of Higher
Education "health colleges, departments and institutes", Saudi's Mail, the Ministry of
Municipal Affairs, could all support the HIS by preparing the needs of the infrastructure in
the cities and providing vocational training for the professionals.

- The Ministry of Health should evaluate the current situation at the other governmental and
private health sectors, as well as realising the ability and the preparation required,
particularly in regard to ICT, which will be a future part of the Saudi HIS.

- It is useful to own knowledge about world applications in Health Information Systems, but
to do this more practically, specialists from different fields such as physicians, specialists in
health informatics, computer and systems engineers, health managers and planners should
be delegated. Sending them to countries which have a broad experience of learning for
training and to gain experience from experts is vital in order to design the best vision for
the dimensions of the system.

- Training and practicing while establishing the HIS and how to use IT is required. However,
it is crucial to carry this out as a curriculum programme in higher education, moreover, the
Ministry of Health should find an administration experienced in developing and training in
this field.

9.5 Suggestions for Future Studies:

This study concentrated on the importance of the Health Information System in the Saudi
Health System. Based on the findings of this study; a number of areas need further research to
illustrate their roles in supporting and making the health system a success. Some of these are as
follows:

- There is a need to carry out a documentation study of the previous and current health
development plans for the purpose of developing its contexts within a general strategic
plan. This is in order to reform the framework of the Ministry of Health within the work
environment based on a Health Information System (HIS).

- There is a need for an in depth survey study for other governmental and private health
sectors to investigate their preparations as to the availability of ICT and to evaluate their
capability to be members of the new health system which will work via HIS.
• Research is needed to investigate the infrastructure in Saudi cities and to compare this with the impact of ideal urban planning, while establishing a complementary base of services such as communication, mail, house postcodes, Global Positioning System (GPS) services, in developing health services by using the HIS.

• Further research will implement an evaluation of the impact of training and performance motivation in health sectors which deal with ICT under the umbrella of the HIS, as well as evaluate the role of the Higher Education sector in developing its curriculum programmes in health informatics and electronic health systems which are available within colleges and departments.

It is hoped that through this study and the results of the above conclusions, recommendations and suggestions for further research, the Ministry of Health and other health sectors will have an opportunity to analyze useful information which will help them to plan for a future vision with practical steps.


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APPENDIX- 1

Formal Letter for Requesting Permission to Circulate Questionnaires
Dear Sir,

I am a PhD student in the Information Science Department at Loughborough University - Uk. The work involves a design of the Pharmacies and Medication Information System in Jeddah city, Saudi Arabia. It is expected that the result of the study will help the researcher to design and implement better solutions for Pharmacies and Medication Services by establishing an electronic information system in Jeddah city.

As the Ministry of Health is responsible for Medication Services in Saudi Arabia I would therefore be most grateful for the opportunity of approaching you to request permission and help to circulate the attached questionnaire to the intended Hospitals (physicians, pharmacists and patients).

I assure you that any information that you may provide would certainly be confidential and used solely for the purposes of this research study.

I thank you for your cooperation.

Yours faithfully,

Mowafag Allaf
APPENDIX-2

Questionnaires in English
Dear Participant:

The attached questionnaire concerns the Pharmacies and Medication Information System in Jeddah city. This study is to investigate the current situation of prescription prescribing and its effect on health services.

This investigation expects that it will produce an electronic system for the government and private health sectors in medication prescribing. Furthermore, it will develop professional medication information resources that will lead to improving the health services in Jeddah city and all others cities in Saudi Arabia.

Your opinion will contribute to the enhancement of healthcare services in Jeddah City. Your personal data and responses will remain confidential and used solely for the purposes of this research study. Therefore, please answer all the questions in the accompanying questionnaire. I am very grateful for your participation in this survey and your commitment to enhance healthcare services.

Thank you very much for your time. I look forward to receiving your reply at your earliest convenience.

Yours faithfully,

Mowafag Allaf
Part One  |  Personal Details
--- | ---
Please select and circle the appropriate response

<table>
<thead>
<tr>
<th>1 Nationality</th>
<th>Saudi</th>
<th>Non-Saudi</th>
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</table>

| 2 How many years have you been in your work field practice? |
|---|---|---|---|---|
| 0 - 5 Y | 6 - 10 Y | 11 - 15 Y | 16 - 20 Y | > 20 Y |
| 1 | 2 | 3 | 4 | 5 |

<table>
<thead>
<tr>
<th>3 What is your qualification</th>
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<th>4 What is your Department</th>
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<tr>
<th>5 Do you have an experience in computer? Please Tick the box</th>
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If the answer in question (5) is (No), please go to Part Three

Part Two  |  Experience in Computer Use
--- | ---

| 6 Do you currently use a computer in your job? Please circle the number under the appropriate response |
|---|---|---|---|---|
| Never | Rarely | Occasionally | Often | Always |
| 1 | 2 | 3 | 4 | 5 |

| 7 What is your computer background level? Please circle the appropriate number from the boxes below: |
|---|---|---|---|---|---|---|---|---|---|
| No Experience | Little Experience | Intermediate Experience | Advanced Experience | High Experience |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

| 8 How many hours a week do you use a computer at your work place. Please circle the number under the appropriate response, notice that (m) is mean minute & (h) is hour. |
|---|---|---|---|---|
| 1 m - 1 h | 1 - 4 h | 4 - 7 h | 7 - 10 h | 10 - 12 h |
| 1 | 2 | 3 | 4 | 5 |

| 9 How do you evaluate your experience in the following? Please circle the number under the appropriate response |
|---|---|---|---|---|---|---|
| A Microsoft Office Programs such as Word, PowerPoint, Excel, Access, etc... |
| No Experience | Beginner | Intermediate | Advanced Level | Expert |
| 1 | 2 | 3 | 4 | 5 |

| B Internet browsing skills |
|---|---|---|---|---|
| No Experience | Beginner | Intermediate | Advanced Level | Expert |
| 1 | 2 | 3 | 4 | 5 |

| C Medicine and Pharmaceutical Databases Searching |
|---|---|---|---|---|
| No Experience | Beginner | Intermediate | Advanced Level | Expert |
| 1 | 2 | 3 | 4 | 5 |

| D Electronic Prescription System |
|---|---|---|---|---|
| No Experience | Beginner | Intermediate | Advanced Level | Expert |
| 1 | 2 | 3 | 4 | 5 |
Part Three - The need and the opportunity for information technology use, the attitude of the current situation for medication prescribing as well as the prescription, the difficulties and the problems with the handwritten prescription, information technology and medication services as well as the role of the pharmacies.

10 Do you have in your work place any electronic system connected to other health sectors such as:

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<tbody>
<tr>
<td>Hospitals, dispnsrs, clinics</td>
<td>Yes</td>
<td>No</td>
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<td>Suppliers or distributors or medication dealers</td>
<td>Yes</td>
<td>No</td>
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<tr>
<td>Pharmacies</td>
<td>Yes</td>
<td>No</td>
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<tr>
<td>The Ministry of Health</td>
<td>Yes</td>
<td>No</td>
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If there are other sites please write these down.

Please circle the number under the appropriate response for questions (11 - 28).

11 Do you have any opportunity of using the computer in order to obtain patient information?

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12 Do you have any opportunity of using the computer in order to obtain information about medication?

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13 Do you think it is necessary to use a computer in order to obtain patient and medication information to complete your works?

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14 Do you think it is necessary to use a computer in order to prescribe medication?

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15 Do you think it is necessary to use a computer in order to send medication prescriptions to pharmacies?

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16 Did the physicians use the paper prescriptions system to prescribe medication?

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17 Did the physicians use the electronic prescriptions system to prescribe medication?

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18 Did all health providers (physicians) prescribe medication by handwritten prescriptions?

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<td>19 Were the handwritten prescriptions kept by the patient himself after purchasing medication?</td>
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<td>20 Does the Physician ask the patient while prescribing medication whether they prefer the cheaper or more expensive option?</td>
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<td>21 Did the physicians write alternative medication (brand names or generic names) while they were prescribing medication?</td>
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<tr>
<td>22 Did the patients face any difficulties and were there any problems with the handwritten prescription?</td>
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<td>23 Did the physicians ask the patients to bring the medication after purchase to the clinic to check before use?</td>
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<td>24 Is it difficult for patients to read some of the prescriptions?</td>
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<tr>
<td>25 Is it difficult for the patients to read the dose description because it was not clear from the prescriptions?</td>
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<tr>
<td>26 Is it difficult for the patients to read the dose description because it was not clear from the pharmacists?</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
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<td>27 Did the pharmacists need to ask the patient about his health problems in order to be sure of the medication prescribed?</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>28 Were some patients compelled to return to the physician or call them to ask about the medication dose because this was unclear</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
What is the behavior of the pharmacists while medication is not immediately available in pharmacy? Please order from 1-4 in the boxes beside each behavior from your personal experience

<table>
<thead>
<tr>
<th>Behavior</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>a Did the pharmacist advise the patient to buy another brand of medication or similar</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b Did the pharmacist advise the patient to call the physician or go back to him to prescribe an alternative</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c Did the pharmacist call the physician to prescribe an alternative</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d Did the pharmacist advise the patient to visit another pharmacy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Part Four: Do you agree with the researcher about the following contexts which he considers are realities in the current health and medication services in Jeddah city? Please circle the number under the appropriate response

<table>
<thead>
<tr>
<th>Context</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
<th>Don't Know</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 Availability of electronic information resources for doctors to currently check drug interactions while prescribing medication and patient safety</td>
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<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>31 Most pharmacies have an efficient electronic process in place to obtain critically needed medication when this is not immediately available in pharmacy</td>
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<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>32 Most of the pharmacies are working without any technical programs or machines and all drug stocktaking operations are carried out in the traditional way</td>
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<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>33 Useful written information on drugs is available in the pharmacy to patients in the community who do not speak Arabic or English</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>34 The place that I am working is an information system member that is connected to the Ministry of Health and medication companies, distributors and health services sectors such as hospitals, dispensaries, clinics and etc</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>35 The medication which is supplied by the companies and distributors, is fully complete without any technical or computerized use</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>36 The Ministry of Health regularly provides us with technical support and advice</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>37 The Saudi Pharmaceutical Society regularly provides us with technical support and advice</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>
38. The Ministry of Health are unable to predict the availability of medication on the local market as well as provide accurate statistics on medication consumption. 

<table>
<thead>
<tr>
<th></th>
<th>Disagree</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
<th>Don't Know</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

39. There is no connection between the Ministry of Health, the Saudi Pharmaceutical Society and the health sectors such as hospitals, the pharmacies and etc... to develop medication services.

<table>
<thead>
<tr>
<th></th>
<th>Disagree</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
<th>Don't Know</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If you have any comments you wish to make, please write them in the space below:

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

This Section for Use by the Researcher:

<table>
<thead>
<tr>
<th>Study Title</th>
<th>PHARMACIES AND MEDICATION INFORMATION SYSTEM IN JEDDAH CITY, SAUDI ARABIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Researcher Name</td>
<td>Mowafag S. KH. Allaf</td>
</tr>
<tr>
<td>Loughborough University</td>
<td>Mobile: 000000000</td>
</tr>
<tr>
<td>Questionnaire Title</td>
<td></td>
</tr>
<tr>
<td>Name of hospital</td>
<td></td>
</tr>
<tr>
<td>E-Mail of hospital</td>
<td></td>
</tr>
<tr>
<td>Web address of hospital</td>
<td></td>
</tr>
<tr>
<td>Street Address</td>
<td></td>
</tr>
<tr>
<td>Hospital Code</td>
<td></td>
</tr>
<tr>
<td>Distribute Date</td>
<td>Classification Code</td>
</tr>
<tr>
<td>Collect Date</td>
<td>Form Number</td>
</tr>
</tbody>
</table>

- 259 -
Dear Participant:

The attached questionnaire concerns the Pharmacies and Medication Information System in Jeddah city. This study is to investigate the current situation of prescription prescribing and its effect on health services.

This investigation expects that it will produce an electronic system for the government and private health sectors in medication prescribing. Furthermore, it will develop professional medication information resources that will lead to improving the health services in Jeddah city and all others cities in Saudi Arabia.

Your opinion will contribute to the enhancement of healthcare services in Jeddah City. Your personal data and responses will remain confidential and used solely for the purposes of this research study. Therefore, please answer all the questions in the accompanying questionnaire. I am very grateful for your participation in this survey and your commitment to enhance healthcare services.

Thank you very much for your time. I look forward to receiving your reply at your earliest convenience.

Yours faithfully,

Mowafag Allaf
Part One | Personal Details
---|---
Please select and circle the appropriate response
1 Nationality | Saudi | Non-Saudi |
2 Do you have an experience in computer Please Tick the box | Yes | NO |

If the answer in question (5) is (No), please go to Part Three

Part Two | Experience in Computer Use
---|---
3 Do you currently use a computer in your home or job? Please circle the number under the appropriate response

<table>
<thead>
<tr>
<th>Never</th>
<th>Rarely</th>
<th>Occasionally</th>
<th>Often</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

4 What is your computer background level? Please circle the appropriate number from the boxes below:

<table>
<thead>
<tr>
<th>No Experience</th>
<th>Little Experience</th>
<th>Intermediate</th>
<th>Advanced Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>8</td>
<td>9</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

5 How many hours a week do you use a computer at your work place. Please circle the number under the appropriate response, notice that (m) is mean minute & (h) is hour.

<table>
<thead>
<tr>
<th>1 m - 1 h</th>
<th>1 - 4 h</th>
<th>4 - 7 h</th>
<th>7-10 h</th>
<th>10 - 12 h</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

6 How do you evaluate your experience in Internet browsing skills? Please circle the number under the appropriate response

<table>
<thead>
<tr>
<th>No Experience</th>
<th>Beginner</th>
<th>Intermediate</th>
<th>Advanced Level</th>
<th>Expert</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Part Three - The need and the opportunity for information technology use, the attitude of the current situation for medication prescribing as well as the prescription, the difficulties and the problems with the handwritten prescription, information technology and medication services as well as the role of the pharmacies.

Please circle the number under the appropriate response for questions (7 - 21)

7 Do you think it is necessary to use a computer in order to prescribe medication?

<table>
<thead>
<tr>
<th>Never</th>
<th>Rarely</th>
<th>Occasionally</th>
<th>Often</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

8 Do you think it is necessary to use a computer in order to send medication prescriptions to pharmacies?

<table>
<thead>
<tr>
<th>Never</th>
<th>Rarely</th>
<th>Occasionally</th>
<th>Often</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

9 Did the physicians use the paper prescriptions system to prescribe medication?

<table>
<thead>
<tr>
<th>Never</th>
<th>Rarely</th>
<th>Occasionally</th>
<th>Often</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

10 Did the physicians use the electronic prescriptions system to prescribe medication?

<table>
<thead>
<tr>
<th>Never</th>
<th>Rarely</th>
<th>Occasionally</th>
<th>Often</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

11 Did all health providers (physicians) prescribe medication by handwritten prescriptions?

<table>
<thead>
<tr>
<th>Never</th>
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<th>Occasionally</th>
<th>Often</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Question</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>12. Were the handwritten prescriptions kept by the patient himself after purchasing medication?</td>
<td>Never</td>
<td>Rarely</td>
<td>Occasionally</td>
<td>Often</td>
</tr>
<tr>
<td>13. Does the Physician ask the patient while prescribing medication whether they prefer the cheaper or more expensive option?</td>
<td>Never</td>
<td>Rarely</td>
<td>Occasionally</td>
<td>Often</td>
</tr>
<tr>
<td>14. Did the physicians write alternative medication (brand names or generic names) while they were prescribing medication?</td>
<td>Never</td>
<td>Rarely</td>
<td>Occasionally</td>
<td>Often</td>
</tr>
<tr>
<td>15. Did the patients face any difficulties and were there any problems with the handwritten prescription?</td>
<td>Never</td>
<td>Rarely</td>
<td>Occasionally</td>
<td>Often</td>
</tr>
<tr>
<td>16. Did the physicians ask the patients to bring the medication after purchase to the clinic to check before use?</td>
<td>Never</td>
<td>Rarely</td>
<td>Occasionally</td>
<td>Often</td>
</tr>
<tr>
<td>17. Is it difficult for patients to read some of the prescriptions?</td>
<td>Never</td>
<td>Rarely</td>
<td>Occasionally</td>
<td>Often</td>
</tr>
<tr>
<td>18. Is it difficult for the patients to read the dose description because it was not clear from the prescriptions?</td>
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<td>19. Is it difficult for the patients to read the dose description because it was not clear from the pharmacists?</td>
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<table>
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<tr>
<th>Question</th>
<th>Disagree Strongly</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
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<td>23 Availability of electronic information resources for doctors to currently check drug interactions while prescribing medication and patient safety</td>
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________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

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<th>PHARMACIES AND MEDICATION INFORMATION SYSTEM IN JEDDAH CITY, SAUDI ARABIA</th>
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</thead>
<tbody>
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<td>Researcher Name</td>
<td>Mowafag S. KH. AlIaf</td>
</tr>
<tr>
<td>Loughborough University</td>
<td>Mobile: 000000000</td>
</tr>
<tr>
<td>Questionnaire Title</td>
<td></td>
</tr>
<tr>
<td>Street Address</td>
<td></td>
</tr>
<tr>
<td>Distribute Date</td>
<td>Classification Code</td>
</tr>
<tr>
<td>Collect Date</td>
<td>Form Number</td>
</tr>
</tbody>
</table>
APPENDIX-3

Questionnaires in Arabic
نمذج استقصاء

عزيزي مجيب الاستقصاء

السلام عليكم ورحمة الله وبركاته ،،، وبعد
بين ديك نموذج استقصاء هو بمثابة أداة مستخدمة في منهج الدراسة المقدمة لقسم علم المعلومات بجامعة لفترة بالمملكة المتحدة لنيل درجة الدكتوراه ، وذلك تحت عنوان ( نظام معلومات الصيدليات والأدوية بمدينة جدة بالمملكة العربية السعودية ) ، وهذا الاستجابة صمم لدرجة رائكة تجاه أساليب الوصف الطبية التي يكتبها الطبيب بشكلها التقليدي اليدوي وآثر ذلك على خدمه الدواء و كذلك الحال تجاه طريقة المتاحة في الصيدليات عند إستلام تلك الوصفات ، من جهة أخرى يحقق هذا الاستجابة من الوسائل التي يتم بها تموين الأدوية و تنظيمها والدليل المقرح حال عدم توفرها.
وبإيجابتك على هذا الاستجابة سنتمكن هذه الدراسة من دعم فكرة البحث التي تهدف إلى:
أولاً: توجيه نظم المعلومات الإلكترونية المحتمل تنفيذها لدى قطاعات الصحة الحكومية والخاصة إلى الوجهة الأولى فيما هو مثير في وصف الدواء وفق أحدث نظام المعلومات الطبية المتاحة حالياً.
ثانياً: تطوير مصادر معلومات الدواء عند قيام الطبيب بوصف الوصفة الطبية ، ولاذ ذلك أيضاً مع الصيدليار عند تلقيه تلك الوصفة.
ثالثاً: تطور خدمات الصيدليات والأدوية كجزء من إجمالي الخدمات الطبية عموماً وذلك من خلال تأسيب فكرة استخدام وسائل تقنية المعلومات على مستوى بث الخدمات الدوائية والتموين والتنظيم لها والأسلوب البيع.
من المعروف عليه أن تطور خدمات المجتمع تعتمد على إجراء دراسات علمية تركز في نجاحها على تقسيم مرأي المجتمع نفسه عن تلك الخدمات ، ورأيك اليوم هو بمثابة ركيزة لهذه
الدراسة التي تنتظر مك منك إجّاجها بتجاوزك الذي سيكون محل تقدير واحترام، وأود التأكيد على أن جميع البيانات التي ستشارك بها عن شخصك وعن الأسئلة الأخرى التي ستجيب عليها ستتمتع بحق السرية التامة ولن تستخدم إلا لغرض الدراسة والبحث العلمي، كما أود أن آنوه لك على أنه قد روجت عند تصميم هذا الاستقصاء الاختصار مع التركيز على أهم النقاط التي تخدم محاور الدراسة وذلك مراعاة لوقتك وأن لا يقلق عليك عند الإجابة عليه، وإجراء اختبار الإجابة على الأسئلة من قبل مجموعة من المشاركين تبين أنه لا يتجاوز وقت الإجابة عليه (10 دقائق)، أمل منكم منح هذا الاستقصاء تلك الدقائق مع إمتاني لك وتقديري.

أعبر لك عن شكري لتجاوزك مع خالص التحية.

الباحث

موفق علاف
الجزء الأول

بيانات شخصية

رجاء إختر الإجابة المناسبة برسم دائرة حولها:

1. الجنسية: سعودي

2. من كم عدد السنوات التي عطلت بها في مجالك في هذا المجال؟ 
   1. 3 سنوات أو أكثر 
   2. من 11 إلى 15 سنة 
   3. من 6 إلى 10 سنوات 
   4. من 1 إلى 5 سنوات 
   5. ما هو مؤهلك?

3. ما هي القسم الذي تعمل به؟ 

4. هل لديك خبرة باستخدام الحاسب الآلي (الكمبيوتر)؟ 
   1. راجع أرس دارئة دائرة حول الإجابة المناسبة إذا كانت إيجابية على السواء رقم (5) براءة أو تقليل إلى الجزء الثالث.

الجزء الثاني

خبرة استخدام الحاسب الآلي (الكمبيوتر)

هل تستخدم الحاسب الآلي (الكمبيوتر) حالياً في عملك؟ راجع أرس دارئة دائرة حول الرقم المناسب تحت الإجابة المناسبة: 

5. من 1 إلى 20 سنة 
   6. ما مستوى خبرتك في استخدام الحاسب الآلي (الكمبيوتر) حالياً؟ راجع أرس دارئة دائرة حول الرقم المناسب داخل الجدول التالي:

<table>
<thead>
<tr>
<th>مستوى خبرة</th>
<th>لا توجد خبرة</th>
<th>مبتدئ الخبرة</th>
<th>خبر متقدم</th>
</tr>
</thead>
<tbody>
<tr>
<td>ما بين (2) إلى (4) سنة</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>ما بين (4) إلى (6) سنة</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>ما بين (6) إلى (8) سنة</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>ما بين (8) إلى (10) سنة</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>ما بين (10) إلى (12) سنة</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>ما بين (12) سنة وما فوق</td>
<td>8</td>
<td>9</td>
<td>10</td>
</tr>
</tbody>
</table>

6. ما هي ما ساعدت استخدام الحاسب الآلي (الكمبيوتر) اساسيًا في عملك؟ راجع أرس دارئة دائرة حول الرقم المناسب تحت الإجابة المناسبة مع نص المشخصة إذا كان الرقم من 1 إلى 20 سنة:

<table>
<thead>
<tr>
<th>ما هو ما ساعدت استخدام الحاسب الآلي (الكمبيوتر) اساسيًا في عملك؟</th>
<th>لا توجد خبرة</th>
<th>مبتدئ الخبرة</th>
<th>خبر متقدم</th>
</tr>
</thead>
<tbody>
<tr>
<td>ب تصصف الشبكة العنكبوتيّة (الإنترنت)</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>ت البحث عن خبر من خلال قواعد بيانات الأدبيّة والصيغة</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>ت استخدام نظام الوصاية الطبيّة الإلكتروني</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

7. فرص وضرورة إستخدامات تكنولوجيا المعلومات، الوضع الحالي لأسلوب وصف الدواء والوصفة الطبية، المشاكل والصعوب المترتبة على الوصيفة الطبية المكتوبة بيدنا، تقنية المعلومات وخدمة الدواء ودور الصيدليات تجاه ذلك: 

<table>
<thead>
<tr>
<th>راجع أرس دائرة حول الرقم المناسب بالجواب التالي</th>
<th>لا يوجد</th>
<th>يوجد</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. المستشفيات، مستوصفات، عيادات</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2. مصري أو موزعي أو وكالات الدواء</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3. الصيدليات</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4. وزارة الصحة</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

8. جهات أخرى يمكن من فضلك.

- 267 -
<table>
<thead>
<tr>
<th>رقم الاستمارة</th>
<th>السؤال</th>
<th>الخيارات</th>
<th>الرد</th>
<th>عدد النجاح</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>هل لديك في مركز علاج حاليًا قرصة إصدار الحاسب الآلي (الكمبيوتر) للوصول إلى معلومات المريض؟</td>
<td>دائمًا</td>
<td>أغلب الأحيان</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>هل لديك في مركز علاج حاليًا قرصة إصدار الحاسب الآلي (الكمبيوتر) للوصول إلى معلومات الأدوية؟</td>
<td>دائمًا</td>
<td>أغلب الأحيان</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>هل تعتقد أنه من الضروري استخدام الحاسب الآلي (الكمبيوتر) لطلب الوصل إلى معلومات المريض والأدوية لإكمال أعمالك؟</td>
<td>دائمًا</td>
<td>أغلب الأحيان</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>هل تعتقد أنه من الضروري استخدام الحاسب الآلي (الكمبيوتر) لإجراء وصفة الدواء؟</td>
<td>دائمًا</td>
<td>أغلب الأحيان</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>هل يستخدم الأطباء عند وصفهم الدواء أسلوب الوصف الورقي لكتابة الدواء؟</td>
<td>دائمًا</td>
<td>أغلب الأحيان</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>هل يستخدم الأطباء عند وصفهم الدواء أسلوب الوصف الإلكتروني بواسطة الحاسب الآلي (الكمبيوتر)؟</td>
<td>دائمًا</td>
<td>أغلب الأحيان</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>هل جميع الأطباء في القطاعات الصحية يصفون الدواء كتابة باليد؟</td>
<td>دائمًا</td>
<td>أغلب الأحيان</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>هل يحتفظ المريض بالوصفة المكتوبة يوميًا بعد شرائه للدواء؟</td>
<td>دائمًا</td>
<td>أغلب الأحيان</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>هل يقم الطبيب للمريض عند كتابته وصفة الدواء فرصة اختيار دواء ذو ثمن منخفض أو مرتفع التكلفة؟</td>
<td>دائمًا</td>
<td>أغلب الأحيان</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>هل الطبيب يكتبون الاسم البديل للدواء عند كتابة الوصفة أو (المسمى التجاري أو اسم جنس الدواء)؟</td>
<td>دائمًا</td>
<td>أغلب الأحيان</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>هل يواجه المريض بعض المشكلات بسبب كتابة وصفة الدواء يوميًا؟</td>
<td>دائمًا</td>
<td>أغلب الأحيان</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>هل يطلب المريض من أن يعود إلى المستشفى بعد شرائه الدواء للتأكد منه قبل تناوله؟</td>
<td>دائمًا</td>
<td>أغلب الأحيان</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>هل تصضع أحرفية الوضائف الطبية من قبل المريض؟</td>
<td>دائمًا</td>
<td>أغلب الأحيان</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>هل المرضى لا يستطيعون قراءة مادة الجرعة المكتوبة في الوصفة الطبية لأنها غير واضحة؟</td>
<td>دائمًا</td>
<td>أغلب الأحيان</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>هل المرضى لا يستطيعون قراءة مادة الجرعة المكتوبة أو إشارات الصيدلي على العبوة لأنها غير واضحة؟</td>
<td>دائمًا</td>
<td>أغلب الأحيان</td>
<td></td>
</tr>
<tr>
<td>الجزء الرابع</td>
<td>هل توافق على صحة ما يُبرر عنه الباحث في الفقرات التالية من نصوص يعتقد هو أنها واقع ملموس في الخدمات الصحية الحالية والدوائية بمدينة جدة? رأياً أرسم دائرية حول الرقم المناسب تحت الإجابة المناسبة</td>
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</tr>
<tr>
<td><strong>30</strong></td>
<td>معلومات عن الدواء وحماية المريض</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>31</strong></td>
<td>معظم الصيدليات لديها وسيلة إلكترونية ذات كفاءة عالية يطبقونها للحصول على الدواء حال عدم توفره</td>
<td></td>
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<td></td>
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<tr>
<td><strong>32</strong></td>
<td>حالياً أغلب الصيدليات تدار بدون برامج وتجهيزات أية وجميع أعمالهم يتم بدويًا بطرق تقليدية</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>33</strong></td>
<td>المعلومات المعقدة والتي تُعرف الآدوية تتوفر في الصيدليات للمرضى من المقيمين الذين لا يتحدثون اللغة العربية أو الإنجليزية</td>
<td></td>
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<tr>
<td><strong>34</strong></td>
<td>المستشفى الذي يعمل فيه عضو ضمن نظام معلومات إلكتروني يتصل بوزارة الصحة و شركات ومصانع الآدوية والقطاعات الصحية الخدمية مثل المستشفيات والمستوصفات والعيادات وغيرها</td>
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<td><strong>35</strong></td>
<td>الأدوية التي تتزود بها الصيدليات من قبل المصنعين تتفرغ إجراءات تمويلها بالكامل حتى وصولها للمستفيد منها بدويًا دون استخدام أي وسيلة أية أو إلكترونية</td>
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<td><strong>36</strong></td>
<td>وزارة الصحة تدعم ببرنامج المستشفى الذي تعمل به بالجدير من التنصير والأراء التطويرية</td>
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</tbody>
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<tr>
<th>هل يحتاج الصيدلي من حين لآخر أن يسأل المريض عن مشكلاته الصحية لكي يتاكد من الدواء الموصوف له؟</th>
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<th>هل بعض المرضى يدرون consciente السؤال إلى الطبيب أو الأخصائي به هاتفيًا للعوائد عن الجرعة التي يجب تناولها من الدواء؟</th>
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</tr>
</tbody>
</table>
لا يوجد لدى وزارة الصحة الوسطى التي تساعد على التنبؤ باحتجاجات سوق الدواء مثل الإحصائيات الدائمة على كمية الإستهلاك

<table>
<thead>
<tr>
<th>لا يعرف</th>
<th>موافق لواقح</th>
<th>محايد</th>
<th>لا موافق</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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</tbody>
</table>

لا يوجد اتصال بين وزارة الصحة وجمعية الصيدلية السعودية والقطاعات الصحية مثل المستشفيات والصيدليات وغيرها من أجل تطوير خدمات الدواء

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<th>موافق لواقح</th>
<th>محايد</th>
<th>لا موافق</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

إذا كان لديك أي تعليق أو ملاحظة يسرني أن تخطوه في الاستر التالية شاكراً لك ملاحظاتك وتعليقاتك

<table>
<thead>
<tr>
<th>عنوان الدراسة</th>
<th>نظام معلومات الصيدليات والدواء بمدينة جدة بالمركبة العربية السعودية</th>
</tr>
</thead>
<tbody>
<tr>
<td>اسم الباحث:</td>
<td>موافق صالح خليل علاف</td>
</tr>
<tr>
<td>مبتعث من:</td>
<td>جامعة الملك عبد العزيز</td>
</tr>
<tr>
<td>هاتف نقال:</td>
<td>هاتف ثابت:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>عنوان الاستقصاء</th>
<th>استقصاء أطباء مستشفيات وزارة الصحة</th>
<th>جهة التتابع لها المشارك</th>
<th>رمز الجهة</th>
</tr>
</thead>
<tbody>
<tr>
<td>عنوان الجهة</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>عنوان الصفحة</th>
<th>إنترنت البريد الإلكتروني</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>تاريخ توزيع النموذج</th>
<th>تاريخ إستلام النموذج</th>
</tr>
</thead>
<tbody>
<tr>
<td>رقم النموذج</td>
<td>رقم التصنيف</td>
</tr>
</tbody>
</table>

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نماذج استقصاء

عزيزي مجيب الاستقصاء

سلام عليكم ورحمة الله وبركاته ... وبعد

بين ديك نماذج استقصاء هو بمثابة أداءً مستندماً في منهج الدراسة المقدمة لقسم علم المعلومات بجامعة
الفترة بالمملكة المتحدة لندن درجة الدكتوراه، وذلك تحت عنوان (نظام معلومات الصيدليات والأدوية بمدينة
الملكية العربية السعودية)، وهذا الاستقصاء تم سمعه رأيك تجاه أساليب الوصف الطبية التي
يجبها الطبيب بشكلها التقديمي اليدوي وثر ذلك على خدمة الدواء وكأن الحال تجاه الطريقة المتينة في
الصيدليات عند إسلام تلك الوصفات، من جهة أخرى يتحقق هذا الاستقصاء من الوسائل التي يتم بها تموين
الأدوية وتنظيمها والدليل المقترح حال عدم توفرها. ويجبك على هذا الاستقصاء ستتمكن هذه الدراسة
من دعم فكرة البحث التي تهدف إلى:

أولاً: توجيه نظم المعلومات الإلكترونية المحتملة تلبى هذه لدى قطاعات الصحة الحكومية والخاصة إلى
الوجهة الأخلاقية فيما هو متبع في وصف الدواء وفق أحدث نظم المعلومات الطبية المتينة حالياً.
ثانياً: تطور مصادر معلومات الدواء عند قائم الطبيب بصرف الوصفة الطبية، وحال ذلك أيضاً مع
المصداقي عند تلبية تلك الوصفة.

ثالثاً: تطور خدمات الصيدليات والأدوية كجزء من إمكاني الخدمات الطبية عموماً وذلك من خلال تأسيسل
فكرة استعمال وسائل تكنولوجيا المعلومات على مستوى بث الخدمات الدواكرية والتموين والتنظيم لها وأسلوب
البيع.

من المتعارف عليه أن تطور خدمات المجتمع تعتمد على إجراء دراسات علمية تركز في نجاحها على
تقصي رأي المجتمع نفسه عن تلك الخدمات، ورأيك اليوم هو بمثابة ركيزة لهذه الدراسة التي تنتظر ملك
إيجابها بتجاوز الذي سيكون محل التقدير والاحترام، وأود التأكد على أن جميع البيانات التي ستشارك بها
شخصكم وعن الأسئلة الأخرى التي ستجيب عليها ستتطلب بحق السرية التامة والتقدير في إلغار
الدراسة والبحث العلمي، كما أود أن أقول لك على أنه قد ركتم عند تصميم هذا الاستقصاء الاختصار مع
التركيز على أهم النقطة التي تخيم محاور الدراسة وذلك مراعاة لوقتك وأن يقلل عليك عند الإجابة عليه،
وبإبراز اختيار الإجابة على الأسئلة من قبل مجموعة من المشاركين تبين أنه لا يتجاوز وقت الإجابة عليه
(8 دقائق)، أمل مكم من نماذج هذه الاستقصاء تلك الدقائق مع إمتالي لك وتقدير.

أكرم لك عن شكري لكتجاوز مع خالص التهاني.

الباحث

 موقف علاف
## بيانات شخصية

**رجاء إختيار الإجابة المناسبة برسم دائرة حولها**

<table>
<thead>
<tr>
<th>الجنسية</th>
<th>معين</th>
</tr>
</thead>
<tbody>
<tr>
<td>نعم</td>
<td>لا</td>
</tr>
</tbody>
</table>

**هل لديك خبرة في استخدام الحاسوب الآلي (الكمبيوتر)?** في منزلك أو مكان عملك؟

<table>
<thead>
<tr>
<th>رجاء إختيار الإجابة المناسبة حول الرقم المناسب تحت الإجابة المناسبة</th>
<th>إذا كنت تجاوبت على السؤال رقم (2) (لا) رجاء إختيار الإجابة الثالثة.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>هل تستخدم الحاسب الآلي (الكمبيوتر) في منزلك او مكان عملك؟</strong></td>
<td><strong>إذا كنت إجابتك على السؤال رقم (2) (لا) رجاء إختيار الإجابة الثالثة.</strong></td>
</tr>
<tr>
<td><strong>لا</strong></td>
<td><strong>إذا كنت إجابتك على السؤال رقم (2) (لا) رجاء إختيار الإجابة الثالثة.</strong></td>
</tr>
<tr>
<td><strong>نعم</strong></td>
<td><strong>إذا كنت إجابتك على السؤال رقم (2) (لا) رجاء إختيار الإجابة الثالثة.</strong></td>
</tr>
</tbody>
</table>

**ما مستوى خبرتك في استخدام الحاسب الآلي (الكمبيوتر)؟** رجاء إرسال دائرة حول الرقم المناسب داخل الجدول التالي:

<table>
<thead>
<tr>
<th>خبرة عالية</th>
<th>خبرة متوسطة</th>
<th>خبرة متدنية</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>7</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

**كم عدد ساعات استمتعت للحاسب الآلي (الكمبيوتر) أسبوعياً؟**

<table>
<thead>
<tr>
<th>الساعات</th>
<th>10</th>
<th>9</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>6</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

**هل لديك خبرة في تصفح الشبكة العالمية (الإنترنت)؟**

<table>
<thead>
<tr>
<th>لا توجد خبرة</th>
<th>مبتدأ الخبرة</th>
<th>خبرة مقدمة</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>7</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

## إستخدامات لتكنيولوجيا المعلومات، الوضع الحالي لأسلوب وصف الدواء والوصفة الطبية، المشاكل والصعاب المرتبطة على الوصفة الطبية المكتوبة باليد

**رجاء إرسال دائرة حول الرقم المناسب تحت الإجابة المناسبة للأسئلة من (7) إلى (11)**

<table>
<thead>
<tr>
<th>الالوان</th>
<th>أغلب الأحيان</th>
<th>من حين لآخر</th>
</tr>
</thead>
<tbody>
<tr>
<td>أداة</td>
<td>نادراً</td>
<td>3</td>
</tr>
<tr>
<td>إداة</td>
<td>نادراً</td>
<td>4</td>
</tr>
</tbody>
</table>

**هل تعتقد أن الضروري استخدام الحاسب الآلي (الكمبيوتر) لرسائل وصفة الدواء إلى الصيدليات؟**

<table>
<thead>
<tr>
<th>الالوان</th>
<th>أغلب الأحيان</th>
<th>من حين لآخر</th>
</tr>
</thead>
<tbody>
<tr>
<td>أداة</td>
<td>نادراً</td>
<td>3</td>
</tr>
<tr>
<td>إداة</td>
<td>نادراً</td>
<td>4</td>
</tr>
</tbody>
</table>

**هل يستخدم الأطباء عند وصفهم الدواء أسلوب الوصف الورقي كتابة الدواء؟**

<table>
<thead>
<tr>
<th>الالوان</th>
<th>أغلب الأحيان</th>
<th>من حين لآخر</th>
</tr>
</thead>
<tbody>
<tr>
<td>أداة</td>
<td>نادراً</td>
<td>3</td>
</tr>
<tr>
<td>إداة</td>
<td>نادراً</td>
<td>4</td>
</tr>
</tbody>
</table>

**هل يستخدم الأطباء عند وصفهم الدواء أسلوب الوصف الإلكتروني بواسطة الحاسب الآلي (الكمبيوتر)؟**

<table>
<thead>
<tr>
<th>الالوان</th>
<th>أغلب الأحيان</th>
<th>من حين لآخر</th>
</tr>
</thead>
<tbody>
<tr>
<td>أداة</td>
<td>نادراً</td>
<td>3</td>
</tr>
<tr>
<td>إداة</td>
<td>نادراً</td>
<td>4</td>
</tr>
</tbody>
</table>

**هل جميع الأطباء في القطاعات الصحية يصفون الدواء كتابة بأكمله؟**

<table>
<thead>
<tr>
<th>الالوان</th>
<th>أغلب الأحيان</th>
<th>من حين لآخر</th>
</tr>
</thead>
<tbody>
<tr>
<td>أداة</td>
<td>نادراً</td>
<td>3</td>
</tr>
<tr>
<td>إداة</td>
<td>نادراً</td>
<td>4</td>
</tr>
</tbody>
</table>

**هل يحافظ المريض بالوصفة المكتوبة باليد بعد شرائه للدواء؟**

<table>
<thead>
<tr>
<th>الالوان</th>
<th>أغلب الأحيان</th>
<th>من حين لآخر</th>
</tr>
</thead>
<tbody>
<tr>
<td>أداة</td>
<td>نادراً</td>
<td>3</td>
</tr>
<tr>
<td>إداة</td>
<td>نادراً</td>
<td>4</td>
</tr>
</tbody>
</table>

**هل يقم الطبيب بفحص الدواء هو كتابته ووصفه الدواء فحصاً إختباراً دواء ذي ثمن متفق أو مرتفع التكلفة؟**

<table>
<thead>
<tr>
<th>الالوان</th>
<th>أغلب الأحيان</th>
<th>من حين لآخر</th>
</tr>
</thead>
<tbody>
<tr>
<td>أداة</td>
<td>نادراً</td>
<td>3</td>
</tr>
<tr>
<td>إداة</td>
<td>نادراً</td>
<td>4</td>
</tr>
</tbody>
</table>

**هل الأطباء يكتبون الاسم البديل للدواء عند كتابة الوصفة أي (المسمى التجاري أو اسم جنس الدواء)؟**

<table>
<thead>
<tr>
<th>الالوان</th>
<th>أغلب الأحيان</th>
<th>من حين لآخر</th>
</tr>
</thead>
<tbody>
<tr>
<td>أداة</td>
<td>نادراً</td>
<td>3</td>
</tr>
<tr>
<td>إداة</td>
<td>نادراً</td>
<td>4</td>
</tr>
<tr>
<td>الجزء الرابع: التوافق على صحة ما يُعيّر عنه الباحث في الفقرات التالية من نصوص يعتقد هو أنها واقع ملموس في الخدمات الصحية الحالية والدوائية بمدينة جدة؟ رجاءً ارسم دائرة حول الرقم المناسب تحت الإجابة المناسبة</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>تتضمن حالياً مصادر معلومات إلكترونية لدى الطبيب لكي يقوم بتدقيق تفاعلات الأدوية عند وصفه للدواء، وذلك لمعرفة معلومات عن الدواء ونظامية المريض</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- معلومات عن الدواء ونظامية المريض</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- بمجردة عدم توفره</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- لا توافق</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- توافق</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- محدود</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- لا توافق</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- توافق</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- محدود</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- لا توافق</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- توافق</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- محدود</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- لا توافق</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- توافق</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- محدود</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- لا توافق</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

15. هل يواجه المرضى بعض المشكلات بسبب كتابة وصفة الدواء بدويًا؟

| دائماً | أغلب الأحيان | نادرًا | من حين لآخر | لا
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5

16. هل يطلب الطبيب من المريض أن يعود بعد شراء الدواء للتأكد من قبل تناوله؟

| دائماً | أغلب الأحيان | نادرًا | من حين لآخر | لا
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5

17. هل تسمح قراءة الوصفات الطبية من قبل المريض؟

| دائماً | أغلب الأحيان | نادرًا | من حين لآخر | لا
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5

18. هل المريض لا يستطيع قراءة مقدار الجرعة المكتوبة في الوصفة الطبية لأنها غير واضحة؟

| دائماً | أغلب الأحيان | نادرًا | من حين لآخر | لا
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5

19. هل يحتاج الطبيب من حين لآخر أن يسأل المريض عن مشكلته الصحية التي يتعامل معها في الدواء الموصوف له؟

| دائماً | أغلب الأحيان | نادرًا | من حين لآخر | لا
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5

20. هل يتضمن الصيادلي في حال عدم توفر الدواء في الصيدلية؟

| دائماً | أغلب الأحيان | نادرًا | من حين لآخر | لا
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5

21. هل بعض المرضى يجدون أنفسهم مضطرين للعودة إلى الطبيب أو الاتصال به للسؤال عن الجرعة التي يجب تناولها من الدواء الأخرى؟

| دائماً | أغلب الأحيان | نادرًا | من حين لآخر | لا
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5

22. ما هو التصرف المتوقع من الصيادلي في حال عدم توفر الدواء في الصيدلية؟

<table>
<thead>
<tr>
<th>رجاءً اكتب رقم من 1 إلى 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

23. هل تتوفر حالياً مصادر معلومات إلكترونية لدى الطبيب لكي يقوم بتدقيق تفاعلات الأدوية عند وصفه للدواء، وذلك لمعرفة معلومات عن الدواء ونظامية المريض؟

<table>
<thead>
<tr>
<th>بثقة لا توقّع</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

24. معظم الصيدليات لديها وسيلة إلكترونية ذات كفاءة عالية يطبقونها للحصول على الدواء حال عدم توفره

<table>
<thead>
<tr>
<th>بثقة لا توافق</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

25. حالياً أغلب الصيدليات تدار بدون برامج وتجهيزات آلية، ومع ذلك بعضهم تم بدويًا بطرق تقليدية

<table>
<thead>
<tr>
<th>بثقة لا توافق</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

26. المعلومات المقدمة والتي تتوفر الأدوية تتوفر في الصيدليات للمريض من المقيمين الذين لا يتحدثون اللغة العربية أو الإنجليزية

<table>
<thead>
<tr>
<th>بثقة لا توافق</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
</tbody>
</table>
إذا كان لديك أي تعليق أو ملاحظة يسرني أن تخطوه في الأسطر التالية شاكراً لك ملاحظاته وتغريدة.
APPENDIX-4

Interview Questions in English
Interview Questions for the Interviewees at the Ministry of Health (MOH) in Riyadh and the Directorate of Health Affairs (DHA) in Jeddah

1 - Who is the beneficiary of your services?
2 - What is the communication means that are available for the services at your administration?
3 - If you are using the Internet, what are the reasons for doing so?
4 - If your administration has a website, what is it?
5 - What are the advantages and the facilities which are provided through the website?
6 - Does the website give users the chance to order through the service?
7 - Do the clients and your administration find positive reactions through use of e-mail and the Internet?
8 - Does your administration have special computer software able to apply to your work?
9 - One of the hypotheses of this study indicated that the health sectors in Jeddah City lack information technology and communication systems to update knowledge and availability of medication, also indicated that the Ministry of Health, pharmaceutical companies and suppliers, have been unable to develop medication services; as a result they require an information system to provide real statistics about the size of medication prescribing and consumption. To what extent do you agree with this? If there are other reasons, please indicate them.
10 - Another hypothesis said that in Jeddah City regular use of the traditional methods of prescribing medication leads to defective medication services. To what extent do you agree with this?
11 - The MOH's plan now is to apply the electronic government project which emphasises using the smart card, which is used to recall patients' electronically files at all health sectors under the unified files. This project will be a multi-description of the patient health reports, the laboratories' results, medication consumption and x-rays. This study focused on the pharmacies and medication, the question here is: Did your administration have enough justification for those responsible for the HIS project to give you the chance of providing the equipment and necessary to link the MOH's parties with other governmental and private health sectors?

Thank you for your answers and for your time you give.

The Researcher
Mowafag Allaf
Interview Questions for the Interviewees at the Medication Companies and Suppliers in Riyadh and Jeddah Cities

1 - Who is the beneficiary of your services?

2 - What is the communication means that available for the services at your establishment?

3 - If you use the Internet in the establishment, for what reasons do you use it?

4 - If your establishment has a website, what is it?

5 - What are the advantages and the facilities which are provided through the website?

6 - Does the website give users the opportunity to purchase?

7 - Do the clients and your establishment find positive reactions through use of e-mail and the Internet?

8 - Does your establishment have special computer software able to apply to your work?

9 - The providers of the medication have policies that should be followed whilst supplying the services to the market. On the other hand, how could you evaluate the needs of the market for the medication and what are the tools used for providing such a service?

10 - One of the hypotheses of this study indicated that the health sectors in Jeddah City lack information technology and communication systems to update knowledge and availability of medication. To what extent do you agree with this?

11 - Another hypothesis said that in Jeddah City regular use of the traditional methods of prescribing medication leads to defective medication services. To what extent do you agree with this?

12 - The MOH's plan now is to apply the electronic government project which emphasises the use of the smart card, which is used to recall patients' electronically files at all health sectors under unified files. This project will be a multi-description of the patient health reports, the laboratories' results, medication consumption and x-rays. This study focused on the pharmacies and medication, the question here is: If your establishment had the chance to be a member within the system of the parties who are responsible for the medication, did you have the facilities and the equipment such as the communication means and the infrastructure for linking with the HIS, and supporting the health project idea. In addition participate in the technical and information issues with all parties of the Ministry of Health and the other governmental and private health sectors?

13 - Another hypothesis said that the Ministry of Health, pharmaceutical companies and suppliers have been unable to develop medication services; as a result they require an information system to provide real statistics about the size of medication prescribing and consumption. To what extent do you agree with this? If there are other reasons, please indicate them.
APPENDIX-5

Interview Questions in Arabic
(Qسم المكتبات والمعلومات)

نبذة تعريفية لإجراء مقابلة شخصية

سلام عليكم ورحمة الله وبركاته... وبعد
بين يدي سعديكم طلب استذان لإجراء مقابلة شخصية مع أحد المتخصصين لديكم بوزارة الصحة في كل
من مدينة الرياض ووجدة في الأقسام التالية:
1 - الإدارة العامة بالرياض - سعادة المستشار الشؤون الإدارية.
2 - الإدارة العامة للحاسب الآلي بالرياض - شعبة المشاريع.
3 - الإدارة العامة للحاسب الآلي بالرياض - شعبة النظام.
4 - الإدارة العامة للحاسب الآلي بجدة.
5 - مركز تكنولوجيا المعلومات بمستشفى الولادة وأطفال بجدة.
6 - إدارة النموذج الطبي بجدة.
7 - قسم الإحصاء بديميرة الصحة بجدة.
8 - تراخيص المستشفيات والصيدليات بديميرة الصحة بجدة.

وذلك لأخذ المشورة من أجل الاختصاص لديكم في تلك الأقسام لدعم منهج الدراسة المقدمة لقسم علم
المعلومات بجامعة "لبيرة" بالملكة المتحدة لبلج درجة الدكتوراه، وذلك تحت عنوان "نظام معلومات
الصيدليات والأدوية بجدة جدة بالمملكة العربية السعودية"، ومن ضمن ما تركز على هذه الدراسة التعرف
على الأسلوب المتع في كتابة الرسالة الطبية من قبل الطبيب وذلك بتشكل التقليدي البدري وائرل ذلك
على خدمة الدواء، ودور مرسوم الأدوية في تطوير معلومات الأطباء عن الأدوية وكذلك الحال تجهز الطريقة
المتبعة في الصيدليات عند استلام تلك الرسالات، من جهة أخرى تعرف هذه الدراسة على الوسائل التي يتم
من خلالا تطوير الأدوية وتنظيمها والدليل المفترض حال عدم توفرها.

وهذه المقابلات هي من ضمن سلسلة مقابلات أخرى تم إجراؤها من قبل أبحاث مع جهات عدة مجموعة من
شريكات ومممي وموزعي الأدوية، وجمعية الصيادلة السعودية، كما تأتي هذه المقابلات كمكملة ثانية

- 279 -
بعد أن تم استخدام الأداة الأولى وهي توزيع نماذج استقصاء للأطباء والصيدلة والمجتمع، والنتائج المتوقعة من
كل ذلك هو تفكك هذه الدراسة من دعم فكرة البحث التي قدم إلى:

أولا: توجيه نظام المعلومات الإلكترونية المحتمل تنفيذها لدى قطاعات الصحة الحكومية والخاصية إلى الوجهة
الأحدث فيما هو معبوث وفق أحدث نظم المعلومات الطبية المتاحة.
ثانيا: تطوير مصادر معلومات الدواء عند قيام الطبيب بصرف الوصفة الطبية، وحال ذلك أيضا مع
الصيدليات عند تلقية تلك الوصفة.
ثالثا: تطوير خدمات الصيدليات والأدوية كجزء من إمكاني الخدمات الطبية عموما وذلك من خلال تأصيل
فكرة استخدام وسائل تقنية المعلومات على مستوى بعض الخدمات الدوائية والتموين والتنظيم لها وأسلوب
البيع.

من المعروف عليه أن تطور خدمات المجتمع تعمد على إجراء دراسات علمية تركز في نهجها على تقسي
رأي المجتمع نفسه عن تلك الخدمات، ودعم وزارتك اليوم هذه الدراسة بتجاوزك الذي سيكون محل
التقدير والاحترام هو بمثابة ركيزة أساسية لنجاحها، وأود التأكيد على أن جميع البيانات التي سيشارك بها
ست تعني بمقاسة السرية، ولا تستخدم إلا لغرض الدراسة والبحث العلمي، كما أود أن أقول لكم على أنه
قد زودٌ عند صياغة الأسئلة ال التركيز على أهم النقاط التي تخدم محاور الدراسة وذلك مراعاة لوقت الجيب
عليها، وإجراء اختبار على الوقت الافتراضي لها بتنين أنها تحتاج إلى ما بين (30 - 45 دقيقة)، أمل بنكم
منحى فرصة اللقاء والتعرف إلى المتخصصين لديك بالوزارة لإجراء المقابلات المشار إليها آنفا مع امتياز لكم
وتقديركم.

أيضاً لكم عن شكري لتجاوزكم مع خالص النحية.

الباحث

موفق علاف

البريد الإلكتروني
allaf_ms@yahoo.com
(قسم المكتبات والمعلومات)

نبذة تعرفية

السادة شركة:

السلام عليك ورحمة الله وبركاته ،،، وبعد
بين يدي سعادتكم طلب استذناب للحصول على معلومات من أحد المتخصصين لدى مؤسستكم في مجال
تمرين الأدوية والتطوير العلمني واكتشاف العمل الذي يقومون به، وذلك لأهل الاختصاص
لديكم لدعم منهج الدراسة المقدمة لقسم علم المعلومات بجامعة "فرقة" بالملكة المتحدة لبلد درجة
الدكتوراه، وذلك تحت عنوان ( نظام معلومات الصيدليات والأدوية بمدينة جدة بالملكة العربية السعودية )،
ومن ضمن ما تركز عليه هذه الدراسة التعرف على الأسلوب المتبني في كتابة الوصفة الطبية من قبل الطبيب
وهذا بشكلها التقليدي اليومي وأثر ذلك على خدمة الدواء، ودور مهني الأدوية في تطوير معلومات
الأطباء عن الأدوية وكذلك الحال تجاه الطريقة المتبعة في الصيدليات عند استلام تلك الوصفات، من جهة
أخرى تعرف هذه الدراسة على الوسائل التي يتم من خلالها تمرين الأدوية وتنظيمها والبديل المقترح حال
عدم توفرها.

وهذا الطلب هو من ضمن سلسلة مبادرات تم إجراؤها من قبل الباحث مع مجموعة من مهنيي الأدوية، ووزارة
الصحة وجمعية الصيدلة السعودية، كما يأتي طلب المعلومات من خلال البريد الإلكتروني من ضمن سلسلة
مكملة لبعضها في جميع بيانات البحث، فقد أن تعامد الأداة الأولى وهي توزيع ناقد استقصاء للأطباء
وصيادلة والجمع في لائحة خطة طلبها من خلال البريد لبعض إضافية لمنهج البحث ويعطي مساحة من الوقت
لحماج عليها، والنواج المتوقع من كل ذلك هو أن يمكن هذه الدراسة من دعم فكرة البحث التي تهدف إلى:
أولاً: توجيه نظم المعلومات الإلكترونية المحتمل تطبيقها لدى قطاعات الصحة الحكومية والخاصة إلى الوجهة
الأحدث فيما هو معين في وصف الدواء وفق أحدث نظم المعلومات الطبية المتبعة حالياً.
ثانياً: تطوير مصادر معلومات الدواء عند قيام الطبيب بصرف الوصفة الطبية، وحال ذلك أيضاً مع
الصيدلي عند تلقيه تلك الوصفة.
all@mis@yahoo.com

का रेखा थाली हो माफी

नगरी कार्यालय

माफि हो जिल्ला ब्रिगेडियर

उद्योग के साथ

का रेखा थाली हो माफी

नगरी कार्यालय

माफि हो जिल्ला ब्रिगेडियर

उद्योग के साथ
أسئلة المقابلة الشخصية لمسندل وزارة الصحة

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س1 - من هو المستفيد من خدمتك؟

س2 - ما وسائل تقنية الاتصال المتاحة لدى إدارتك لتقديم خدماتك؟

س3 - إذا كنت تستخدم شبكة الإنترنت في المهام التي تتم من خلالها؟

س4 - إذا كان إدارتك موقع على شبكة الإنترنت ما هو عنوانه؟

س5 - ما الإمكانات والمزايا المتاحة من خلالها؟

س6 - هل يتبع لزوار الموقع إمكانية طلب خدماتك؟

س7 - هل يمكن تثبيت برامج مخصصة ومتخصصة ومتوافرة على تطبيقات في طبيعة المجال الذي تعملون فيه؟

س8 - هل لديك برامج كمبيوتر مخصصة ومتوافرة على تطبيقات في طبيعة المجال الذي تعملون فيه؟

س9 - أحدث فرضيات هذه الدراسة تشير إلى أن القطاعات الصحية بمدينة جدة تعتمد من قبل في تقنية المعلومات وتؤثر تطورات التي تشير إلى أن القطاعات الصحية ومفاهيم الأدوية والعلاجية. وتذكر أيضا أنه تظهر تطور تنفيذ الدواء وذلك نتيجة لتنوع معلومات الدواء التي تكون في الادوية من قبل المرضى. إلى أي حد تلفق مع تلك الفرضية وهل هناك أسباب أخرى تسبب أن تشير إليها إذا اتفقت مع هذا النص؟

س10 - فرضية ثانية تقول إن الأسلوب التقليدي في وصف الدواء في مدينة جدة ينتج عنه بعض العيوب في خدمات وسلامة صرف الدواء، إلى أي حد تؤون هذا النص؟

س11 - تتجه وزارة الصحة حالياً لتطبيق مشروع الحكومة الإلكترونية والذي يركز على البطاقة الذكية والتي يسترجع من خلالها معلومات المريض من جميع القطاعات الصحية تحت رقم مفرد، والمشروع يتبع من حيث مواصفاته لتصبح تجربة من المريض وعن الأدوية والتحاليل والمنتجات الخاصة به وغيرها، والذي يهدف للمنافع البارزة: هل لدى إدارتك المبررات الكافية والتي يحكم من خلالها إنتاج الجهات المسنودة من المشروع لأغراضا أولاً
الاستماع وتمكينكم من التجهيزات اللازمة من حيث وسائل الاتصال والبنية التحتية وتقنية المعلومات لربط الجهات الصحية والجهات التي تقدم خدمات الدواء والتي تشرف عليه المديرية بمدينة جدة? رجاءً بعض الإيضاحات حول ذلك.

شكرًا على حسن تجاوبكم ومنحكم لي من وقتكم إرجوا لك توفيق الحياة المميزة.

الباحث

موفق علاف
أسئلة المقابلة الشخصية لمموني الأدبية الخاصة بدراسة
( نظام معلومات الصيدلانيات والأدوية بمدينة جدة بالمملكة العربية السعودية)

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س 1 - من هو المستفيد من خدماتك؟
س 2 - ما وسائل الاتصال المتاحة لدى مؤسستك لتقديم خدماتك؟
س 3 - إذا كنت تستخدمون شبكة الإنترنت فيما هي الاستخدامات التي تتم من خلالها؟
س 4 - إذا كان مؤسستك موقع على شبكة الإنترنت ما هو عنوانه؟
س 5 - ما الإمكانات والمزايا المتاحة من خلاله؟
س 6 - هل يتيح لزوار الموقع إمكانية الشراء؟
س 7 - هل يتيح عملك مؤسستك تجارة من خلاله وتتفاوض اتفاق من خلال بريدك الإلكتروني على الشبكة؟
س 8 - هل لديكم برامج كمبيوتر متخصصة ومتوفر عليها تتيح تطبيقات في طبيعة المجال الذي تعملون فيه؟
س 9 - هل لدي مموني الأدوية سياسة ممنوبة يتم من خلالها تأمين احتياجات السوق المحلي من الأدوية
سو - كيف يمكن أن تؤثر احتياجات السوق من الأدوية وما الأدوية التي تستخدمها تأمينها؟
س 10 - أجرد خيارات هذه الدالة تشير إلى أن القطاعات الصحية بمدينة جدة تعاني من قلة في تلبية المعلومات ونظام الإ kişiler التي تساعى على تجديد المعلومات الصحية والدوائية، ما تتيحكم على ذلك؟
س 11 - فرضية ثانية تقول إن الأسلوب التقليدي في وصف الدواء في مدينة جدة ينتج عنه بعض العيوب في خدمات سلامة صرف الدواء، إلى أي حد تؤدي هذا الفعل؟
س 12 - تتجه وزارة الصحة حالياً لتطبيق مشروع الحكومة الإلكترونية والذي يركز على البطاقة الذكية والتي
ينتج عن خاصة يشمل أدوات المريض والتحديات والأشياء وغيرها، وهذه الدراسة تركز على جزءية الأدوية والصيدليات
الموقعه من المشروع، والسؤال المطور حالياً هو: إذا أعطيت الفرصة لمسؤولكم لكون عضواً ضمن منظومة
الجهات المصنعة عن الأدوية فهل تزداد الاستعداد من حيث وسائل الاتصال والبنية التحتية لدخول نظام الشبكات
المختص ودعم فكرة البرامج الموحدة للمشروع مع المشاركة من الناحية الفنية والمعلوماتية لكل ما فيه خدمة
مجال عملكم والأطر المشتركة فيه والمستفادة منه من قطاعات صحية حكومية وخاصة؟
س 13 - أعود إلى فرضيات الدراسة وفرضية أخرى تقول: أن وزارة الصحة وممثلي الأدوية والصيدليات لا يوجد
لديهم المقيدة على تطوير خدمات الدواء وذلك نتيجة طبيعية لمعد توفر نظام معلومات يهمهم بالمعلومات اللازمة حول
حجم الوصفات التي يكتبها الأطباء وحجم استهلاك الأدوية من قبل المرضى. إلى أي حد تستطيع أن تتفق مع ذلك
وهل هناك أسباب أخرى تحب أن تشير إليها إذا اتصلت بتلك الفرضية؟
أشكركم على حسن الضيافة وعلى تجاوبكم ومنحكم لي من وقتكم ارجوا لك كل توفيق وحياة سعيدة.

الباحث

 موقف صالح خليل علاف