Internship Training

At

Dell International Services India Private Limited

"HIE Adoption and its Implementation Challenges"

By

Afshin Qureshi
PG/14/002

Under the guidance of
Dr. Anandhi Ramachandran

Post Graduate Diploma in Hospital and Health IT Management

2014-16

International Institute of Health Management Research
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To whomsoever it may concern

This is to certify that **Afshin Qureshi** of **International Institute of Health Management Research, Delhi** has been working with Dell International Services for her summer project.

Project Details:

Project Name	**: HIE Adoption and its Implementation challenges**
Duration	**: 08 February 2016 – 29 April 2016 (3 Months)**
Location	**: Bangalore**
Guide Name	**: Ashish Arora**
Sponsor Name	**: Ajay Aiyar**

She has successfully completed her project and her performance during the tenure of the internship has been found to be satisfactory.

Her findings in course of the project has been found to be practical and relevant and some of the recommendations will be incorporated on the floor on approval from the business.

Thanking You,

Regards,

Ashish Kumar
Talent Acquisition Sr. Advisor
Dell International Services India Private Limited

TO WHOMSOEVER IT MAY CONCERN

This is to certify that Afshin Qureshi student of Post Graduate Diploma in Hospital and Healthcare IT Management (PGDHM) from International Institute of Health Management Research, New Delhi has undergone internship training at **Dell International Services India Pvt. Limited** from **08.02.2016** to **29.04.2016.**

The Candidate has successfully carried out the study designated to him during internship training and his approach to the study has been sincere, scientific and analytical.

The Internship is in fulfillment of the course requirements.

I wish him all success in all his future endeavors.

Dr. A.K. Agarwal
Dean Academics and Student Affairs
IIHMR, New Delhi

Dr. Anandhi Ramachandran
Associate Professor
IIHMR, New Delhi

CERTIFICATE OF APPROVAL

The following dissertation titled **"HIE Adoption and its Implementation Challenges"** At **"Dell International Services India Private Limited** is hereby approved as a certified study in management carried out and presented in a manner satisfactorily to warrant its acceptance as a prerequisite for the award of **Post Graduate Diploma in Health and Hospital Management** for which it has been submitted. It is understood that by this approval the undersigned do not necessarily endorse or approve any statement made, opinion expressed or conclusion drawn therein but approve the dissertation only for the purpose it is submitted.

Dissertation Examination Committee for evaluation of dissertation.

Name	Signature
Dr. Oommen John	
Dr. Nishikant Bele	
Dr. Anandhi Ramadoss	

Certificate from Dissertation Advisory Committee

This is to certify that **Ms. Afshin Qureshi,** a student of the **Post- Graduate Diploma in Hospital and Healthcare IT Management** has worked under our guidance and supervision. She is submitting this dissertation titled " **HIE Adoption and its Challenges**" at "**Dell International Services India Private Limited**" in partial fulfillment of the requirements for the award of the **Post- Graduate Diploma in Hospital and Healthcare IT Management.**

This dissertation has the requisite standard and to the best of our knowledge no part of it has been reproduced from any other dissertation, monograph, report or book.

Dr. Anandhi Ramachandran
Associate Professor
IIHMR Delhi

Ajay Apr- 29, 2016
Ajay Aiyar
EMR Global Delivery Head
Dell International Services

INTERNATIONAL INSTITUTE OF HEALTH MANAGEMENT RESEARCH, NEW DELHI

CERTIFICATE BY SCHOLAR

This is to certify that the dissertation titled **"HIE Adoption and its Implementation Challenges"** and submitted by (Name) **Afshin Qureshi** Enrollment No. **PG/14/002** under the supervision of **Dr. Anandhi Ramachandran** for award of Postgraduate Diploma in Hospital and Health Management of the Institute carried out during the period from **8 Feb. 2016** to **29 April 2016** embodies my original work and has not formed the basis for the award of any degree, diploma associate ship, fellowship, titles in this or any other Institute or other similar institution of higher learning.

Signature

FEEDBACK FORM

Name of the Student : Afshin Qureshi

Dissertation Organisation : Dell International Services

Area of Dissertation : HIE Adoption and its challenges

Attendance : 100%

Objectives achieved : Successfully completed dissertation and expectations were met.

Deliverables : 1. Trained in different EMR products.
2. Shadowed on request tasks

Strengths : Good presentation and communications skills, sincere, dedicated and postivie attitude.

Suggestions for Improvement: Loses focus and at times diverges from the core topic of discussion.

Signature of the Officer-in-Charge/ Organisation Mentor (Dissertation)

Date: April 29, 2016

Place: Bangalore

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Apart from the efforts of the mine, the success of any project depends largely on the encouragement and guidelines of many others. I take this opportunity to express my gratitude to the people who have been instrumental in the successful completion of this project. I would like to show my greatest appreciation to **Dr. Ashish Arora (PT)** at **Dell Services**, Bangalore for providing us the opportunity to do the Project on **"HIE Adoption & its Implementation Challenges"** and for providing complete support throughout the project. Without his encouragement and guidance this project would not have materialized.

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Acronyms / Abbreviations / Keywords

HIE	Health Information Exchange
HIS	Health Information System
HIT	Health Information Technology
AHCCCS	Arizona Health Care Cost Containment System
CHT	Center for Health Transformation
EDs	Emergency departments
EHR	Electronic health record
EMR	Electronic Medical Record
NHHRC	National Health and Hospitals Reform Commission
NBN	National Broadcasting Network
NEHTA	The national e-health transition authority
GPMPs	General practice management plans
HIC	Australia's Health Informatics Conference
RHIO	Regional Health Information Organization
HISA	Australian health information society
GP	General Physician
RHIO	Regional Health Information Organization
WHO	World Health Organization

LIST OF FIGURES

1. Organization Profile

Dell is a leading provider of end-to-end scalable solutions for customers around the world—delivering technology solutions that enable people everywhere to grow, thrive, and reach their full potential. Michael Dell founded the company more than 30 years ago in Austin, Texas, and since then we have been listening to and engaging our customers with their insight guiding everything we do. Dell's end-to-end solutions strategy—and the innovations and investments it makes to enable that strategy—are, as you would expect, truly customer-inspired.

Dell's industry focus

- Healthcare and life sciences
- Banking, financial services, securities and insurance
- Manufacturing, energy and utilities
- Consumer industries (retail, packaged goods and logistics)
- Education, state and local government
- Travel and hospitality
- Telecommunications, media and technology
- U.S. federal government

Dell in Healthcare

Dell has established four solutions groups to support customer segments—end-user computing, enterprise solutions, software and services—and is committed to designing and delivering technologies that are practical, relevant, and customer-inspired. Dell's goal is to provide the best tools, products, and services for realizing hosting efficiencies, while improving service delivery. Through automation, standardization, and the right set of tools, IT works smarter to provide the "always-on and anywhere" service that end users expect. As a leader in healthcare IT for more than 30 years, Dell is continuously chosen by customers to understand and identify the right solutions that help improve care, drive overall efficiency, and manage financial risks.

The company offers end-to-end solutions for healthcare providers and health plans, including hardware, software, hosting, application implementation and support, systems integration, consulting, business process services, and services for Electronic Health/Medical Records (EHRs/EMRs), Health Insurance Exchanges (HIXs), revenue cycle management, and policy administration.

Dell's global reach encompasses operations in North America, Europe, the Middle East, and Asia. Dell currently manages IT projects for more than 1,000 hospitals worldwide. The team of experienced technologists within Dell has gained an in-depth understanding of the challenges inherent in integrating IT solutions within the most complex healthcare multi-vendor environments.

Dell's secure end-to-end solutions and services enable healthcare organizations to solve critical problems and enhance patient care. The company's goal is to build and support information-driven healthcare environments. This dynamic environment empowers caregivers and patients with technology, data, and processes to integrate new IT services into their daily routines for the betterment of care delivery.

Dell has successfully assisted customers with meeting their organizational goals through offering support from extremely qualified and experienced individuals who "know" healthcare organizations and workflow processes.

Industry Recognition

- Positioned by Gartner in the "Leaders" quadrant of the *Gartner Magic Quadrant for Data Center Outsourcing and Infrastructure Utility Services, North America* for the fifth consecutive year.
- Ranked "#1 IT Services Provider to Healthcare Providers," by Gartner for the sixth straight year.

- Positioned as a leader in Everest Group's "IT Outsourcing in the Healthcare Provider Industry—Service Provider Landscape with PEAK Matrix Assessment" for a third consecutive year.

2. Introduction

2.1 Background

Health information exchange (HIE) is the electronic sharing of data and information between clinical care and public health entities. HIE, also known as health data exchange, refers to the electronic movement of health-related information among organizations using nationally recognized standards.

The evolution of health information exchange (HIE) has required data sharing across the boundaries of often competing institutions, with the hope of reducing wasted health care resources (i.e., reducing test duplication and fostering better medication reconciliation, better and more timely care, and improved care coordination among fragmented provider systems). Such sharing of data has been problematic because of a lack of trust among these otherwise competing institutions. This policy page addresses how these challenges are being overcome and what new policies are being embraced.

In today's age of electronic transactions, electronically available health care data, such as clinical, administrative, and financial information, abounds. These data are vulnerable to abuse and the headlines are rife with stories of sensitive data about patients--such as HIV status or mental health records--being lost or stolen. There is concern that disclosure of such information may lead to harm in terms of denied employment, claims, and discrimination. Such abuses have led to the enactment of the Health Information Portability and Accountability Act (HIPAA) statutes, which aim to ensure that medical data, including electronically available clinical data, is secured properly and that its use and transmission are strictly regulated.

The evolution of health information exchange (HIE) has required data sharing across the boundaries of often competing institutions, with the hope of reducing wasted health care resources (i.e., reducing test duplication and fostering better medication reconciliation, better and more timely care, and improved care coordination among fragmented provider systems).

This report was developed to help you understand what is needed to develop a realistic and achievable prospective model for Health Information exchange project.

This study investigates the health information exchange within different health information systems. First, it looks at the threats to health and the challenges facing health care systems in the developing world. Next, it surveys the landscape of efforts to specify and create successful HIE at the national level. Then we examine different case studies in depth and finally reviews the important challenges and opportunities associated with development and prospective model of an effective HIE.

We shall carry out a theoretical study to find out the relevant concepts by reviewing the related literature and analyzing them. As a result of our theoretical study we shall investigate the basic model for health information exchange system. Then we shall conduct an empirical study to validate the result from the theoretical study which helped us to narrow down our research area. We shall revise our proposed theoretical model by the lesson learnt from our empirical study results.

3. Problem Statement

Communication behaviors between healthcare collaborators are complex, as it is mentioned earlier in most of HISs transferring information between different information systems is a vital and also possibly safety-critical part of the whole procedure which is ignored by information systems and technology usage. For instance, most of the time a single user can retrieve information from the IS or decision-support system support an individual user mostly to make their health decision. Although most electronic health record (EHR) systems are intended to be used by multiple users, but they often help little in acknowledgement of the many message tasks and related decision making.

Through our investigation we found out that there are some important IT issues namely as: Security of the data, Security and privacy concerns are mainly from researchers' and patients' side. The informatics protocols addressed these concerns, level of accessibility for each stakeholder and pattern of information flow, **financial stability, Interoperability,** duplicate testing, medication errors, **Data sharing etc.**

One of the most important one is the system flexibility from an IT aspect. Information exchange systems need flexibility in order to become a member in a wide network. Having a standard for information exchange and some rules to access the data is necessary in order to have a comprehensive system in nationwide.
There are some unknown barriers to impellent new systems such as motivation for health providers to adopt a new information system and one of the best ways to minimize these barriers is investigate the current information systems in a health organization first and try to apply a very similar IS.

The most important obstacles facing HIEs depend on the perspective of who is looking at them – the patients, the providers, etc. So as we move forward, we have to make sure to address all these stakeholders.

"There is no one-size-fits-all answer to the problems of HIEs."

HIE is considered to be one of the key components of the national health IT infrastructure. Policymakers and health care providers believe this health IT infrastructure will produce a number of benefits, many of which are directly related to HIE.

We will discuss that there should be a proper systematic design between different HISs which can address the necessities of group communication among GPs and other allied healthcare as the users. And they can do a collaborative work and communicate with each other more efficiently.

4. Review of Literature

Health Information Exchanges (HIE) are becoming integral parts of the national healthcare reform efforts, chiefly because of their potential impact on cost reduction and quality enhancement in healthcare services. However, the potential of an HIE platform can only be realized when its multiple constituent users actively participate in using its variety of services.

As a rapidly increasing number of health care providers adopt electronic health records (EHRs), the benefits that can be realized from these systems is substantially greater when patient data is not trapped within individual institutions. The timely sharing of electronic health information can improve health care quality, efficiency, and safety by ensuring that healthcare providers have access to comprehensive clinical information. It also vastly expands the volume and quality of health-related data for secondary aims, such as public health programs and clinical research.

There are substantial barriers, however, to the exchange of health information through the electronic interoperability among EMRs. Such an exchange would require extended technical and political processes and involve standardization and modification of current information systems. Electronic exchange of health information also raises questions about policies and procedures regarding confidentiality, security, and identity management.

Many health providers are reluctant to give up confidentiality of their records, and many EMR vendors have found the process of creating complex algorithms to convert one database to another to be costly and time consuming. As a result, only limited health information- such as demographics and immunizations can be accessed through data exchange among information systems available today. To achieve the many benefits of interoperability—such as improvements in quality, safety, and the costs of health care, new solutions are needed to integrate and exchange health information between different health care providers and consumers.

The enterprise-level HIE may be a hospital, a health system, a large physician group that seeks to enhance the exchange of patient data within its 'four walls.' There is no one model for an HIE, and HIEs are developing based on different needs, governance models, directives, time frames, interface issues, and systems' upgrades and replacements. Developing the enterprise-level HIE is often complicated by the fact that various hospital-based clinics, specialty groups like orthopedics and radiologists very often use their own EHRs. The community- level HIE expands from the enterprise hub out to community providers such as physicians, clinics, pharmacies, nursing homes, and home health agencies.

As it is described above the process of electronic sharing patients' health information among different health providers, is called health information exchange. Although these systems is implemented in many countries specially developed countries but studies show that still the usage of HIE systems is low and it is not as high as expected. One of the purposes of this study is to verify the issues associated with this phenomenon.

4.1 Barriers to Achieving Health Information Exchange

Over the past few years, there has been plenty of discussion around health information exchange (HIE) and other forms of exchanges for patient electronic information. But unfortunately, these organizations and networks have not been as widely implemented as they should.

There are of course several different reasons for this, and the following is a list that outlines just some of those:

A. Lack of exchange standards:

In order for different EHR systems to easily talk to one other, they must agree on a standard through which the data will be transmitted and mean the same thing to everyone, regardless of the application. This meant that for many physicians who are already using an EHR system, the format in which the data is exchanged must be standardized. So lacking a unified standard for many of the EHR packages has been one of the leading challenges for many to have the ability to exchange the information without significant conversion and interfacing costs.

B. Lack of statewide exchange networks:

There are currently several HIE initiatives within different states, but unfortunately, only few states have implemented and adopted an exchange platform statewide. For these states, their physicians who are using an EHR package have the ability to connect to through their software and exchange patient medical information. Those who don't are currently out of luck.

C. Slow EHR adoption rates:

While some physicians may be using electronic medical records already or have been for years, others are still on paper charts and miles away. Even though paper based documents can be digitized through scanners and sent via faxes/secure email, they still cannot be exchanged or sent as structured data or be utilized for clinical data analytics.

D. Cost and capital investment:

In order to establish connectivity and the exchange of information, an organization must ensure that they are using a system that supports the standard exchanges. But this requires setup, membership with HIEs and additional costs associated with interfaces and connectivity requirements. In some cases additional upgrade maybe required from the EHR vendor.

E. Active exchange of information is not a mandate:

Currently exchanging information is not mandated for every patient record. However, there has been a push to adopt exchange of clinical information through the meaningful use.

In addition to that this study tries to identify some current problems and deficits in communication between different health information systems, and then tries to address some of these current problems. Actually we've tried to outline the weak points and deficits of sharing health information in current systems, in order to do so; we explored the communication problems among HIS in different countries.

4.2 Benefits of Health Information Exchange

To better track and securely share patients' complete medical histories, more and more health care providers are participating in health information exchange (HIE). HIE helps facilitate coordinated patient care, reduce duplicative treatments and avoid costly mistakes. This practice is growing among health providers because the need for HIE is clear and the HIE benefits are significant.

HIE benefits include:

- Provides a vehicle for improving quality and safety of patient care by reducing medication and medical errors
- Stimulates consumer education and patients' involvement in their own health care
- Increases efficiency by eliminating unnecessary paperwork
- Provides caregivers with clinical decision support tools for more effective care and treatment
- Eliminates redundant or unnecessary testing
- Improves public health reporting and monitoring
- Creates a potential loop for feedback between health-related research and actual practice
- Facilitates efficient deployment of emerging technology and health care services
- Provides the backbone of technical infrastructure for leverage by national and State-level initiatives
- Provides a basic level of interoperability among electronic health records (EHRs) maintained by individual physicians and organizations
- Reduces health related costs

Electronic health information systems can help prevent errors by ensuring that everyone involved in a patient's care—whether in a primary care setting, a specialists' office or emergency department—has access to the same information. HIE also encourages efficient care by enabling automatic appointment reminders or follow-up instructions to be sent directly to patients, and prescriptions directly to pharmacies. HIE reduces the amount of time patients spend filling out paperwork and briefing their providers on their medical history, allowing more time for discussions about health concerns and treatments. And by saving time for patients and providers along the entire continuum of health care delivery, HIE has the potential to both reduce costs and improve health outcomes.

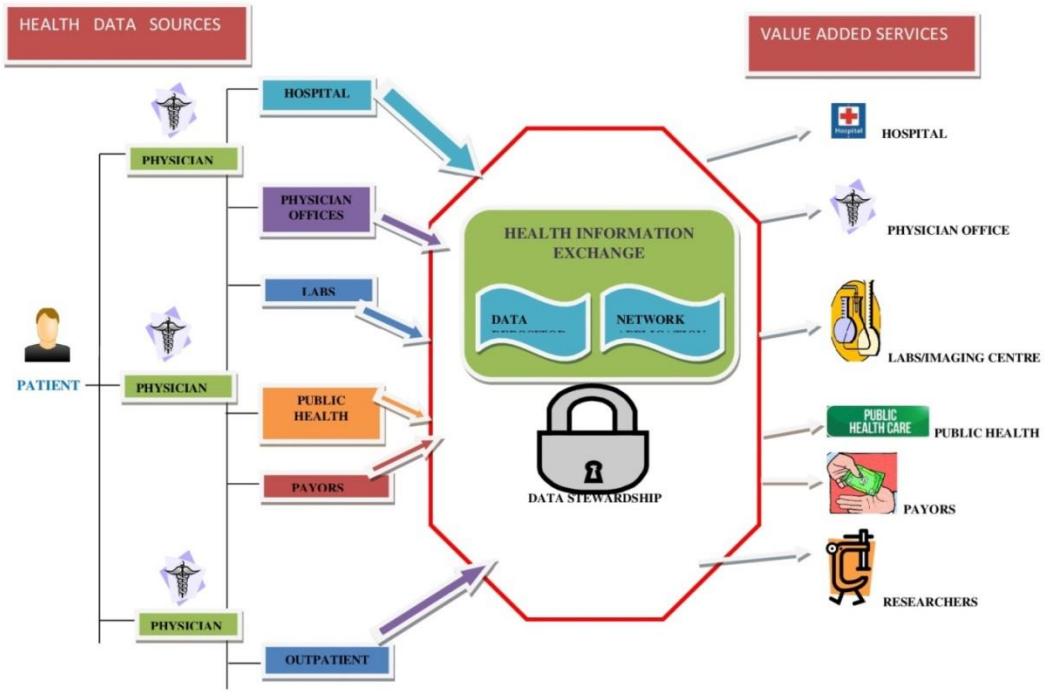

Figure01- Health Information Exchange Work Flow

Value added services

(A). HOSPITAL

- Results Delivery
- Mu Support
- Public Health Integration

(B). PHYSICIAN OFFICES

- Results Delivery
- Mu Support
- Clinical Quality Support
- Community Health Record Access

(C). LABS/IMAGING CENTRES

- Results Delivery
- Community Health Record System

(D). PUBLIC HEALTH

- Bio surveillance
- Reportable Conditions
- Results Delivery

(E). PAYORS

- Quality Reporting
- Physician Bonus Administration

(F). RESEARCHERS

- De-Identified Longitudinal Clinical Data

4.3 Expected outcomes

As a summary to the purpose of this study; the expected outcomes may be to:

- Determine the issues which can increase the usage of HIE among health providers.
- Identify the communication deficits in HIS and present the roots of communication problems faced during a process and their consequences.
- Develop a comprehensive model based on the theoretical concepts, for a health hub. And identify the patient's information and messages which should be shared in that hub.
- There are many potential benefits for physicians and group practices in joining an HIE, both in terms of receiving and sending information.
- Effectiveness is defined in terms of clinical outcomes (e.g., mortality and morbidity), economic outcomes (e.g., costs and resource use, the value proposition for HIE) and population outcomes.

5. Objectives And Goals Of The Research

The main objective of this study tries to identify some current problems and deficits in communication between different health information exchange systems, and then tries to address some of these current problems. Actually we try to outline the weak points and deficits of sharing health information in current systems, in order to do so; we shall explore the communication problems among HIS in different countries. So HIE would probably being used among HISs more effectively. In addition to that, the goal of this research is to make a comprehension knowledge which may lead to deep understanding of better communication process in health information systems.

6. Project Research Work Flow

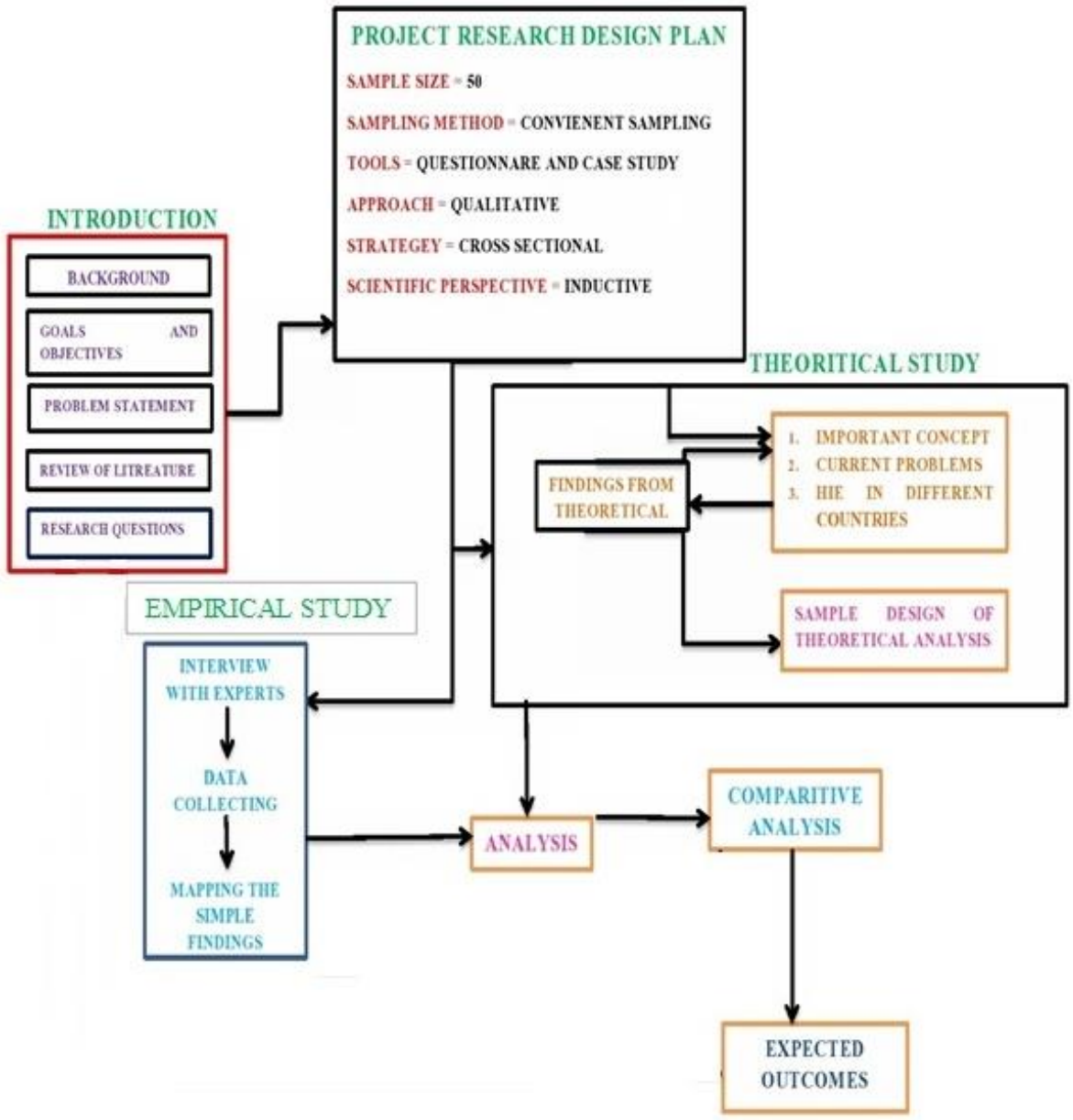

Figure02- Project Research Work Flow Diagram

7. Methodology

The data collection techniques which will be used in this study is basically interviews and reviewing published materials related to the topic of the research, so we will use data gathered from interviews that I would conduct myself and related documents in a same research concept to provide better understanding of the phenomenon. The comparative analysis will be applied in this research in order to identify the distinctions between the finding and results from theoretical study and empirical study. It will be done through the addressing to the research questions and sub-questions.

7.1 Sample

- Sample Size = 50
- Sample Group = Doctors, Senior and Junior Healthcare Professionals
- Sampling Method = Convenient Sampling

7.2 Data Collection Tools and Techniques

- Questionnaire and textual analysis
  (Textual analysis is simply about related previous published materials and writing them down in order to analyze and present the new findings and perspectives)
- Approach = Mixed Method Approach
- Method = Cross sectional

.

8. Project Research Design Plan

“Research Method” is a technique of collecting data, the chosen method has influenced on choosing the type of instrument for collecting data.

In this section of research, we have to develop a logical model and design in order to do the Research based on that so it will become the theory for the study against other similar research. Research question will be refining during research as well, and they will use as guides to the method for collecting data.

As an abstract to the method part the below table shows the research design briefly:

Scientific approach	**Inductive**
Epistemological position	**Interpretivism**
Research strategy	**Case study/ interviews**
Study period	**3 Month**
Data analysis	**Comparative analysis**

8.1 Scientific Perspective

8.1.1 Inductive

Inductive reasoning makes broad generalizations from specific observations. "In inductive inference, we go from the specific to the general. We make many observations, discern a pattern, make a generalization, and infer an explanation or a theory,"

8.2 Epistemological consideration:

Interpretivism where is more about pre-understanding, the researchers have to form their own opinions about the topic. So interpretivism could be an approach that makes it possible for researchers to interpret a text as the data in the best possible way according to their own viewpoints. This study is based on document research and empirical evidence that have been collected, organized and interpreted by texts. It argued for choosing interpretive perspective since this kind of view has more considerable benefits for information systems studies and research. The process of interpretation is a large part of this research.

8.3 Research Strategy

8.3.1 Cross-sectional:

In this type of research several cases and objects are examined and investigated at only one point of time; variables also are more than one, and the objects examined on several variables to find out a pattern associated to their behavior

8.4 Case study:

In this type of study which is very common in qualitative communication information systems studies, particular event, person, community or organization will be go under detailed analysis and investigation.

8.5 Data Collection Procedures

8.5.1 Focus group:

A group of people (Doctors, Senior and Junior Healthcare Professionals) are chosen to ask and investigate their ideas, beliefs and perception toward a specific issue. The procedure of investigating is done through a survey taken online by creating a link of questionnaire which is **https://www.surveymonkey.com/r/9CCYLQX**

8.5.2 Interview (primary data)

One of the most common methods for data collection which is used in qualitative research is interview. This project report includes Structured, semi-structured (in-depth as kind of it) interviews.

8.5.3 Documents (secondary data)

Beside the primary method for collecting data, usually researchers organized a secondary method as well to support and facilitate the primary ones. Primary data is the one which gathered directly by researcher specially in order to investigate a specific purpose in the research, in the other hand we have secondary data which are gathered by someone else and it is used for other intended points.

In our study according to the topic and the research design, we have chosen the in-depth interview as our main method to collecting our primary data and our secondary data is document analysis.

9. Theoretical study

This section provides an understanding of the challenges and the potential benefits associated with high-performing, interoperable health information systems in the developed world.

9.1 What Was Studied

I did several documents systematic review to get through the understanding of the Health Information Exchange Systems “HIE” background, therefore various situations was studied. But since I concentrate to introduce a health hub, and this system is relatively new in this area of studying therefore I mostly focus to investigating in similar works in HIE/HIS such as RHIOs in USA.

First, a general understanding of health information exchange was presented. Then, the status of communication level and usage of information exchange systems were studied. Then I tried to present the previous accomplishments in this field and illustrate the strong and weak points of the previous studies.

I tried to propose a new way based on the textual analysis in order to exchange the health information among the different systems.
I studied different thesis and case studies of developed and developing countries.

9.2 Criteria for Selecting Materials

I initially searched “information exchange within health information systems”, and tried to focus on the new approaches in this area. Following to that I started to investigate more on the health network or health hub such as RHIOs in USA and SUPER CLINIC in Australia.

I combined the following three groups of key words in informatics and medical in my searching:

(1) Health information systems, health information exchange between different information systems “IS”

(2) Current procedure of health information exchange between different parts of health care systems in developed countries

(3) Reviews and critiques on the current and the old designs for accessing and retrieving data of a patient in health information systems.

9.3 Motivation

Evidences show that large number of patients go to GP regarding to their chronic illness. These patients require long-term and systematic care which needs a proper communication among different healthcare professionals. These healthcare professionals need to access to the Patients' health information, such as the previous diagnostics, treatments, laboratory tests and etc. at the same time and continuously in order to make a good decision. Such this process may lead to place a big load of work on the health participant if the information exchange System was not implemented properly enough. In addition to there is not sufficient time, while the bureaucracy and paperwork has considerable weight in terms of time (Precedence Healthcare)

For instance health care system is very complex in US and sporadic because of using different Information technology in different areas which lead to have different standards in their health Care systems. Despite of the considerable expenses in health care systems in US in compare to other developed countries, still there is some evidence shows the lack of efficiency in their Healthcare systems: the medical errors and lots of duplicated tests. Institute of Medicine in US estimated the number of death caused by medical errors between 40,000 to 90,000 (Linda T Kohn, Corrigan, & Donaldson, 2000)

Many possible reasons for this issue are existing; such as lots of wasting (e.g., duplicating process in tests) and medical fault (e.g., undesirable medicine reactions).

The following picture illustrates a summary of the necessity of implementing a good e-health strategy in order to improve the efficiency in communication between different health information systems-

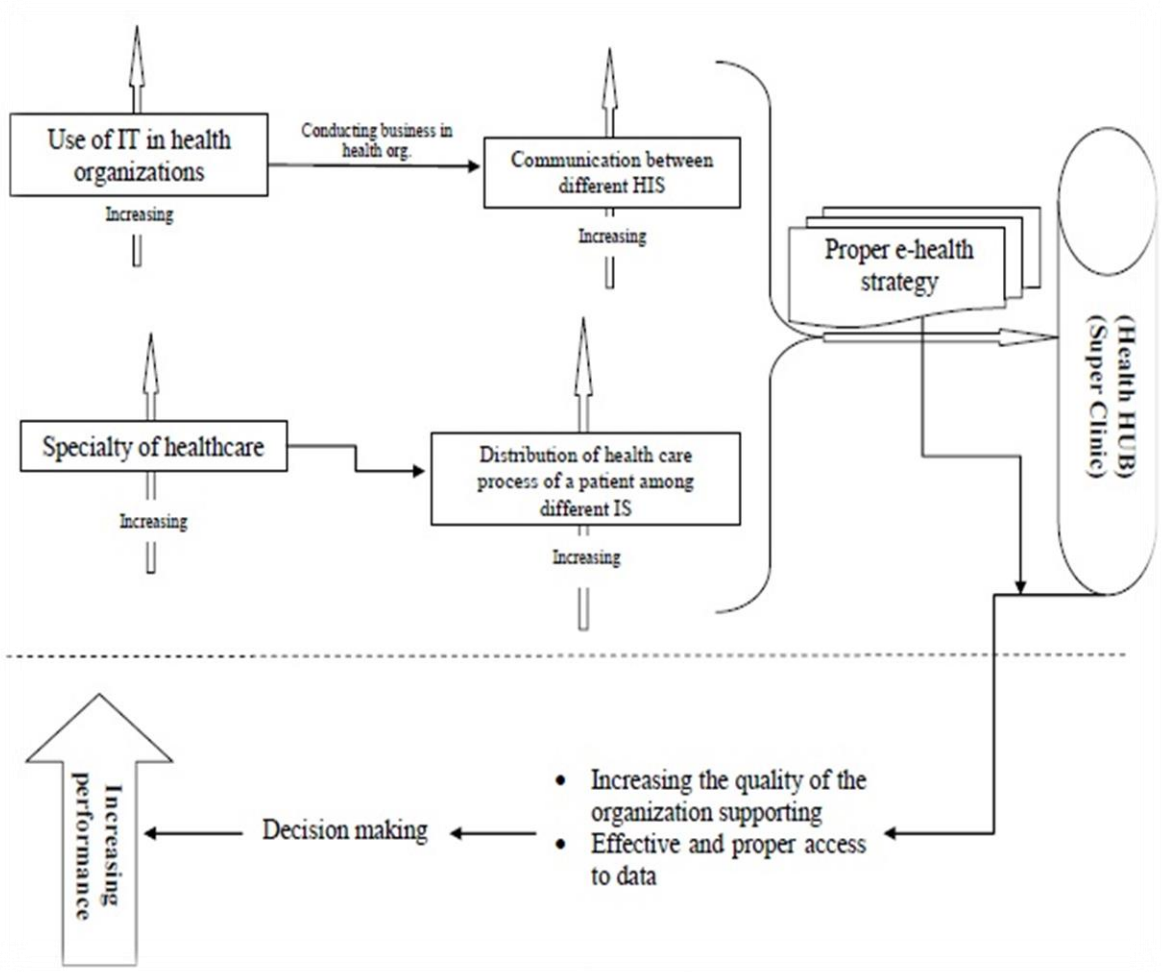

Figure03- Importance of proper HIE Strategy

9.4 Overview to Simple Communication System in HIE

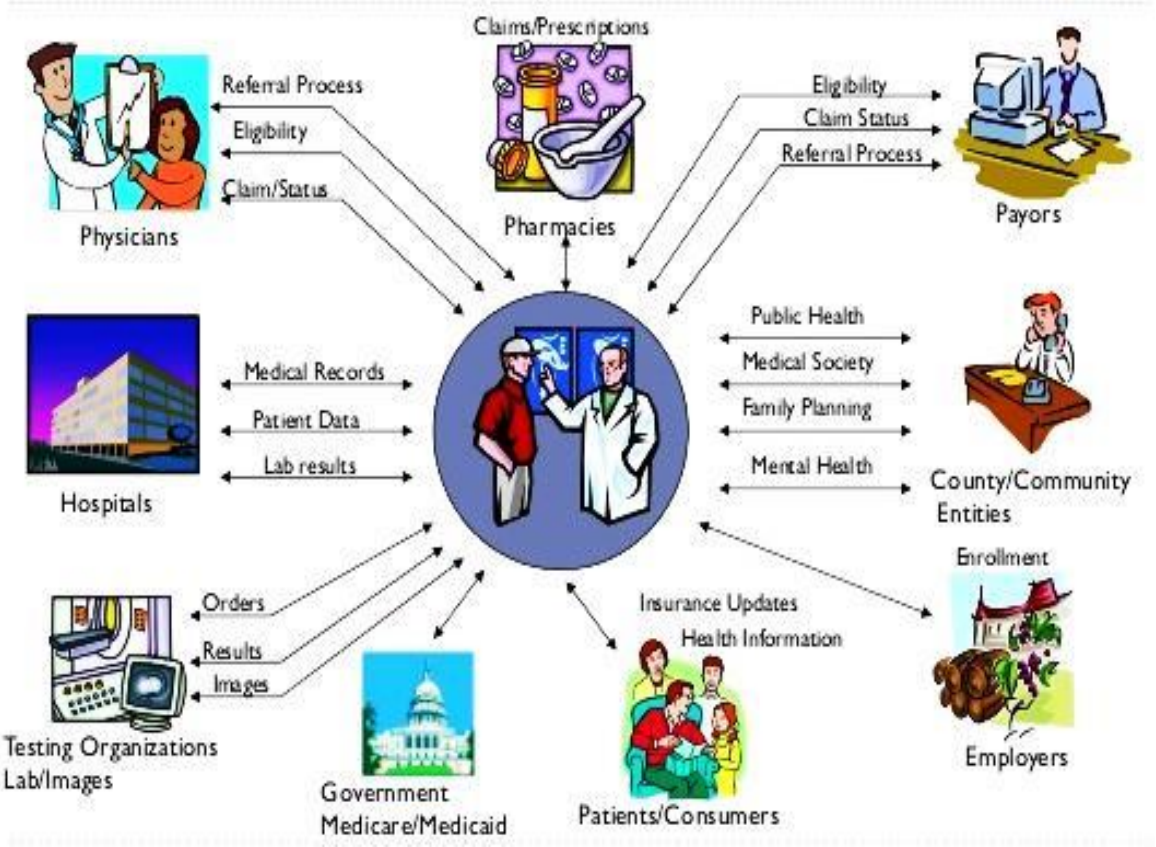

Figure04- Communication in HIE

9.5 Case Study

HIE in Developed Countries

Ashish K. Jha and his colleagues had conducted a study researched on usage of HIE in four developed countries (UK, Netherlands, Australia and NZ), they reported out that the all four nations use the electronic health records (EHRs) as an important main of HIE, among GPs in nearly universal rate which is above 90% (Jha et al., 2008). This rate is about 40-80% in Germany and the US and Canada even had much less in rate of 10-30% in their ambulatory care physicians; they also stated out that there were no high quality data setting in hospitals and only a small part of hospitals in Australia was provided by main component of the EHR systems (Jha et al., 2008). Efforts to establish a better HIE system were in high priority in Australia same as other 3 countries. In these countries health information technology (HIT) have accomplished to high level of EHR adoption specially in primary care section but still legged with the EHR and HIE of inpatient sectors, they concluded that increased attempts would be required if interoperable EHRs covered the whole systems (Jha et al., 2008).

The below table summarized the major attempt toward HIE systems in some industrialized countries, figure 05 reproduced from (Jha et al., 2008):

	Australia	United States	Canada	United Kingdom	Germany	Netherland
Major Policy	NEHTA	RHIOs	Health Informatics way	National Programme for IT	D2D, smart cards	National Switch Point
State of HIE by 2008	• Early pilot project • Little actual HIE • Great focus on Telemedicine • Planning for greater HIE	• <12 organization sharing any health data • Total patient involved in <<1% of the population of US	• National program developing. • <5% of prescription are exchangeable	• Programs are underway	• Most Germans have smartcards with administrative data but would allow to access more clinical data in future	• Full implementation by end of 2008

Figure05- HIE achievement in developed countries (reproduced from (Jha et al., 2008))

9.5.1 Case Study 1: HIE in USA

According to our literature review I found out that the most similar project to the "Super Clinic" or 'Health Hub" is RHIOs in USA. Therefore I decided to review the HIE development in USA first and analyze the weak and strong points during its improvement.

VTMEDNET:

In 1995's, VTMEDNET was starting to lunch in US, while there was a legacy of supporting any residential areas which is less than ten thousand square miles and has fewer than six hundred thousand population, with reasonable and high quality of health care; VTMEDNET was starting to design and found in about 20 years ago in Vermont, the most rural state in the nation (J. McGowan, Evans, & Michal, 1995), and later in 2006, VTMEDNET became the first extensive state-wide health information network in the country.

It was very basic version of HIE , and used the simple web-based technology to support health decision making and access to EHRs, but after a while this state went under development of RHIOs (J. J. McGowan, Jordan, Sims, & Overhage, 2007).

Since health care system in US was very fragmented across providers and care settings, re -in structuring health care system in US became notable by 2006. There were many factors influencing this fragmentation. For instance American clinicians faced to limitation of the scope to their practices in special area of care or even a single setting (Wilcox et al., 2006).

In USA launching RHIOs (as an achievement in HIE systems) in different states allows The citizens to benefit from more qualified health care. The patients and the health care providers can access to their clinical data anytime or anywhere in a state-wide range. Walker and his colleagues reported out of roughly a billions saving financially in HIE employment in US (Walker et al., 2005).

By 2010 great efforts on smoothing the progress of HIE have existed for over two decades in USA but still there is need to improve it more, therefore in recent federal policies and actions for health informatics, developing a proper HIE) would be addressing fragmented personal health information and increase the level of quality in healthcare, new methods of strategies are essential to eliminate and overcome the barriers, obstacles, and challenges associated with technology (Vest & Gamm, 2010).

Commonwealth Fund (CMWF) carried out a survey and stated out that 81% of GPs in US do prescribing electronically while 79% using complete EHRs in their health process from

Prescribing to diagnosing and any other related health information (Schoen et al., 2006).

Why some RHIOs are successfully implemented while others not?

RHIOs hold one of the main achievements toward improvement in health information exchange, it plays an important role in US attempts to activate broad HIE; but the point is, still there are lots of questions regarding successful efforts and failure ones in RHIO projects (Adler-Milstein, Landefeld, & Jha, 2010). Therefore the issues which have influence in developing a RHIO and its viability should be studied in order to analyze the future similar one such as Super Clinic.

Studies shows the most of the successful RHIOs contain some main distinctive factors, these factors are: they founded on mixture of federated architectures; they collected frequent fees from their participant to keep on their viability financially; the third one is the exchange of the health information are narrow between them while the type of stakeholders are relatively wide and finally they were provided with very formal management.

It is predictable that while they started to develop RHIOs in the different states which previously used an older version of HIE systems, like Vermont used VTMEDNET, some issues had been encountered. These kinds of issues and strategically solutions for them lead the team to have some major guidelines in developing RHIOs. These set of issues and responses to them can help NHIN vision as well. Therefore another main disadvantages in developing RHIOs is matching them with previous HIE systems. We need to minimize the cost of the restructuring and increase the quality of the health care delivery.

To summarize the RHIOs disadvantages, we have to mention that there are two main disadvantages:

- One is that most of the RHIOs were not easy to implement in rural areas

- The second one is that RHIOs should have an ongoing communications with other HIE systems to survive so it should be implemented in way that the cost of maintaining or up to dating it with other new HIE systems would be minimized.

9.5.2 Case Study 2: HIE in Australia

Australia's Health Informatics Conference (HIC) annual reports reflect exactly how Australian health information society (HISA) is contributing and impacting on world health informatics scene through outlining the progress of health informatics in theory and practice, in different aspects including software development, evaluation, standards, policy development and education (Hansen, Schaper, & Maeder, 2011). HIC 2011 covers the fundamental aspects of health informatics such as demonstrating innovation which is the ability of the practices and processes within healthcare; this revolution outlines a variety of topics on different sectors from primary and acute care to public health.

Till 2003 the main application of ICT in healthcare was: telemedicine, e-health (telehealth) and home telecare. Telemedicine is a system to deliver health care services through the examination of patients by using telecommunication technology; in Australia telemedicine was developed well by that time (Celler, Lovell, & Basilakis, 2003).

There were some old obstacles to implementing a proper HIE systems in Australia. In about ten years ago one of the main obstacles to improving the health communication systems among the providers and patients in Australia was weak communication infrastructure, like high speed internet connectivity, access to computer and the most important one is using it by indigenous people who needs more access to technology to have more opportunity to challenge with ICT and learn it (Forbes et al., 2010). Dayson conducted a study in 2004 to investigate the effects of the western technology values on low adoption of information communication technology by indigenous Australians, he concluded that instead of the western values in technology it was the excitingly passionate response to technology by school children and also the potentials was limited just by economic issues related to difficulties in access to computers and poor infrastructures and low IT skills (Dyson, 2004).

McInnis et al stated out that 98% of GPs in Australia use the EHR systems , they print out the prescription and hand it out to the patient so they do the prescription electronically, and it is good to mention that 80% of their systems supported by high level of decision making tools (McInnis, Saltman, & Kidd, 2006) . If we want to move further it would be more efficient if they could support with the necessary health data of a patient, from any section to make the decision better. We mean to have a more proper system to exchange the health information not only between GPs but the whole health care section e.g. laboratories, primary care, hospitals and etc.

Australia have already computerized their administration part which is the first step for the patient to enter to the health Centre, also many of the laboratories do their result reporting electronically as well, however in order to convert the documents to electronic version we would face to limitation to computerized discharge reviews which are mainly sent from hospitals to GPs and there is mostly no electronic prescribing settled in hospitals (Jha et al., 2008).

Australia has implemented HIE systems over a decade ago, the National E-health Transition Authority (NEHTA) has commenced extensive planning of HIE systems implementation, besides that there is a pilot project in New South Wales (NSW) which is trying to persuade hospitals and other health centers to exchange their health data for about 50,000 patient in a small suburb (Jha et al., 2008). In 2008 the GPs who supported by comprehensive EHRs can automatically download other section's result, e.g. Pathobiology or imaging reports (Jha et al., 2008).

One of the main problem in Australia is lack of a unique national identifier which caused to hinder HIE systems, the process of building a national HIE could be easier if there is a single health identifier; . Regarding this issue there is a service in Australia operated by Medicare called health identifier service (HI Service). It is run by the governance authority, NEHTA as the main operator.

It allocates a unique 16 digit number to each individual, healthcare organizations and healthcare providers. Although the federal, state and territory governments in Australia build up a common healthcare identifiers service(HI service), but this unique identifier is limited in state wide only and in addition to that the identifier from one public organization like Medicare may be the same as a private one like Medibank. Therefore it is necessary to have a national unique identifier to facilitate the information exchange systems.

9.5.3 Case Study 3: Arizona Health Care Cost Containment System HIE

Dates of Note *f*	**2005: Planning initiated**
Overall Program Objective	Improve coordination and communication between the Behavioral Health and Physical Health Systems to improve the quality and efficiency of care for Medicaid patients.
Engaged Stakeholders	• State Medicaid Agency *f* • Physicians *f* • Mental Health Providers (e.g., psychologists, nurses, physician assistants) *f* • Health Plans
Target Population *f*	Arizona Medicaid patients receiving both behavioral and physical health treatment
Technology/Infrastructure *f*	• CDR updated semi-weekly *f* • Web-based interface

Overview

Arizona's Medicaid agency, the Arizona Health Care Cost Containment System (AHCCCS), is working to improve coordination of information between its physical and behavioral health providers and improve the quality of care for the Medicaid population. In Arizona, treatment for mental health is a carved-out benefit under AHCCCS that is administered under a separate DOH agency, the Behavioral Health System (BHS). BHS receives funding from AHCCCS to provide behavioral treatment to Medicaid-eligible members. The existence of two separate systems has created challenges for physicians in serving AHCCCS patients who are treated for both behavioral health and physical health needs.

A patient's behavioral health history is frequently unknown to the patient's primary care physician (PCP) and the patient's medication history and other relevant information is often unknown to the treating behavioral physician. To date, there has been no automated mechanism to exchange data between the BHS and the physical health systems under AHCCCS. In addition, there has not been a mechanism for physicians or other providers (e.g., nurse practitioners, physician assistants, psychologists) to easily communicate patient information (e.g., lab data, medication lists) and coordinate care. To address this, AHCCCS is building a CDR with a web-based interface to allow providers to access behavioral and physical health information, better understand the full spectrum of care their patients are receiving, and ultimately improve the coordination and quality of care for this patient population.

As an example, certain behavioral health medications can cause metabolic syndromes in patients with diabetes, which may lead to a deterioration of blood sugar control, even in previously well controlled patients. However, oftentimes, the prescribing behavioral health physician does not have the ability to monitor the patient's blood sugars because AHCCCS only pays for glucose testing under the physical health system's benefit. Therefore, under the current process, if a behavioral health physician wants to track a patient's blood glucose, he or she must request the information from the patient's PCP and then wait until the PCP orders the test and returns the test results to the behavioral health physician.

This PCP-focused process is intended to avoid unnecessary duplication of services by narrowing the number of physicians who can order tests on Medicaid members. Not surprisingly, this limited and cumbersome communication creates many challenges for patients and providers, and is often inconsistent, inefficient, and frequently has led to problems with patient medication compliance (e.g., the patient does not receive a prescription or does not receive the correct prescription).

Financing and Sustainability

In the short-term, facilitated through low maintenance data transfers from health plans, PBMs, and labs, the sustainability of the initiative's technology will be relatively easy and inexpensive. However, the long-term development and fiscal solvency of the program is unclear. This HIE project differs from the other projects highlighted in this report because it is currently funded entirely by the State's Medicaid program (AHCCCS). The initiative is also staffed by full-time AHCCCS employees, which is estimated to cost $100,000 to $150,000 in staff time. AHCCCS may also fund the anticipated $50,000 in hardware costs necessary to support a separate stand-alone server. However, the program is currently in negotiations with BHS to evaluate if the two agencies can share these costs. Looking at overall program costs, AHCCCS is considering the most cost-effective way to run the program. They are conducting a cost-benefit analysis to evaluate whether it should be launched, supported, and housed within the State's Medicaid program. In particular, they are evaluating the costs of running the HIE project internally, including staff time and hardware/software costs, as well as having the project managed exclusively through an external vendor. While there have been many vendors willing to provide AHCCCS with the "perfect system," the interviewees stressed the costs have been prohibitive. For example, the interviewees indicated that vendor solution costs are approximately three to five times the amount AHCCCS anticipates it will cost to house and run the technology internally. It is currently unclear if AHCCCS has sufficient administrative funds to launch and maintain this project and may ultimately consider applying for public and/or private sector funding.

9.6 HIE systems in recent time in Australia:

Computer use by Australian is rapidly expanding; this is result of need, financial inducements, software accessibility due to reasonable prices, relatively low hardware costs and support by the means of classifications of general practice (Pearce & Haikerwal, 2010).

General practices have been taking advantages of computers on desktop which had resulted in

Australia's biggest electronic database of clinical information; there is also potential high financial savings and higher quality level of practices as a result of adapting them to e-health, on the other hand, there is no official means for communicating the data among different systems although the PIP e-Health proposes public key for information encryption. Additionally, there is no method to back up the use of available, precise and complete data for quality purposes although there are lots of grounds for the effectiveness of e-Health. The main setback of hospital procedures is generally the extent of the disconnections between the clients taking advantage of electronic means for patient care, planning, measuring, evaluating and ones that offer local, regional, state and federal funding.

No compatibility in hospital systems in region and across borders and complex need for national synchronization result in less beneficial use of data and knowledge throughout the nation. The cost that lies within the change management when adapting e-health is generally underestimated; there are also short comings with the infrastructure and existing technologies within the hospital systems. Existence of processes such as computerized entries, advancement in safety and decreasing usage of medicine will result in higher efficiency with only one setting; nonetheless, this may cause the "point of care" staff to perform more work due to computer-regulated protocols.

The whole care process will result in better health services as well as considerable savings due to more efficient use of resources. On the contrary, in order to succeed, training in technology needs to be benefit from though (http://www.ehealthnt.nt.gov.au) in Northern Territory and (http://www.barwonhealth.org.au) in Victoria. The problems associated with the transformation are different in government level as they need to assess the funding expenditures alongside the needs of an electorate or stakeholders. They also need to consider the communication between health care providers. On the basis of importance of team work in modern health care this connectivity may have benefits that are not accounted for in a single sector. These benefits are as a result of large, less unpleasant outcomes and less tests.

Using electronic health records (EHRs) also boosts the efficiency and quality of all the services involved. The challenge for the government is the primary funding they need to provide to increase the gain for the future.

Funding for equipment such as beds might seem of an immediate value but using e-health care system by the means of modern technology will have a long term positive impact by reducing the claims for new beds and overall expenses; this will result in a more sustainable system for the future.

9.7 Current NEHTA System:

It has been more than a decade that Australian government has been trying to create a national e-health system. Many evaluations have been conducted and also investing about $5 billion on several e-health schemes. However, no major outcome has been derived from all these and the focus still remains on local and regional prospects (Anonymous, 2010).

The subjects of matter involved with implementing a sustainable e-health system are as follows:

- To have a clear picture of a national e-health system
- The extent of the Australian health division at the national level
- The e-health scheme
- Two notions to focus on – progress and individual healthcare identifiers
- Disappointment of The Council of Australian Governments(COAG)

On July 5th 2005, the national e-health transition authority (NEHTA) was established by commonwealth, state and territory governments, this organization was responsible to improve the means data that is collected electronically over may secure networks (Bramley, Richards, Cordell, Richardson, & Guo, 2009). NEHTA with the help of its National Clinical Terminology and Information Service (NCTIS) was in charge of producing, maintaining and presenting standard terms in order to describe the contents of health domain as well as less ambiguous and more meaningful results derived from data, therefore data will be exchanged in a more effective and efficient manner within the health sectors

9.8 Future “Super Clinic”

GP super clinic was founded recently in Australia while Australian Government commitment of $275 million in about 4 years in order to develop 31 General Practice Super Clinics (GPSCs) around Australia. The main goal to this big project is to decrease primary care workforce in future and facilitate the information exchange between different health information systems while providing high quality education and training opportunities(Vickery, Dodd, & Emery, 2009).

The planning steps for Super Clinic involve:

- Recognition of common motivation
- Building up a governance foundation
- Identifying the required technology and IT infrastructure
- Clarifying the protocols and standards for communication
- Data exchanging
- Planning the business strategy
- Confirming its feasibility

9.9 Result from Theoretical Study (Super Clinic)

According to the theoretical study there are abundance of health information for each patient and also very wide range of health providers. As the theoretical findings show one of the best way to facilitate and increase the viability of this Super Clinic is to making narrow data set exchange and have more variety of stakeholders connected to the "Health Hub". It should be consider that information exchange and communication in any field needs interaction among people ad these people may have different perception of concepts. Therefore the main concepts also should be predefined to avoid misunderstanding. And some protocols and standards also could be applied in order to do this.

The outcomes from the theoretical study is basically a very fundamental design for "Super Clinic", and the way that involved entities in the super clinic could exchange the information, therefor it is very basic design for its IT infrastructure. In theoretical study part, THE AUTHOR investigated similar systems and it helped me to understand the "Super Clinic" with below basic structure as a potentially good address to the current deficits of HIE systems in Australia.

In this design the main different point is the using a central hub, which several stakeholders such as GPs, hospitals, ambulatories, referrals, laboratories and other health provider connected to that directly, instead of having several hubs in each part. In this way the amount of direct stakeholders increased and it could be a good motivation for them to implement this system more.

The point with this hub which makes it very different and outstanding in HIE systems, is the unique protocol that would be used among the all entities in this new system. This is the main reason of using a central hub, so the stake holders provided with unique protocol to share the data. In the old systems it may exist various standards and protocols to connect to the data bases and access the data, so the possibility of the systems viability was low because one of the main important reason to keep these system active is their communication with other systems, so they may need revising in future and if the protocol and standards are unique and are not various it can be much easier to keep it up to date.

It is good to mention that as it is trying to optimize the communication and information exchange systems among the health partners, it is assumed that the data are all computerized, therefore in this study we limited our perspective to the sharing of these computerized health data.

10. Empirical Study

Purposes

The main purpose of the empirical study is to add some empirical data to existing knowledge which are gathered from literatures review and analysis of them. We planned to conducted interviews in a way to address the research questions in mainly informatics perspectives from the related experts in this area.

10.1 Analysis

In empirical study,

Sample Population

Category	Year of experience	No. of people
Category 1	>12 year experience	11
Category 2	8-12 year of experience	15
Category 3	4-8 year experience	14
Category 4	0-4 year experience	10

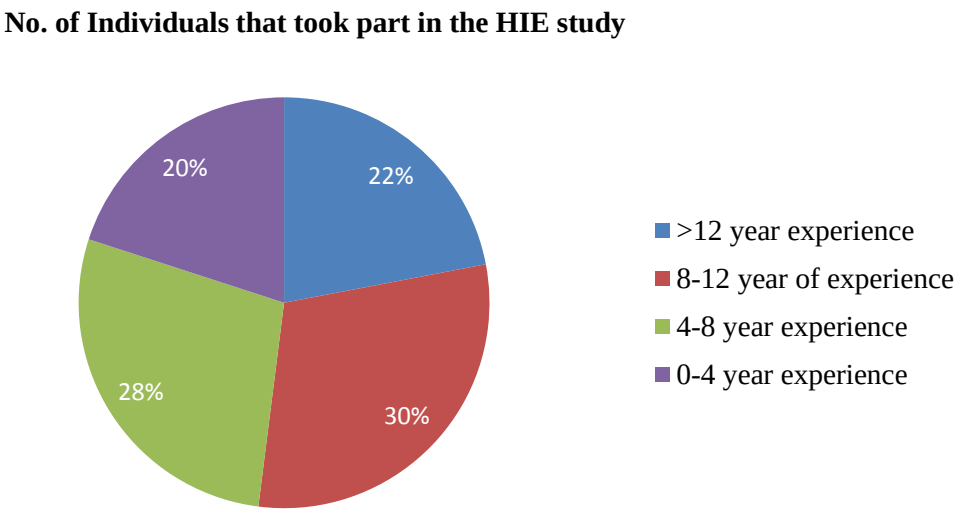

Figure06- No. of experienced people selected for survey (Graph a)

Q1. Have you ever used or, aware of an EMR/EHR product?

Analysis from survey:

From >12 year of experience, all surveyors have used EMR/EHR products

From 8-12 year of experience, out of 15, 14 people used and rest are aware of it

From 4-8 year of experience, out of 14, 10 people used and rest are aware of it

From 0-4 year of experience, out of 10, 4 people used and rest are aware of it

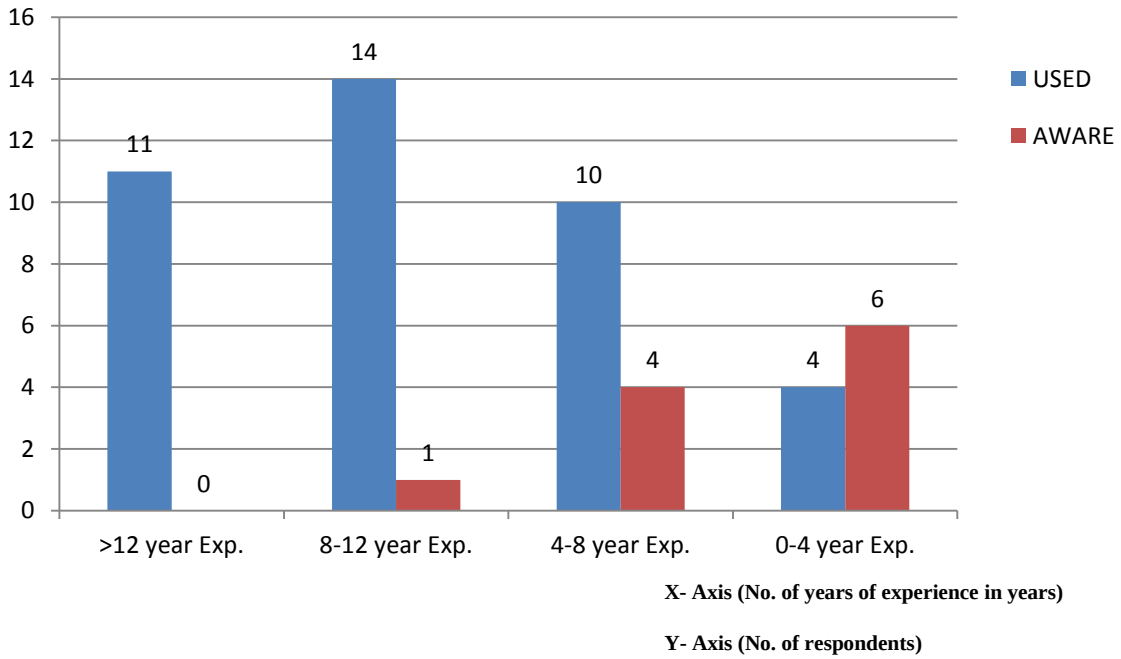

Figure07- Used/Aware of EMR/HER (Graph b)

Interpretation-

Surveyors who are aware/used EMR/EHR are satisfied with its ability to incorporate the exchange of clinical information within their EHR work flow.

Q2. What is your perception regarding an HIE?

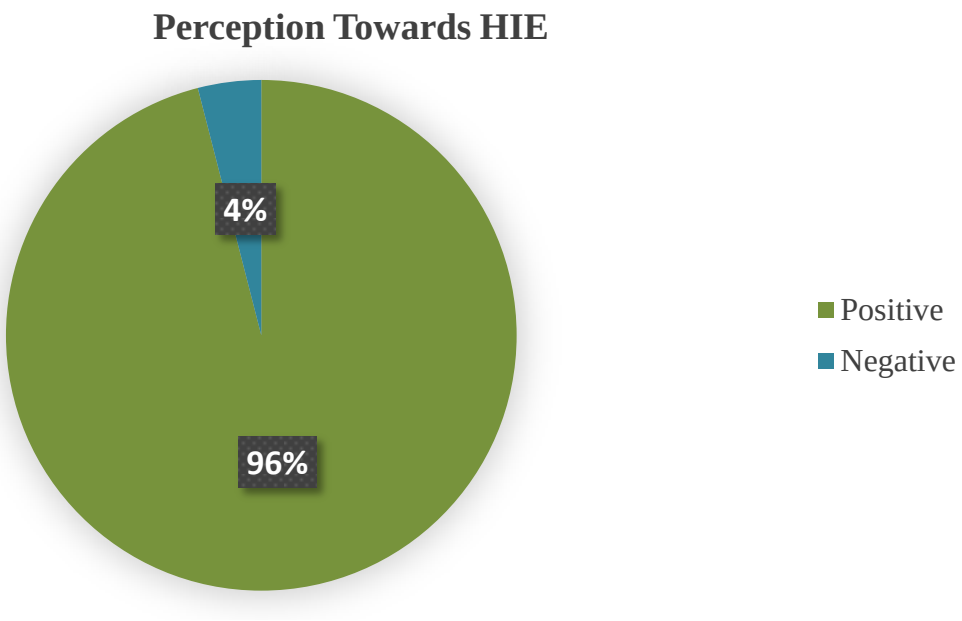

Figure08- Perception towards HIE (Graph c)

Interpretation:

Nearly 96% responded positive perception regarding HIE.

A. If Positive Perception then,

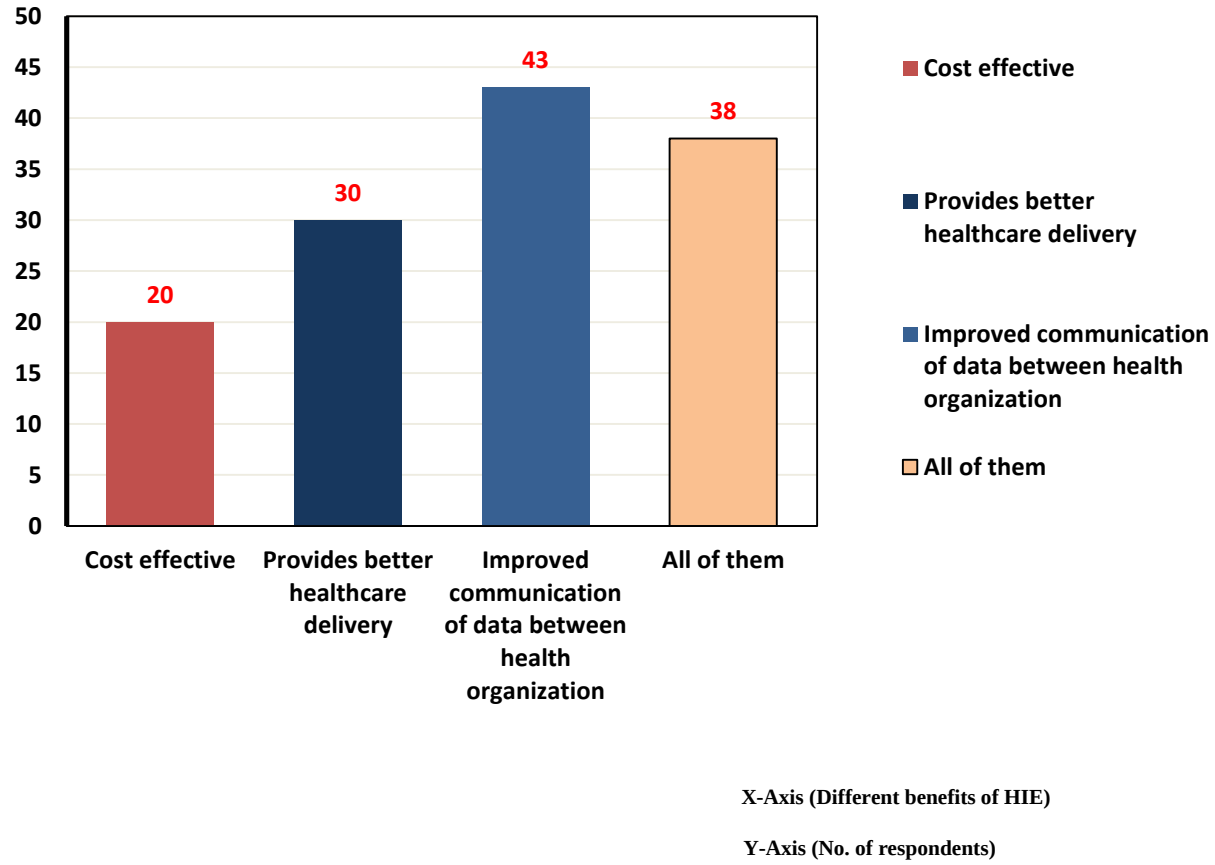

Figure09- No. of Respondents positive Perception towards HIE (Graph d)

Q3. Is health information exchange (HIE) effective in improving clinical, economic and population outcomes?

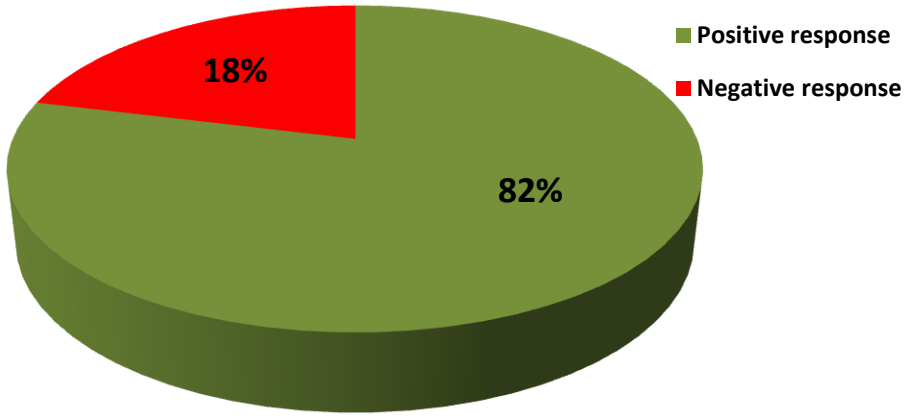

Figure10- Effectiveness of HIE (Graph e)

Interpretation:

Out of described sample size, 48 respondents said Health Information Exchange is effective in improving clinical, economic and population outcomes.

Q4. According to your perception, what are the important barriers in development of HIE?

(May select more than one)

Analysis of barriers in development of HIE

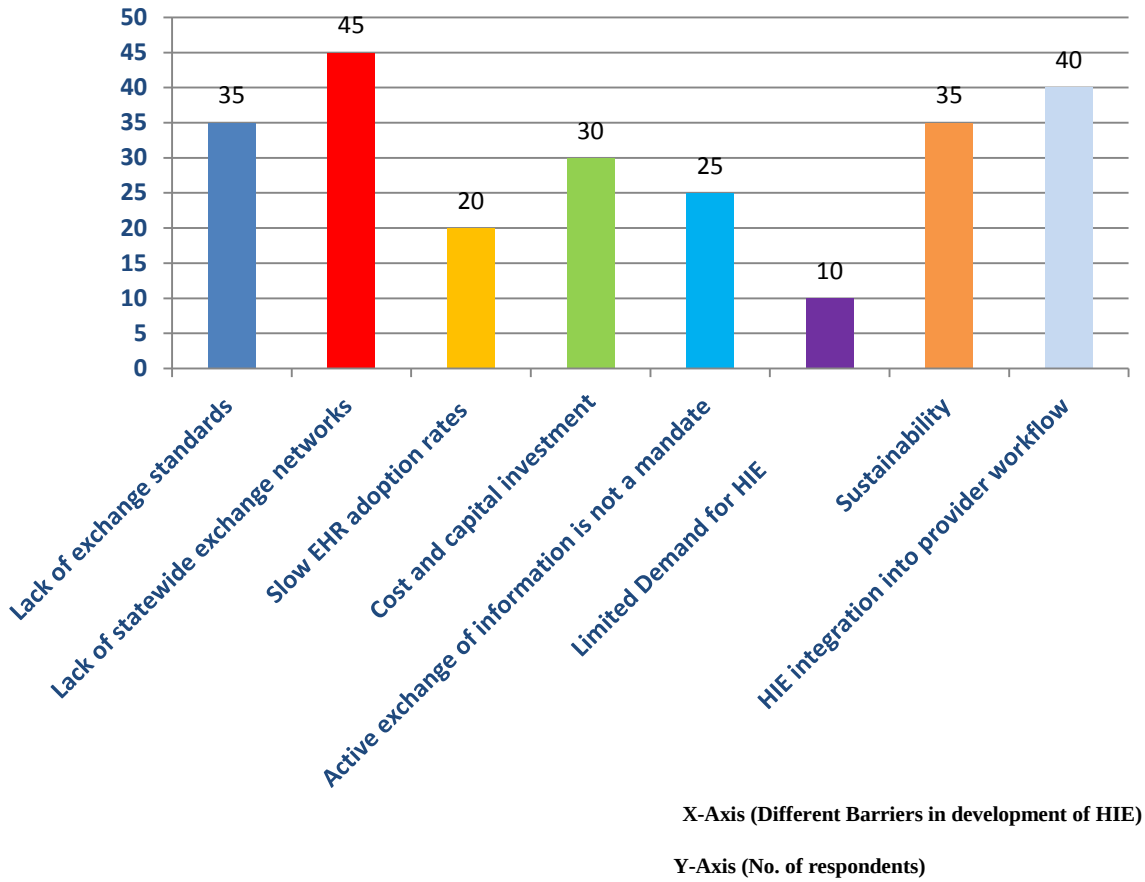

Figure11- Barriers in development of HIE (Graph f)

Interpretation:

Maximum no. of surveyor's responded to lack of statewide exchange networks, lack of exchange standards and sustainability as main barriers in development of HIE.

Q5. How data and health information should be categorized in order to improve the Efficiency of the HIE?

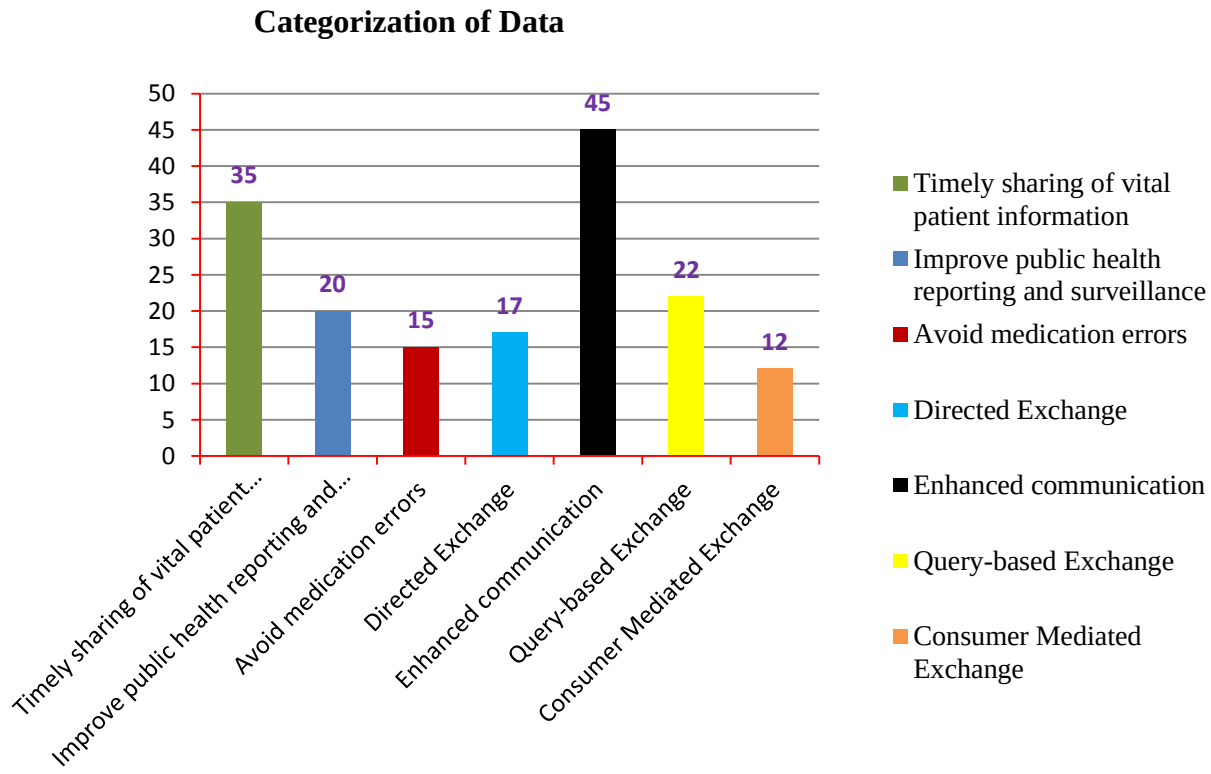

Figure12- Categorization of data to improve efficiency of HIE (Graph g)

Interpretation:

Maximum no. of surveyors recommended the enhance communication and timely sharing of data in order to improve the efficiency of HIE.

Q6. Do you think most of the physicians need to redesign and transform their Workflow and Practice to Leverage and embrace an HIE?

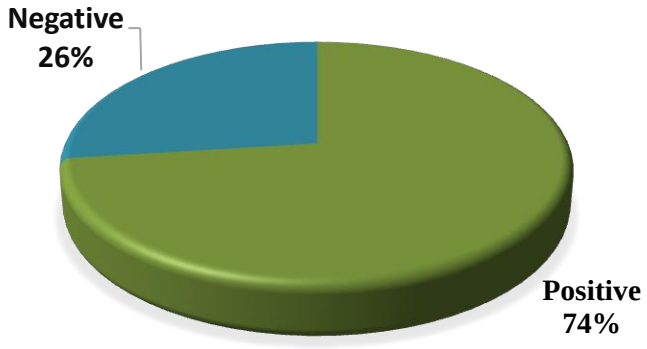

Figure13: % of surveyors who think a new technology infrastructure is necessary for a Successful HIE (Graph h)

Interpretation:

74% surveyors responded for addition of new technology in HIE while rest are not in favor.

Q7. Which aspect of the Workflow needs to be redesigned?

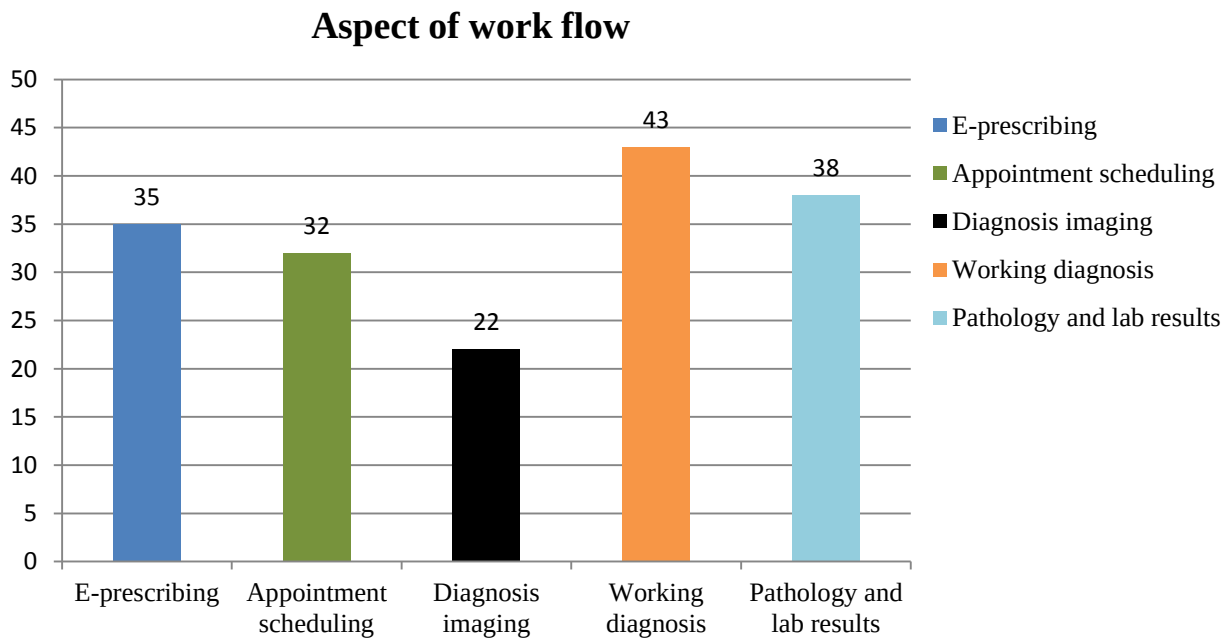

Figure14: Aspects of workflow (Graph i)

Interpretation:

A/c to surveyors, Physicians need to transform

Aspect of workflow	% of Recommendation
E-prescribing	**70 %**
Appointment scheduling	**64 %**
Diagnosis imaging	**44 %**
Working diagnosis	**86 %**
Pathology and lab results	**76 %**

The highest no. of respondent specified that by changing the working diagnosis, we can achieve the goal for HIE in a simpler manner, followed by data/ result flow to the physician or other end user from the laboratories, would help in HIE.

Q8. Which of the entities should be part of the HIE ecosystem?

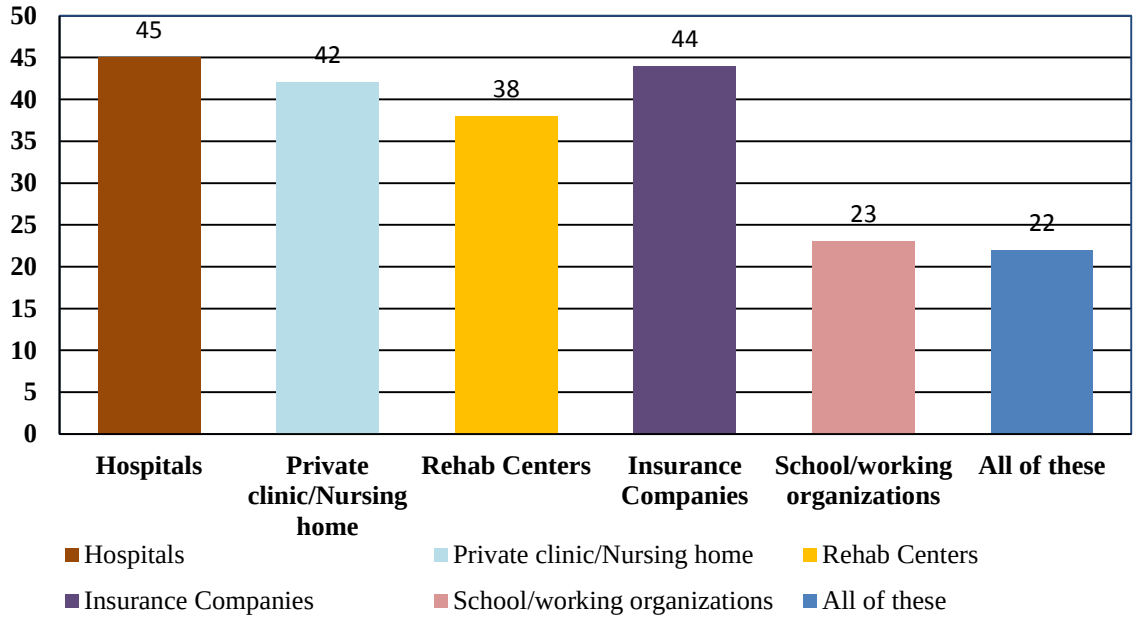

Figure15: Entities for HIE eco system (Graph j)

Interpretation:

As per the surveyors these are the entities which should be a part of successful HIE ecosystem.

Q9. How do you think the HIE would benefit the overall experience in patient care?

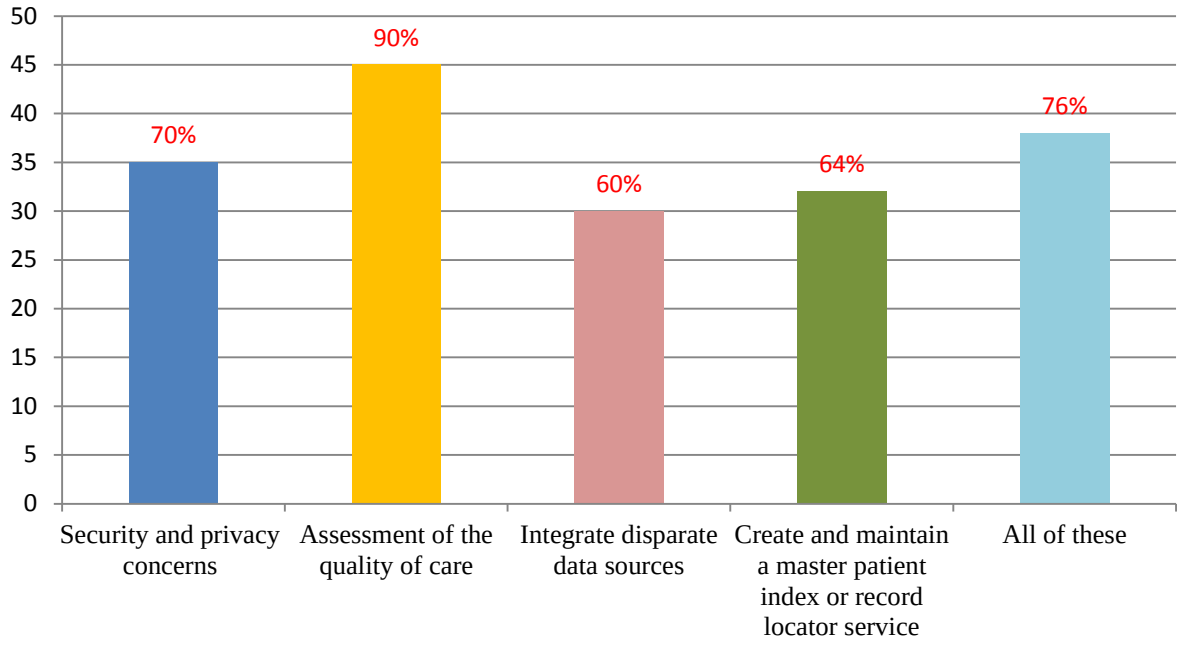

Figure16: Benefits for HIE for overall experience in patient care (Graph k)

Interpretation:

Above figure clearly shows that maximum no. of people recommended the assessment of the quality care and security and privacy concerns so as to benefit the overall experience in patient care.

10.2 Results from the Empirical Study

From interviews showed there are many IT issues influencing on effective information exchange. In the first phase of implementing new HIE system; we have to focus on the key IT factors. One of the most important one is the system flexibility from an IT aspect. Information exchange systems need flexibility in order to become a member in a wide network. Having a standard for information exchange and some rules to access the data is necessary in order to have a comprehensive system in nationwide.

The main barrier for HIE is the concern about the security of the data. Security and privacy concerns are mainly from researchers' and patients' side. The informatics protocols addressed these concerns. Lack of statewide exchange networks, Lack of exchange standards and Sustainability are also key barriers for HIE.

11. Comparative Analysis

According to the empirical results, while it is necessary to have an informatics framework, the new HIE systems should consider the flexibility in some aspects. The interviewees mentioned that informatics and technological standards should be set during implementing the new HIE systems. It may avoid many potential IT problems like security of data or accessibility to data. There are some common standards for sharing and exchanging data currently used by most of the HIE systems such as HL7. The new HIE systems can be inspired from these existing standards to save time. Geographical expanding is another important IT issues. Usually in expanding a system geographically many technical problems may rise.

The results from empirical study showed that the IT characteristics should address the concern about privacy. They have also stated that HIE systems need to revise the current informatics, security and privacy policies instead of building up new ones. The best way is to review mature and successful HIE in terms of information exchange, financial and operational feasibility.

Theoretical study results showed the most of HIE grants funding encouraged development in health information systems. Also wide-range of stakeholders had an outstanding influence in increasing applying new HIE systems, the new HIE systems could benefit from broader resources financially (Adler-Milstein et al., 2010).

In 2011 Alder and his colleagues conducted another study and concluded that the main policy characteristic is large amount of grants to different states to implement a new health information exchange system. This is to improve the data security in nationwide and increase the usage of HIE new systems in more organizations.

How data and health information should be categorized in order to improve the efficiency of the HIE?

According to the results from the **theoretical study**, different health data needs to be exchanged among different participants. Some data should be available to the whole participant in the Hub and some had much stronger security to access. Sharing the test results, medication list and inpatient data in the Health Hub with easy accessibility is more important than personal information of each entity in systems.

The HIE systems were growing and supporting more areas, they included more data types such as: pathology results, inpatient and outpatient information, medication lists, hospital discharge summaries and demographics of the patients. Fennel and Overage have also highlighted that the following data categories should be included in any HIE systems: laboratory results, diagnoses histories, procedure histories, inpatient data and demographics.

Results from **Empirical Studies** also confirmed the outcomes from **Theoretical Study**. In order to have more successful HIE systems, they had to make each data package narrow and increase the number of the packages. Results from interviews illustrated omitting unnecessary data in each transaction helped HIE systems to save more costs. With including narrow groups of data, technical informatics challenges would be simplified consequently. They also mentioned that the most important set of data based on the past experiences are the test results, inpatient records, and discharge letters from hospitals, clinical notes and medication procedure.

12. Discussion

12.1 Findings

Important factors to have a successful HIE:

- Focusing on providing the clinicians with relevant health data in a timely manner. It leads to help them in decision making
- Standardization of healthcare to save time and expenses.
- Current system of HIE is not as effective to data exchange between EHRs
- Electronic reporting for public and population health measurement is lacking. So a new efficient system with fewer barriers is needed to design.
- Data available untimely for clinicians
- Standardization of healthcare to save time and expenses.
- Seamless integration between different EHR & EMR

12.2 Additional Findings

- Care giver point-of-view: Providers are not convinced that Health Information Exchanges provide complete, accessible, secure patient information.
- Lack of interoperability and the lack of HIE infrastructure Privacy and Liability concerns were major challenges.
- When receiving health information from an outside clinician, they prefer to "pick and choose" which information they want to include in their EHR, compared to only few said I prefer to upload and include all the information.

12.3 Limitation of survey

- Prospective of insurance providers and other entities could not be taken as a part of the study. only provider prospective were taken.

- Sample size is another limitation as no. of respondent were hard to find, who have worked in the healthcare setup within established HIE network

13. Recommendations

- Adoption of HIT standards across all the entities

- Adoption of newer IT Platforms which are interoperable in nature

- Spreading a knowledge of HIT standards among the users & its benefits.

- Standardization of workflow & process across the various healthcare entities (Best practices.)

- Introducing the modern healthcare tech. using **health hub** or **Super Clinic**.

- Super Clinic is about enhancing communication and information exchange between different information systems.

- Ensure continuity with the workflow of a hospital or physician practice with limited interruptions.

14. Conclusion

- To minimize HIT problems using any new HIE ecosystem in health information exchange is create a list of IT standards and protocols as a kind of certificate for each HIE system. Thus improving the quality of data exchange and increasing the likelihood of intended positive outcomes, improved coordination of patient care, Cost savings, increased patient engagement etc.

- Since HIE initiatives and pilot projects proliferate, there is a pressing need for them to be formally evaluated with research methods that will provide robust evidence about the financial impacts and actual efficiency, quality, and safety gains that are achieved.

15.References

1. Department of Health and Ageing - GP Super Clinics National Program Guide 2010. (2010) Retrieved 15/05/2012, 2012, from http://www.health.gov.au/internet/main/publishing.nsf/Content/pacd-gpsuperclinics-ProgramGuide2010

2. https://www.healthit.gov/providers-professionals/health-information-exchange/what-hie

3. Adler-Milstein, J., Des Roches, C. M., & Jha, A. K. (2011). Health information exchange among US hospitals. American Journal of Managed Care, 17(11), 761.

4. Adler-Milstein, J., Bates, D. W., & Jha, A. K. (2009). US Regional health information organizations: progress and challenges. *Health Affairs, 28*(2), 483-492.

5. Kaplan, B., & Maxwell, J. A. (1994). Qualitative research methods for evaluating computer information systems. Evaluating health care information systems: Methods and applications, 11(2), 137-155

6. WHO / World Health Organization. (2012) / Retrieved/ April/ 2012, from http://www.who.int/en/

7. https://en.wikipedia.org/wiki/Health_information_exchange.

8. http://www.himss.org/library/health-information-exchange

9. http://www.immregistries.org/resources/AHRQ_Jan2006.pdf

10. Cesnik, B. (1996). History of health informatics. Health Informatics: An Overview.

11. Forbes, D., Sidhu, A., & Singh, J. (2010). A framework for patient practitioner information exchange. Paper presented at the Computer-Based Medical Systems (CBMS), 2010 IEEE 23rd International Symposium on.

12. http://www.who.int/healthpromotion/conferences/7gchp/track2/en/

13. http://precedencehealthcare.com/cdmnet/

14. Information Governance - e-Health - Accenture. Retrieved 29/04/2012, 2012, from http://www.accenture.com/us-en/pages/insight-information-governance-effective-ehealth-summary.aspx

15. https://healthit.ahrq.gov/sites/default/files/docs/page/guide-to-evaluating-hie-projects.pdf

16. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2995716/

17. http://bmcmedinformdecismak.biomedcentral.com/articles/10.1186/1472-6947-13-121