To Study the change in Physician's perception about Electronic Health records on its usage over a period of time

A dissertation submitted in partial fulfillment of the requirements

for the award of

Post-Graduate Diploma in Health and Hospital Management

by

Vipin Vasudev S Pai

Enroll. Id: PG/10/059

International Institute of Health Management Research

New Delhi -110075

May, 2012

To Study the change in Physician's perception about Electronic Health records on its usage over a period of time

A dissertation submitted in partial fulfillment of the requirements

for the award of

Post-Graduate Diploma in Health and Hospital Management

by

Vipin Vasudev S Pai

Enroll. Id: PG/10/059

International Institute of Health Management Research

New Delhi -110075

May, 2012

Acknowledgements

This dissertation began with a conversation with Mr. Ashish Chaudhary, Dell Services, Noida during summer training 2011, when I was about to finish my Summer Training. During this conversation we discussed about the studies which can be conducted at the customer site and also will be useful for both. Since I had thought about some longitudinal study on physician perception about Computerized Patient Record System, I asked him about the possibility to conduct such study. His response was encouraging and very clear. He enthusiastically agreed to get permission for the same and told me to proceed with my ideas. At this point of time I would like to express my deepest gratitude to Mr. Ashish Chaudhary, Dell Services, for giving me an opportunity to do my internship & also do this Dissertation and to learn various aspect of Healthcare IT.

This work could not have been completed without support from many people. I owe a debt of gratitude to the 60 respondents who took time out of their busy schedules to complete and return the questionnaire. I am extremely grateful to Dr. Vivek Sahi, Dell Services who guided and helped me during each phase of this study.

My deep gratitude to Dr. Fahad Mustafa Khan, Principal Consultant and Dr. Tanika Kaistha Dell Services, for their support, involvement and encouragement during Internship and Dissertation period.

I thank Mr. Ajay Aiyar, Dell Services, Noida for giving his full support in completing our dissertation project.

I also thank Dr. Anandi Ramachandran, my Mentor for continuous guidance and support throughout my dissertation period. Without her patience, invaluable guidance, comments, perspectives & suggestions, and direction this work would have never come to fruition.

I also thank Dr. Pawan Kumar Taneja for continuous guidance and support for this study.

I would also like to express my deepest gratitude to Ms. Jyotsna Khatri, my friend for her continuous support and valuable inputs from beginning till the end of my dissertation.

Last but not least, I would like to thank my Mother and Sister who always encouraged me to follow my dreams and for their love, incredibly great confidence, and unbounded support throughout the course of this journey and beyond.

Table of Contents

Sl No		Page Number
I	Acknowledgement	
II	List of Figures	
III	List of Tables	
IV	Abbreviations	
1	Organizational Overview	1
2	Internship Report	7
	Project Overview	8
	Lessons Learned	13
	Dissertation Work Overview	14
3	Dissetation Report	15
	Dissertation Abstract	16
3.1	Introduction	17
	Health and Healthcare	17
	From Healthcare to e Healthcare	17
	Technologies in e Healthcare	18
	Limitations in imparting e Healthcare	18
	Indian Healthcare Industry	18
	Healthcare & IT	19
	HIT Adoption	20
	Challenges	20
	Critical Success Factors for EHR	21
	Barriers to EHR implementation in Medicine	21
	Electronic Medical Records	23
	Electronic Health Records	23
	Advantages of an EHR	24
	Obstacles	24
	Purposes of CPRS	24
	Differences between Paper Medical records and CPRS	25
	Perception	27
	What is Perception	28
	Steps in perceptual process	29
3.2	Literature Review	32
3.3	Problem Statement	41
3.4	Rationale	42
3.5	Objectives	43
3.6	Research Methodology	44
	Study Design	44
	Variables	45
	Sampling method	45
	Study Setting	46
	Nature of Respondent	46
	Sample Size	46
	Data Collection Techniques	46
	Quantitative Analysis Techniques	47
	Factor Analysis	47
	Reliability Test	48
	Correlation	49
	ANOVA	50
3.7	Results and Analysis	51
	Hypothesis & Testing	86
	Correlation Analysis	94
3.8	Discussion	97
3.9	Conclusion	97
3.10	Lessons Learned	98
3.11	Recommendations	99
3.12	References	101
3.13	Appendices	107

List of Figures

Figure		Page No:
Figure1.	Gantt Chart showing work done during Internship period	8
Figure2.	Gantt Chart showing work done during Dissertation period	14
Figure3.	Conceptual Model for Technology Acceptance Model (TAM)	37
Figure4.	Theory of Reasoned Action : Model	37
Figure5.	New Relationship Formulation in TAM	39
Figure6.	First Modified Version of TAM	40
Figure 7	Final Version of TAM	40
Figure 8	Graph Showing Frequency of Respondents - Age Group	52
Figure 9	Graph Showing Frequency of Respondents - Gender	53
Figure 10	Graph Showing Frequency of Respondents - Highest Qualification	54
Figure 11	Graph Showing Frequency of Respondents - Prior experience of using EHR	54
Figure 12	Bar Diagram showing Crosstabulation Age Group and Highest Qualification	55
Figure 13	Bar Diagram showing Crosstabulation Gender and Highest Qualification	56
Figure 14	Mean Score Graph- Computers are necessary for delivering quality healthcare	58
Figure 15	Mean Score Graph- CPRS will reduce the patient record retrieval time	58
Figure 16	Mean Score Graph- New system will decrease gap betwen different stake holders	59
Figure 17	Mean Score Graph- New System will increase coordination between different stake holders	59
Figure 18	Mean Score Graph- CPRS will optimize patient safety	60
Figure 19	Mean Score Graph- CPRS will increase workload	60
Figure 20	Mean Score Graph- CPRS will increase consultation timings	61
Figure 21	Mean Score Graph- CPRS will decrease the number of patients consulted	61
Figure 22	Mean Score Graph- CPRS is Userfriendly	62
Figure 23	Mean Score Graph- CPRS will reduce medication errors	62
Figure 24	Mean Score Graph- CPRS is Useful	63
Figure 25	Mean Score Graph- I am satisfied with CPRS	63
Figure 26	Mean Score Graph- I will encourage my colleagues for using CPRS	64
Figure 27	Mean Score Graph- CPRS will support physicians and nurses in providing efficient care	64
Figure 28	Mean Score Graph- Overall my attitude about CPRS is positive	65
Figure 29	Correlation Model Pre Go Live	95
Figure 30	Correlation Model 90 Days Post Go Live	95
Figure 31	Correlation Model 180 Days Post Go Live	96

List of Tables

Table No:		Page No:
Table 1.	Cronbach's alpha (α) Value Classifications	49
Table 2.	Correlation (r) Value classifications	49
Table 3.	Frequency of Respondents - Age Group	52
Table 4.	Frequency of Respondents - Gender	53
Table 5.	Frequency of Respondents - Highest Qualification	53
Table 6.	Frequency of Respondents - Prior experience of using EHR	54
Table 7.	Crosstabulation Age Group and Highest Qualification	55
Table 8.	Crosstabulation Gender and Highest Qualification	56
Table 9.	Mean Score Comparison Table Pre Go Live and Post Go Live	57
Table10.	Total Variance - Perception Usefulness Wave 1	66
Table11.	Component Matrix - Perception Usefulness Wave 1	67
Table12.	KMO and Bartlett's Test - Perception Usefulness Wave 1	67
Table13.	Reliability Statistics - Perception Usefulness Wave 1	68
Table14.	Total Variance - Perception Ease of Use Wave 1	68
Table15	Component Matrix - Perception Ease of Use Wave 1	69
Table16	KMO and Bartlett's Test - Perception Ease of Use Wave 1	69
Table17	Reliability Statistics - Perception Ease of Use Wave 1	69
Table18	Total Variance - Perception Workload Wave 1	70
Table19	Component Matrix - Perception Workload Wave 1	70
Table20	KMO and Bartlett's Test - Perception Workload Wave 1	71
Table21	Reliability Statistics - Perception Workload Wave 1	71
Table22	Total Variance - Attitude Wave 1	71
Table23	Component Matrix - Attitude Wave 1	72
Table24	KMO and Bartlett's Test - Attitude Wave 1	72
Table25	Reliability Statistics - Attitude Wave 1	73

List of Tables cont..

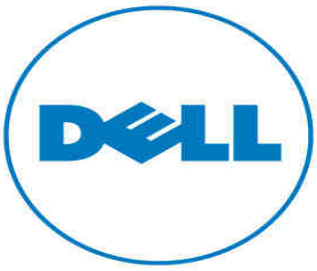
Table No:		Page No:
Table 26	Total Variance - Perception Usefulness Wave 2	73
Table 27	Component Matrix - Perception Usefulness Wave 2	74
Table 28	Reliability Statistics - Perception Usefulness Wave 2	74
Table 29	Total Variance - Perception Ease of Use Wave 2	75
Table 30	Component Matrix - Perception Ease of Use Wave 2	75
Table 31	KMO and Bartlett's Test - Perception Ease of Use Wave 2	75
Table 32	Reliability Statistics - Perception Ease of Use Wave 2	75
Table 33	Total Variance - Perception Workload Wave 2	76
Table 34	Component Matrix - Perception Workload Wave 2	76
Table 35	Reliability Statistics - Perception Workload Wave 2	76
Table 36	Total Variance - Attitude Wave 2	77
Table 37	Component Matrix - Attitude Wave 2	77
Table 38	KMO and Bartlett's Test - Attitude Wave 2	78
Table 39	Reliability Statistics - Attitude Wave 2	78
Table 40	Total Variance - Perception Usefulness Wave 3	79
Table 41	Component Matrix - Perception Usefulness Wave 3	79
Table 42	KMO and Bartlett's Test - Perception Usefulness Wave 3	80
Table 43	Reliability Statistics - Perception Usefulness Wave 3	80
Table 44	Total Variance - Perception Ease of Use Wave 3	80
Table 45	Component Matrix - Perception Ease of Use Wave 3	81
Table 46	KMO and Bartlett's Test - Perception Ease of Use Wave 3	81
Table 47	Reliability Statistics - Perception Ease of Use Wave 3	81
Table 48	Total Variance - Perception Workload Wave 3	82
Table 49	Component Matrix - Perception Workload Wave 3	82
Table 50	KMO and Bartlett's Test - Perception Workload Wave 3	82

List of Tables cont..

Table No:		Page No:
Table 51	Reliability Statistics - Perception Workload Wave 3	83
Table 52	Total Variance - Attitude Wave 3	83
Table 53	Component Matrix - Attitude Wave 3	84
Table 54	KMO and Bartlett's Test - Attitude Wave 3	84
Table 55	Reliability Statistics - Attitude Wave 3	84
Table 56	Summary Table of Factor Analysis and Reliability Test	85
Table 57	Summary Table of Factor Analysis	85
Table 58	ANOVA (Perceived usefulness and Acceptance) Wave 1	86
Table 59	ANOVA (Perceived usefulness and Acceptance) Wave 2	86
Table 60	ANOVA (Perceived usefulness and Acceptance) Wave 3	87
Table 61	ANOVA (Perceived ease of use and Acceptance) Wave 1	87
Table 62	ANOVA (Perceived ease of use and Acceptance) Wave 2	88
Table 63	ANOVA (Perceived ease of use and Acceptance) Wave 3	88
Table 64	ANOVA (Acceptance and Perception about Patient Satisfaction) Wave 2	89
Table 65	ANOVA (Acceptance and Perception about Patient Satisfaction) Wave 3	89
Table 66	ANOVA (Perception about Workload and Acceptance) Wave 2	90
Table 67	ANOVA (Perception about Workload and Acceptance) Wave 3	90
Table 68	ANOVA (Acceptance and Highest Qualification) Wave 1	91
Table 69	ANOVA (Acceptance and Highest Qualification) Wave 2	91
Table 70	ANOVA (Acceptance and Highest Qualification) Wave 3	92
Table 71	ANOVA (Acceptance and Age Group) Wave 1	92
Table 72	ANOVA (Acceptance and Age Group) Wave 2	92
Table 73	ANOVA (Acceptance and Age Group) Wave 3	93
Table 74	Correlation analysis Factors Wave 1	94
Table 75	Correlation analysis Factors Wave 2	94
Table 76	Correlation analysis Factors Wave 3	94

Abbreviations

ANNOVA	Analysis of Variance
BCMA	Bar coded Medication Administration
CDO	Care Delivery organization
CDSS	Clinical Decision Support System
CEO	Chief Executive Officer
CFA	Confirmatory Factor Analysis
COW	Computer On Wheels
CPR	Computerized Patient Record
CPRS	Computerized Patient Record System
EFA	Exploratory Factor Analysis
EMR	Electronic Medical Records
EHR	Electronic Health Records
HIPAA	Health Insurance Portability & Accountability Act
HIT	Health Information Technology
ICT	Information Communication Technology
IS	Information System
IT	Information technology
MAR	Medical Administration Record
MUMPS	Massachusetts General Hospital Utility Multi Programming System
PACS	Picture Archival & Communication System
PHR	Patient Health Record
R & D	Research & Development
SPSS	Statistical Package for Social Sciences
SWOT	Strength Weakness Opportunities & Threats
TAM	Technology Acceptance Model
VA	Veteran Affairs
VHA	Veteran Health Affairs
VistA	Veteran Health Information Systems & Technology Architecture



Dell Services

Dell Inc. (Dell) is a global information technology company that offers its customers a range of solutions and services delivered directly by Dell and through other distribution channels. Dell is a holding company that conducts its business worldwide through its subsidiaries. Dell Inc. was founded in 1984 and is headquartered in Round Rock, Texas.

Dell traces its origins to 1984; when Michael Dell created PCs Limited while a student at the University of Texas at Austin. The dorm-room headquartered company sold IBM PC-compatible computers built from stock components.[1] Dell dropped out of school in order to focus full-time on his fledgling business, after getting about $300,000 in expansion-capital from his family.

In 1985, the company produced the first computer of its own design, the "Turbo PC", which sold for US$795.[2] PCs Limited advertised its systems in national computer magazines for sale directly to consumers and custom assembled each ordered unit according to a selection of options. The company grossed more than $73 million in its first year of operation.

The company changed its name to "Dell Computer Corporation" in 1988 and began expanding globally. In June 1988, Dell's market capitalization grew by $30 million to $80 million from its June 22 initial public offering of 3.5 million shares at $8.50 a share. In 1992, Fortune magazine included Dell Computer Corporation in its list of the world's 500 largest companies, making Michael Dell the youngest CEO of a Fortune 500 company ever.

Dell has grown by both increasing its customer base and through acquisitions since its inception; notable mergers and acquisitions including Alienware(2006) and Perot Systems (2009). As of 2009, the company sold personal computers, servers, data storage devices, network switches, software, and computer peripherals. Dell also sells HDTVs, cameras, printers, MP3

players and other electronics built by other manufacturers. The company is well known for its innovations in supply chain management and electronic commerce**.**

Perot Systems was an information technology services provider founded in 1988 by a group of investors led by Ross Perot and based in Plano, Texas, United States. A Fortune 1000 corporation with offices in more than 25 countries, Perot Systems employed more than 23,000 people and had an annual revenue of $2.8 billion before its acquisition in 2009 by Dell, Inc. for $3.9 Billion.[3]

Perot Systems provided information technology services in the industries of health care, government, manufacturing, banking, insurance and others. Perot Systems was especially strong in health care industries with services such as digitizing and automating medical records.

The integration of Perot Systems has strengthened Dell Services, expanded its portfolio of capabilities, and established a strong foundation for future growth. The combined Dell Services business unit represents almost $8 billion in annual revenue. With more than 43,000 team members working in 90 countries, Dell Services operates 60 technology support centers around the world, 36 customer data centers and provides technical support for 14 million client systems and 10,000 Software-as-a-Service (SaaS) customers. Over the past year, the Services team met or exceeded all of its integration milestones, achieving more than $100 million in cost savings in fiscal year 2011 and capturing revenue synergies of more than $150 million, both surpassing original estimates.

At February 3, 2012, it held a worldwide portfolio of 3,449 patents and had an additional 1,660 patent applications pending. The Company also holds licenses to use numerous third-party patents. The Company designs, develops, manufactures, markets, sells, and supports a range of products, solutions, and services. It also provides various customer financial services to its Commercial and Consumer customers. During fiscal year ended February 3, 2012 (fiscal 2012), Dell acquired Compellent Technologies, Inc. (Compellent), SecureWorks Inc. (SecureWorks), Dell Financial Services Canada Limited and Force10 Networks, Inc. (Force10). In February 2012, the Company acquired AppAssure. In April 2012, the Company acquired Clerity Solutions.

Recent plans and acquisitions

In 2006, Dell acquired Alienware, a manufacturer of high-end PCs popular with gamers.[4][5][6]

The company acquired EqualLogic on January 28, 2008, to gain a foothold in the iSCSI storage market. Because Dell already had an efficient manufacturing process, integrating EqualLogic's products into the company drove manufacturing prices down.[7]

In 2009, Dell acquired Perot Systems, based in Plano, Texas, in a reported $3.9 billion deal.[8] Perot Systems provided Dell with applications development, systems integration, and strategic consulting services through its operations in the U.S. and 10 other countries. In addition, the acquisition of Perot brought a variety of business process outsourcing services, including claims processing and call center operations.[9]

On February 10, 2010, the company acquired KACE Networks a leader in Systems Management Appliances. The terms of the deal were not disclosed.[10]

On August 16, 2010, Dell announced plans to acquire the data storage company 3PAR.[11] On September 2, Hewlett-Packard offered $33 a share for 3PAR, which Dell declined to match.[12]

On November 2, 2010, Dell acquired Software-as-a-Service (SaaS) integration leader Boomi. Terms of the deal were not disclosed.[13]

In February 2011 the acquisition of Compellent by Dell was completed after the initial announcement of Dell's intention to buy the company was announced on 13 December, 2010

On Friday February 24, 2012 Dell acquired Backup and Disaster Recovery software solution AppAssure Software of Reston, VA. AppAssure delivered 194 percent revenue growth in 2011 and over 3500% growth in the prior 3 years. AppAssure supports physical servers and VMware, Hyper-V and XenServer. The deal represents the first acquisition since Dell formed its software division under former CA CEO John Swainson. Dell added that it will keep AppAssure’s 230 employees and invest in the company.

In March 2012, USA Today said that Dell agreed to buy SonicWall, a company with 130 patents. SonicWall which develops security products, is a network and data security provider[14].

On 2 April, 2012, Dell announced that it wants to acquire Wyse, global market-leader for thin client systems[15]

On 3 April, 2012, Dell announced that it has acquired Clerity Solutions. Clerity, a company offering services for application (re)hosting, was formed in 1994 and has it headquarters in Chicago. At the time of the take-over aprox. 70 people were working for the company[16].

Business Segments

The Company operates in four segments: Large Enterprise, Public, Small and Medium Business, and Consumer. The Company's Large Enterprise customers include global and national corporate businesses. Its Public customers, which include educational institutions, government, health care, and law enforcement agencies, operate in their own communities. Its SMB segment is focused on helping small and medium-sized businesses by offering products, services, and solutions. Its Consumer segment is focused on delivering technology experience of entertainment, mobility, gaming, and design.

Enterprise Solutions and Services

The Company's enterprise solutions include servers, networking, and storage products. Servers and Networking portfolio includes rack, blade, and tower servers for enterprise customers and value tower servers for small organizations, networks, and remote offices. During fiscal 2012, it expanded its Power Connect campus networking product offerings with a suite of Dell Force10 data center networking solutions. It offers a portfolio of advanced storage solutions, including storage area networks, network-attached storage, direct-attached storage, and various backup systems. During fiscal 2012, it shifted more of its portfolio of storage solutions to Dell-owned storage products.

The Company's services include a range of configurable information technology (IT) and business services, including infrastructure technology, consulting and applications, and product-related support services. The Company offers a variety of services to its customers as part of an overall solution. It offers services that are tied to the sale of its servers, storage, and client offerings. These services include support and extended warranty services, managed deployment, enterprise installation, and configuration services. Its outsourcing services include data center and

systems management, network management, life cycle application development and management services, and business process outsourcing services. It also offers short-term services that address an array of client needs, including IT infrastructure, applications, business process, and business consulting.

The Company will classify its services as Support and Deployment services, Infrastructure, Cloud, and Security services, and Applications and Business Process services. Support and deployment services are tied to the sale of its servers, storage, networking and client offerings, as well as multivendor support services. Infrastructure, Cloud, and Security services may be performed under multi-year outsourcing arrangements, subscription services, or short-term consulting contracts. These services include infrastructure and security managed services, cloud computing, infrastructure consulting, and security consulting and threat intelligence. Applications services include such services as application development and maintenance, application migration and management services, package implementation, testing and quality assurance functions, business intelligence and data warehouse solutions, and application consulting services.

Software and Peripherals

The Company offers Dell-branded printers and displays and a multitude of competitively priced third-party peripheral products, such as printers, televisions, notebook accessories, mice, keyboards, networking and wireless products, digital cameras, and other products. It also sells a range of third-party software products, including operating systems, business and office applications, anti-virus and related security software, entertainment software, and products in various other categories.

Client Products

The Company offers a variety of mobility and desktop products, including notebooks, workstations, tablets, smartphones, and desktop personal computers (PCs), to its Commercial and Consumer customers. Its Latitude, Optiplex, Vostro, and Dell Precision workstation lines of mobility notebooks and desktop PCs are designed with its Commercial customers in mind. The Vostro line is designed to customize technology, services, and expertise to suit the specific needs of small businesses. It also offers the precision line of mobile and desktop workstations for professional users. During fiscal 2012, it introduced the Vostro 3000 series notebooks, and the

Dell Precision M4600 and M6600 mobile workstations, and made enhancements to Dell Latitude E-family of notebooks. For its Consumer customers, it offers the Inspiron, XPS, and Alienware lines of notebooks and desktop PCs. The Company targets sales of its Alienware line to customers seeking advanced multimedia capabilities for gaming. During fiscal 2012, it introduced desktops and notebooks in each of its consumer brands, including Inspiron and XPS notebooks.

Financial Services

The Company offers or arranges various financing options and services for its Commercial and Consumer customers in the United States and Canada through Dell Financial Services (DFS). DFS offers a range of financial services, including originating, collecting, and servicing customer receivables primarily related to the purchase of Dell products. DFS offers private label credit financing programs to qualified Consumer and Commercial customers and offers leases and fixed-term financing primarily to Commercial customers. Financing through DFS is one of many sources of funding that its customers may select.

Product Development

The Company focuses on developing technologies. It employ a collaborative approach to product design and development, in which its engineers, with direct customer input, design solutions and work with a global network of technology companies to architect system designs, and integrate technologies into its products. In fiscal 2012, it opened the Dell Silicon Valley Research and Development Center, bringing the total number of global research and development centers the Company operated to 12.

Manufacturing and Materials

Third parties manufacture the client products the Company sells under the Dell brand. Its manufacturing facilities are located in Austin, Texas; Penang, Malaysia; Xiamen, China; Hortolandia, Brazil; Chennai, India, and Lodz, Poland. Its manufacturing process consists of assembly, software installation, functional testing, and quality control. Testing and quality control processes are also applied to components, parts, sub-assemblies, and systems obtained from third-party suppliers. Quality control is maintained through the testing of components, sub-assemblies, and systems at various stages in the manufacturing process.

Part 1 :Internship Report

(2nd January 2012 – 30th March 2012)

Internship Report

(2nd January 2012 – 30th March 2012)

The internship period was from 02nd January 2012 to 30th March 2012. During this internship period worked as an intern in VistA Project**.**

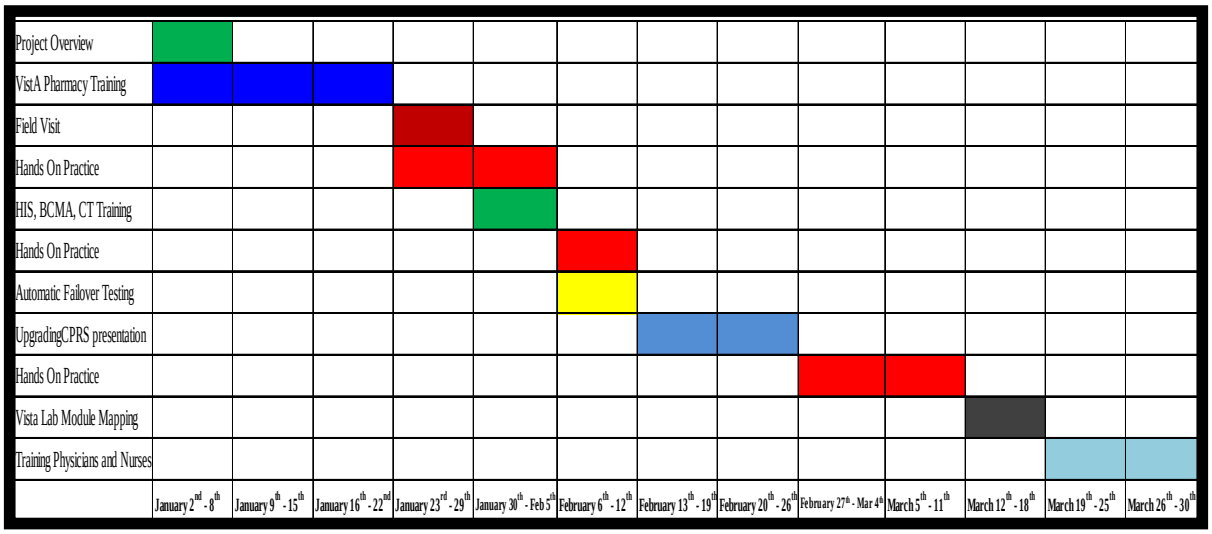


Figure 1. Gantt Chart showing work done during Internship Period

VistA Project overview

The Veterans Health Information Systems and Technology Architecture (VistA) is an enterprise-wide information system built around an electronic health record, used throughout the United States Department of Veterans Affairs (VA) medical system, known as the Veterans Health Administration (VHA).VistA, is an integrated system of software applications that directly supports patient care. By 2008, the VHA was the largest single medical system in the United States, providing care to 5 million veterans, employing 180,000 medical personnel and operating in 163 hospitals, over 800 clinics and 135 nursing homes. By providing electronic health records capability, VistA is thereby one of the most widely used EHR in the world.

The VistA system is a public domain software, available through the Freedom of Information Act directly from the VA website, or through a growing network of distributors. The VistA software alliance is a non-profit trade organization that promotes the widespread adoption of versions of

VistA for a variety of provider environments. VistA is a collection of about 100 integrated software modules. Name of few modules of VistA are mentioned below

CPRS – Computerized Patient Record System

BCMA – Bar Coded Medication Administration Module

Pharmacy Module

Lab Module

Diet Module

Radiology Module

Internship Report

The internship period was from 02nd January 2012 to 30th March 2012. During this internship period worked as an intern in VistA Project. Received training on various modules of VistA and also Hospital Information Systems (HIS). The training was for a period of forty five days which was then followed by Hands on Practice sessions.

Initially received training on VistA Pharmacy module which included front end and back end operations. The front end operations included the verification of the orders prescribed by physicians from VistA CPRS. Verification process for inpatient, outpatient, and emergency drug orders were taught. The back end operations included drug build up, mapping of the drugs & wards etc.

After the training on VistA Pharmacy module, the ordering/ indenting process for the drugs which has reached reorder level and also general pharmacy work processes were taught. The entire VistA Pharmacy module training was for a period of 3 weeks which was followed by 4 days of hands on practice session.

At the end of first month, a field visit to the Customer site was organized to give an exact idea about the work processes and also the optimum space utilization in the department. This field visit

gave the idea about the work process before Go Live. A mini knowledge assessment test was conducted by the Pharmacy Subject Matter Expert (SME).

After the training on Pharmacy process and VistA Pharmacy module, training on other modules like BCMA Module (Bar Coded Medication Administration), HIS(Hospital Information System), CPRS (Computerized Patients Record System), Diet and Laboratory module etc was given. This was followed by training on Clinical Transformation and Down Time policies.

BCMA training gave an overview about how the nurse will administer drug to the patient with Bar Code Scanner at patient bed side. The training session demonstrated most of the possible scenarios which a nurse can face while administering drug to the patient. HIS training gave entire idea about the features & functionalities present in it.

CPRS training gave idea about how the Physician works on the system. It explained how a physician enters chief complaint, allergies, examination details, places medication, lab, radiology, Admission, Discharge & Transfer orders etc. This training also included how nurses enter Assessment details, vitals and other details into the system.

After the training was completed on various modules explained above, one week of time was given for exploring and practicing on the same. This helped to understand more about the modules and the functionalities & features present in it. This Hands on training sessions gave an in depth knowledge about the various features and also to understand more about the application.

All the training sessions were very interactive which gave a chance to critically analyze various scenarios and ask questions to the trainers. Discussions during training sessions helped to actively participate during the training sessions which helped to increase interest on VistA.

Knowledge assessment tests were conducted at the end of the training session and feedback was given on it. Feedback about the training sessions was taken after the training sessions were completed.

Support Team Operations

After implementation of VistA at the Customer site, it is important to keep it alive. It takes time to stabilize an application in any organization. It's the same with EHR. EHR deployment requires routine care and maintenance. There are numerous tasks that need to be undertaken on daily or weekly basis. Integrating EHR into an organization after a successful launch presents its own unique challenges. Continuing to ensure system integrity, organization compliance and overall usability decides the eventual outcome of this huge investment. Eventually Success or failure largely depends on the amount of support an organization provides.

During Internship it was observed, how the support team provides support to the customer's end users. Support team quickly resolves the incidents affecting the Customers' business. For this project a tool called OPAS is used.

The following types of support were observed:

1st line support : Project executes Service Desk function.

2nd line support : Project receives Tickets (Incident or Requests) from the Service Desk and works on the Tickets or, if needed, sends them to 3rd line support, which in this case can be the customer or another supplier.

3rd line support : Team gets involved only if specialist application knowledge is required. This is often done when the case requires changes in coding.

Automatic Failover testing

Automatic failover is automatic switching to a redundant or standby computer server, system, or network upon the failure or abnormal termination of the previously active application, server, system, or network. Failover and switchover are essentially the same operation. The mild difference is that failover is automatic and usually operates without warning, while switchover requires human intervention.

Systems designers usually provide failover capability in servers, systems or networks requiring continuous availability and a high degree of reliability.

As VistA Project team member was involved in Automatic failover testing to check whether failover is working in the right way.

Upgrading CPRS training material presentation

After 45 days of Internship which included rigorous training on various VistA modules, task was assigned to upgrade training materials of VistA CPRS module. This task was really challenging as the objective was to add animations to the existing presentation and also to use new screen shots of the CPRS application wherever required. The old CPRS presentations were prepared on the basis of US scenarios. For this upgrading work new screen shots were taken and new presentations were made to demonstrate step by step process which user has to follow. Animations were added to the presentations to make presentation user friendly. For doing this MS Power Point was used.

Training Session

After training and hands on practice sessions, I became part of training team. As a training team member an overview of entire training pattern and list of topics to be covered was given. The training sessions were given to trainers who are supposed to train the end user of the hospital. Physicians were trained on CPRS and Nurses were trained on CPRS and BCMA. For both the physician and nurses system downtime policies and clinical transformation sessions were also given. Also as a training team member I was assigned to take CPRS sessions for physicians and BCMA sessions for nurses. At the end of training session all the trainers were made to write a test which helped to assess what they learned. Feedback about the training session was collected from each trainer.

This work gave an in depth knowledge about the work processes of CPRS and BCMA**.**

Lessons Learned during Internship

VistA and its Modules

- ✓ Open source Software, Mirth Integration engine, HL7 messaging
- ✓ Pharmacy Module and its drug build up
- ✓ Pharmacy space utilization and process optimization
- ✓ VistA CPRS, BCMA, Diet and Lab
- ✓ Configuration and Mapping Process

Automatic Failover testing

- ✓ What is AFT
- ✓ How automatic failover testing
- ✓ Why it is done.

Train the trainer session

- ✓ How to train end user and trainers
- ✓ How to schedule
- ✓ What all to cover for training

Dissertation Report

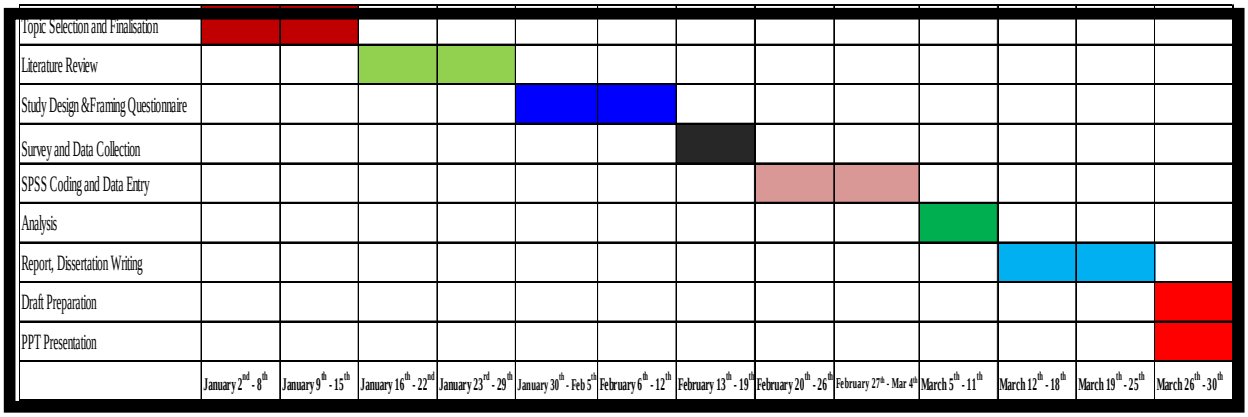


Figure 2 Gantt Chart showing Work done during Dissertation Period

Besides getting training on various modules of VistA, the dissertation project was also done. The dissertation topic was selected based on the topic which will benefit the organization and its customer. The topic was selected after doing complete research on ongoing project of the organization. The selected topic was approved by the mentor in the organization & Institute. When the final approval was received from the Institute, an in depth literature review was done on similar topics and also topics related to the objectives of the study. This literature review gave an idea about the real need of the study, what studies has been conducted on it till now etc. Based on various literature reviews questionnaire was framed.

Once the questionnaire was approved by the mentors, survey was conducted in hospital. Physicians and Nurses were interviewed and responses were collected in the pre designed questionnaire. This survey continued for five days.

The responses received from the survey were then entered into SPSS for analysis. Then the analysis was done and documented in the reports. All the other requisites were added in the report and the draft of report was made. After that print out was taken. Then finally the presentation was made from that draft of report.

PART 2

DISSERTATION

To Study the change in Physician's perception about Electronic Health records on its usage over a period of time

Abstract

To Study the change in Physician's perception about Electronic Health records on its usage over a period of time

Healthcare industry has introduced a new concept of diffusion of IT in the form of EHR. It helps in producing permanent medical records. Most of the EHR/EMR Implementation across the globe has failed. EMR/EHR system implementations have even higher failure rates. However, literature says that some IT implementations in Healthcare setting has been unsuccessful due to lack of acceptance by the users. So, it is very imperative to know the acceptance and rejection of the information system implementation. There are many factors associated with this. But these factors are curbed and yet to be explored. Knowing these factors may lead to the success of the product implementations.

The objective of this study is to identify the changes in Physician's perception about Electronic Health records on its usage over a period of time. For this, we used a self-administered quantitative survey. This study was conducted in ABC Multispecialty hospital owned by ABC Business Group at XYZ location. The study was designed as longitudinal study and was carried out over a period of nine months. The survey for the study was conducted three times. Same samples were used for all the three studies. The study was conducted as follows

- Wave 1 – June 2011 Before Go Live of EHR (after scheduled training sessions)
- Wave 2 – November 2011 3 months after Go Live
- Wave 3 – February 2012 6 months after Go Live

Various literatures & theoretical framework as TAM was used to design the questionnaire. Then with the help of Factor Analysis, correlation & ANNOVA test, data was analyzed and results were obtained. It was found that Attitude of the clinical staff is directly & ultimately leading to the acceptance of EHR by them. The attitude in turn is being positively influenced by perception ease of Use and usefulness. This study shows that the perception and attitude of the physician changes on usage of an application over a period of time.

1. Introduction

Health and Healthcare

The basic necessities of any human being on earth are food, clothing, shelter, water and air. Besides this health is also an essential requirement. The quality of an individual is largely determined by the physical integrity and it also enables the mankind to reproduce and to stay successfully over a period of time.

According to World Health Organization, “Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity”.

Besides this, the United Nations Universal Declaration of Human Rights emphasizes on adequate standard of living for maintaining an individual’s health and well-being. Thus, it’s the prime responsibility of every nation in the world to provide a national health infrastructure support, which should fulfill all the needs that are incorporated in the definition of health, which consists of not only the physical freedom from the diseases but also caters to both the psychological and social aspects of an individual’s health.

Healthcare means support of individual health and collective health. According to World Health Organization, healthcare embraces all the goods and services designed to promote health, including “preventive, curative and palliative interventions, whether directed to individuals or to populations”.

From Healthcare to E-Healthcare

“E-health is an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the internet and related technologies. In a broader sense, the term characterizes not only a technical development, but also a state of mind, a way of thinking, an attitude and a commitment for networked, global thinking, to improve healthcare locally, regionally and worldwide by using information and communication technology”

The main objective of E-health is to help the patients, physicians and community hospitals to make suitable use of Information and Communication Technologies in order to get an improved

access and enhanced quality of healthcare deliverance and to reduce the cost of its management. Thus this connects medicine, business and information technology in a new innovative way.

Technologies in E-healthcare

- Medical Information Technology
- Telemedicine
- Telehealth
- E-health tools
    - Electronic Health Records
    - Patients Information Systems
    - Hospital Information Systems
    - Decision Support Systems
    - National Electronic Registries
    - National Drug Registries

Limitations in imparting E-healthcare

Though it is the most advanced technology for accessing healthcare in almost all unreachable areas but still this technology is having some limitations or challenges as mentioned below

- Using Information and Communication Technologies
- To spare time for this activity by doctors initially
- Society
- Infrastructure f data, storage space and speed.
- Integrity of the data and its security.
- Lack of intimacy associated with traditional environment.
- Limited interaction with doctor.

Indian healthcare industry

The Indian healthcare industry growing at a rapid pace and is expected to reach over US$ 70 billion by the end of this year. Indian healthcare sector has experienced growth of 12 % per annum in the last four years. Change in lifestyles, rising income level, increase in elderly

population are the factors which drives this growth. But the healthcare infrastructure in India is very poor and has only few centre of excellence in healthcare delivery system. These facilities are inadequate in meeting the current healthcare demands. With a world average of 3.96 hospital beds per 1000 population India stands just a little over 0.7 hospital beds per 1000 population. Privatization has been crucial in the development of Indian health services which led for easy availability of the funds. As funds became readily available infrastructure and technology drastically improved. Medical and Dental tourism has succeeded by offering high quality services at third world prices. Considering the increasing number of medical tourists to India, Electronic Health Records seem to be a necessity for the Indian healthcare industry. The country needs to adopt an efficient electronic information system to stay connected to the patients post-treatment. If this Electronic Health Records are deployed, the foreign healthcare providers can easily have an access to patient records.

Healthcare and IT

When it comes to the use of IT in Healthcare, the Indian government positioned itself as one of the early adopters of healthcare IT among developing countries when it launched its "Development of Telemedicine Technology" project in 1997. In 2002, the Department of Information Technology established the committee for the Standardization of Digital information in order to facilitate the implementation of telemedicine systems. In 2003, the Department published a framework for "Information Technology Infrastructure for Health in India." This framework is centered on the philosophy that "information is determined of health" and that "healthcare is one of the keys that can benefit from the use of IT." The framework encompasses:

In spite of being an early adopter, India is not completely utilizing the benefits of IT in healthcare. The key IT application that are being implemented in the private healthcare sector include hospital IS, PACS and telemedicine programs. So far there are no instances of EHRs that completely integrate clinical information. The use of EHR for reporting, modeling and improving clinical decision-making is not yet a priority.

IT in healthcare industry is necessary to deliver all information needs to its stakeholders of this industry like government, public sector hospitals, patients, vendors, suppliers, insurance companies and organizations of healthcare delivery.

There are various obstacles in the implementation of IT in the healthcare industry. The providers had a laid back attitude when it came to implementation of IT for maintaining information. Providers should be given proper training to make best use of the technology and avoid resistance.

HIT Adoption

Despite India's recent development as the hub of the IT and IT-enabled services industry powered by a vast pool of skilled manpower, it has lagged tremendously behind other countries in HIT adoption. Large corporate hospitals in India spend under 1% of their operating budget on IT, while spending is closer to 3% in the West. Barring a few preliminary attempts to computerize basic hospital administrative and some clinical functions, there has been little appreciation or impetus given to HIT adoption

Challenges

- Absence of clear & coordinated government policy to promote HIT adoption
- Non-existent government funding for HIT has resulted in lack of HIT adoption in government health facilities and a lack of trained medical informatics professionals
- Low computer literacy among the government staff, and to a large extent in the private provider community
- Lack of supporting infrastructure and coordination between public and private sector.
- Except for a very few privately owned large hospitals, most patient records are paper based and very difficult to convert to electronic format.
- Local HIT systems that do not adhere to standards for information representation and exchange. This could be further complicated because of the use of multiple local languages by patients and some health workers
- Patient confidentiality is an open area. The Supreme Court of India has not addressed the specific right of privacy issue with respect to health information.

Critical success factors for EHR

- Change Management
- Completion of a readiness assessment
- Buy- in and contribution from stakeholders, including physicians
- Ability to report on evaluation metrics established for each phase of the project
- Training before, during and after EHR implementation
- How leadership deals with technology malfunctions

Operationally, the critical success factors leadership in hospital needs to consider are

1. A governance plan that ensures uniform adoption and assimilation of the system.
2. Reliable information technology infrastructure.
3. A well designed system that supports practice workflow and workload.
4. An implementation plan that capitalizes on strength of the hospital and minimizes its weakness.
5. Standardized workflow and processes, which can be designed through a collaborative effort among administration, providers and staff.
6. Ongoing management and development that ensures optimal use of EHRs.

Success of any Electronic Health Records (EHR) implementation requires strong organizational goals which can be fulfilled by the use, selecting the right vendor and planning for the implementation, ongoing management and development of the EHR system. Critical success factors are the elements which are necessary to accomplish any goals.

Barriers to EMR/ EHR Implementation in Medicine

The barriers to EMR/ EHR implementation include physicians' limited IT knowledge, cultural barriers, and the need to secure patient privacy (Frodesen, 2001, p.124). Unlike other professions, where IT training is an integral part of studies, medical training in the United States is not multidisciplinary (Frodesen, 2001, p. 125). Even in India IT training is not a part of MBBS/ BDS course curriculum. As such it does not incorporate technology training into its curriculum. Upon

completion of graduation from medical school/ college, physicians typically find themselves burdened with loans taken for their education and finally start their own practice. While practicing medicine, physicians incorporate much of what they learned in medical school/ college. Older generations of physicians were being trained to use paper records. Even now at present in India neither undergraduate students nor residents are trained to use electronic format of records. They are still using paper records. At the dawn of this new technology, many of these doctors found themselves not prepared and perhaps overwhelmed. But in US, younger generations and current medical students, already likely possess the required tools to incorporate IT into their practices. It stands to reason that the acquisition of IT skills will serve as a catalyst for early EMR technology adoption and satisfaction (Henning-Thurau, Honebein, & Aubert, 2005, p.136).

The limited computer knowledge of physicians is speculated to inhibit EMR implementation, limited medical knowledge on behalf of IT professionals is also speculated to affect EMR adoption. With the ultimate goal for increased quality of patient care, EMR software designs should incorporate medical terminology, secure data integrity issues, mirror practice work flow and provide the flexibility necessary to thoroughly capture all relevant patient information (Frodeson, 2001, p. 126). Common physician complaint about EMR's overly simplified user interface that limits the input of critical information. Consequently, physicians may not view EMR technology as useful or easy to use.

Another barrier is the nature of the medical profession itself. A profession geared toward patient care, it does not generally prepare physicians for their roles as business owners and entrepreneurs. As such, their focus is not on operational efficiency but rather on affective tasks such as service to their patients and fostering respect within their medical community. Physicians tend to remain dependent on methods they believe will ensure constant assessment and reassessment of their medical practices (Fodersen, 2001, p. 127). Paper records, for example, provide physicians with a limitless method of documentation. In addition, EMR technology typically requires large financial investments. Physicians, who are not trained to evaluate the return of such an investment, may shy away from it.

Another barrier is that the physicians are worried that adoption of EMR in their clinical practice will decrease the rapport between the patients. The doctor patient relationship will be lost as they use much of the time in entering data into computer.

Finally, the need to protect the security and privacy of patient records has also slowed the adoption of EMR technology. In fact, Fodersen (2001) cites maintaining privacy the most significant and immediate barrier to EMR adoption. The Health Insurance Portability and Accountability Act of 1996 (HIPAA) provides regulations for securing healthcare coverage for workers in between jobs (COBRA), preventing healthcare fraud and abuse, and enforces the privacy and security of all patient information. Failure to comply with HIPAA regulation results in severe civil, criminal, and financial penalties. Noncompliance, in some cases, may even lead to imprisonment. With that in mind, while technology may better assimilate, store, and share patient information; physicians are still not sure how well it will protect patient information. Recent headlines of breach of patient-record confidentiality only serve to fuel physician concerns. Patient record privacy must then be guaranteed secure before physicians will feel comfortable using EMR technology.

Electronic Medical Record:

It is an application environment composed of the clinical data repository, clinical decision support, controlled medical vocabulary, order entry, computerized provider order entry, pharmacy, and clinical documentation applications. This environment supports the patient's electronic medical record across inpatient and outpatient environments, and is used by healthcare practitioners to document, monitor, and manage health care delivery within a care delivery organization (CDO). The data in the EMR is the legal record of what happened to the patient during their encounter at the CDO and is owned by the CDO.

Electronic Health Record

It is a subset of each care delivery organization's EMR, is owned by the patient and has patient input and access that spans episodes of care across multiple CDOs within a community, region, or state (or in some countries, the entire country). The EHR can be established only if the electronic medical records of the various CDOs have evolved to a level that can create and support a robust exchange of information between stakeholders within a community or region.

Advantages of an Electronic Health Record

- Easy access to information.
- Comprehensive and standardized documentation.
- Improved quality of patient care.
- Increased nursing efficiency.
- Improved process communication.
- Reduced medication errors.
- Reduced hospital costs.

Obstacles

- Startup cost of implementing such a system is high
- The user needs to have some technical knowledge to use the system effectively and efficiently.
- Confidentiality and security issues associated with the use of EHR.
- Portability of the equipment is an issue associated with the use of EHR.
- Lack of standardized terminology, system architecture and indexing.

Purpose of CPRS

The purpose of a patient record is "to recall observations, to inform others, to instruct students, to gain knowledge, to monitor performance, and to justify interventions" [Reiser, 1991]. The many uses described in this statement, although diverse, have a single end goal— to further the application of health sciences in ways that improve the well being of patients. Yet, observational studies of physicians' use of the paper-based record find that the logistical, organizational, and other practical limitations reduce the effectiveness of traditional records for storing and organizing an ever increasing number of diverse data. A computer-based patient record is designed to overcome many of these limitations, as well as to provide additional benefits that cannot be attained by a static view of events.

A computer-based patient-record (CPR) is a repository of electronically maintained information about an individual's lifetime health status and health care, stored such that it can serve the multiple legitimate users of the record. Traditionally, the patient record was a record of care provided when a patient is ill. Managed care encourages healthcare providers to focus on the continuum of health and health care from wellness to illness and recovery. Consequently, the record must integrate elements regarding a patient's health and illness acquired by multiple providers across diverse settings. In addition, the data should be stored such that different views of those data can be presented to serve many uses.

A computer-based patient-record system adds information-management tools to provide clinical reminders and alerts, linkages with knowledge sources for health-care decision support, and analysis of aggregate data for outcomes research and improved management of the healthcare delivery system. To use a paper-based patient record, the reader must manipulate data either mentally or on paper to glean important clinical information. In contrast, a CPR system provides computer-based tools to help the reader organize, interpret, and react to data.

Ways in Which a CPRS Differs from a Paper-Based Record

In contrast to a traditional patient record, whose functionality is tethered by the static nature of paper— a single copy of the data stored in a single format for data entry and retrieval— a computer based patient-record is flexible and adaptable. Data may be entered in a format that Simplifies the input process (which includes electronic interfaces to other computers where patient data are stored) and displayed in different formats suitable for their interpretation. Data can be used to guide care for a single patient or in aggregate form to help administrators develop policies for a population. Hence, when considering the functions of a CPR, we do not confine discussion to the uses of a single, serial recording of provider–patient encounters. A CPR system extends the usefulness of patient data by applying information-management tools to the data.

Inaccessibility is a common drawback of paper records. In large organizations, the traditional record may be unavailable to others for days while the clinician finishes documentation of an encounter. For example, paper records are often sequestered in a medical records department

until the discharge summary is completed and every document is signed. During this time, special permission and extra effort are required to locate and retrieve the record. Individual physicians often borrow records for their convenience, with the same effect. With computer-stored records, all authorized personnel can also access patient data immediately as the need arises. Remote access to CPRs also is possible. When the data are stored on a secure network, authorized clinicians with a need to know can access them from the office, home, or emergency room, to make timely informed decisions.

Documentation in a CPR is usually more legible because it is recorded as printed text rather than as hand writing, and is better organized because structure is imposed on input. The computer can even improve completeness and quality by automatically applying validity checks on data as they are entered. For example, numerical results can be checked against reference ranges. Typographical errors can be detected if a datum fails a reference range check. Moreover, an interactive system can prompt the user for additional information. In this case, the data repository not only stores data, but also enhances their completeness.

Data entered into a computer can be reused. For example, a physician could reuse her clinic visit note in the letter to the referring physician and the admission note. Reusability of data is one way that a CPRS increases efficiency of the provider's workflow.

Reuse of data also increases the quality of data. The more users and uses that depend on a data element, the more likely that it will be reviewed and be kept up-to-date.

The degree to which a particular CPR demonstrates these benefits depends on several factors:

- **Comprehensiveness of information**: Does the CPR contain information about health as well as illness? Does it include information from all clinicians who participated in a patient's care? Does it cover all settings in which care was delivered? Does it include the full spectrum of clinical data, including, clinicians' notes, laboratory-test results, medication details, and so on?
- **Duration of use and retention of data.** A record that has accumulated patient data over 5 years will be more valuable than is one that contains records of only the visits made during 1 month.
- **Degree of structure of data.** Medical data that are stored simply as narrative text entries will be more legible and accessible than are similar entries in a paper medical record. Non

coded information, however, is not standardized, and inconsistent use of medical terminology limits the ability to search for data. Use of a controlled, predefined vocabulary facilitates automated aggregation and summarization of data provided by different physicians or by the same physician at different times. Coded information is also required for computer-supported decision making and clinical research.

- **Ubiquity of access.** A system that is accessible from a few sites will be less valuable than one accessible from any computer by an authorized user.

Perception

Most people assume everyone sees the world the same way. This can be expected because people are not able to compare what they see to what someone else sees. This assumption is incorrect. There is evidence that each person's perception of the world is different in minor ways. The concept of perception can be explained by answering three key questions: 1) what does a different perception entails mentally, 2) what provokes different perceptions to occur, and 3) how does this all fit together on a neurological level. To come to the conclusion, perception must first be defined on a neurological level to use as background information.

Perception may not be what he/she thinks it is. Perception is not just a collection of inputs from our sensory system. Instead, it is the brain's interpretation of stimuli which is based on an individual's genetics and past experiences. The biological process of perception can help explain this definition. According to biologists, the process begins with stimuli, usually in the form of photons, vibrations or chemical reactions from the outside world, being picked up by the sensory systems. The stimulus is detected by a sensory neuron located on the surface of the body. This neuron converts the stimuli's light, sound, heat, etc. into action potentials. The action potential changes the membrane permeability of the neuron which allows it to transform into electric signs. The signs are conducted to a primary processing area and elaborated on eventually being converted into corresponding information regarding color, shape, shade, etc. Next, this new information is brought to the thalamus (usually) where it is linked to older data containing similar experiences to form a complete message. The message is carried to its specific cortical center to become perception. Therefore, perception is actually message constructed using outside inputs, inner-neuron processes and past, relevant information stored in the brain.

Perception is the process by which we attach the meaning to the world around us. Our world consists of the people, experiences and objects that influence us. Perception is unique to each person. No two people view the world exactly the same. No one can perceive 100% of all things at all times. The perception process consists of three stages, which are selection, organization and interpretation.

- Selection

It is the first stage in perception process. In this stage we select the stimuli to which we attend.

- Organization

It is the second stage in the perception process. In this stage we mentally arrange the stimuli, so that we can understand or make sense out of the stimuli.

- Interpretation

It is the third stage in the perception process. The interpretations are subjective and based on our values, needs, beliefs, experiences, expectations, involvement, self concept and other personal factors.

The perceptual process allows us to experience the world around us. This overview of perception and the perceptual process, will give more idea about how to detect the stimuli in the environment to actually take action based on that information.

What Is Perception?

Perception is the sensory experience of the world around us and involves both the recognition of environmental stimuli and actions in response to these stimuli. The perceptual process helps to gain the information about properties and elements of the environment that are critical to our survival. Perception not only creates experience of the world around; it allows acting within the environment.

Perception includes the five senses; touch, sight, taste smell and taste. It also includes what is known as proprioception, a set of senses involving the ability to detect changes in body positions

and movements. It also involves the cognitive processes required to process information, such as recognizing the face of a friend or detecting a familiar scent.

The perceptual process is a sequence of steps that begins with the environment and leads the perception of a stimulus and an action in response to the stimulus. This process is continual, but spends great time thinking about the actual process that occurs when he/ she perceive the many stimuli that surround him/ her at any given moment.

The process of transforming the light that falls on the retinas into an actual visual image happens unconsciously and automatically. The subtle changes in pressure against the skin that allow to feel object occur without a single thought. The perception process can be explained as follows:

The Steps in the Perceptual Process are

1. The Environmental Stimulus
2. The Attended Stimulus
3. The Image on the Retina
4. Transduction
5. Neural Processing
6. Perception
7. Recognition
8. Action

- The Environmental Stimulus

The world is full of stimuli that can attract the attention through various senses. The environmental stimulus is everything in the environment that has the potential to be perceived. This might include anything that can be seen, touched, tasted, smelled or heard. It might also involve the sense of proprioception, such as the movements of the arms and legs or the change in position of the body in relation to objects in the environment.

- The Attended Stimulus

The attended stimulus is the specific object in the environment on which attention is focused. In many cases, the focus on stimuli that is familiar is, such as the face of a friend in a crowd of strangers at the local coffee shop.

- The Image on the Retina

Next, the attended stimulus is formed as an image on the retina. The first part of this process involves the light actually passing through the cornea and pupil and onto the lens of the eye. The cornea helps focus the light as it enters the eye, and the iris of the eye controls the size of the pupils in order to determine how much light to let in. The cornea and lens act together to project an inverted image on the retina. The image on the retina is actually upside down from the actual image in the environment. At this stage of the perceptual process, this is not terribly important. The image has still not been perceived, and this visual information will be changed even more dramatically in the next step of the process.

- Transduction

The image on the retina is then transformed into electrical signals in a process known as transduction. This allows the visual messages to be transmitted to the brain to be interpreted. The retina contains many photoreceptor cells. These cells contain proteins known as rods and cones. Rods are primarily for seeing things in low light, while cones are associated with detecting color and shapes at normal light levels. The rods and cones contain a molecule called retinal, which is responsible for transducing the light into visual signals that are then transmitted via nerve impulses.

- Neural Processing

The electrical signals then undergo neural processing. The path followed by a particular signal depends on what type of signal it is (i.e. an auditory signal or a visual signal). Through the series of interconnect neurons located throughout the body, electrical signals are propagated from the receptors cells to the brain.

- Perception

In this step of the perception process, the stimulus object in the environment is perceived.

- Recognition

Perception doesn't just involve becoming consciously aware of the stimuli. It is also necessary that the brain to categorize and interpret what it is sensing. The ability to interpret and give meaning to the object is the next step, known as recognition.

- Action

The final step of the perceptual process involves some sort of **action** in response to the environmental stimulus. This could involve a variety of actions, such as turning your head for a closer look or turning away to look at something else.

2. Literature Review

Veterans Health Information Systems and Technology Architecture (VistA).

VistA & CPRS

The Veterans Health Information Systems and Technology Architecture (VistA) is an enterprise-wide information system built around an electronic health record, used throughout the United States Department of Veterans Affairs (VA) medical system, known as the Veterans Health Administration (VHA).VistA, is an integrated system of software applications that directly supports patient care. By 2008, the VHA was the largest single medical system in the United States, providing care to 5 million veterans, employing 180,000 medical personnel and operating 163 hospitals, over 800 clinics and 135 nursing homes. By providing electronic health records capability, VistA is thereby one of the most widely used EHRs in the world.

Features

The VistA system is public domain software, available through the Freedom of Information Act directly from the VA website, or through a growing network of distributors. The VistA software alliance is a non-profit trade organization that both promote the widespread adoption of versions of VistA for a variety of provider environments. VistA is a collection of about 100 integrated software modules. Some of the modules included in VistA which enables the user with a number of advantages are

Computerized Patient Record System (CPRS) Module

The most significant is a graphical user interface for clinicians known as the Computerized Patient Record System (CPRS), which was released in 1997. In addition, VistA includes computerized order entry, bar code medication administration, electronic prescribing and clinical guidelines. CPRS provides a client–server interface that allows health care providers to review and update a patient's electronic medical record. This includes the ability to place orders, including those for medications, special procedures, X-rays, nursing interventions, diets, and laboratory tests. CPRS provides flexibility in a wide variety of settings so that a consistent, event-driven, Windows-style interface is presented to a broad spectrum of health care workers.

CPRS provides electronic data entry, editing, and electronic signatures for provider-patient encounters as well as provider orders. Its computer-based provider order entry (CPOE) capability is an important enabler in the migration from paper-based charting to electronic medical records (EMRs).

Laboratory Module

Laboratory module enables the user with Ordering of tests and procedures on both patient and non-patient specimens, Collection and Accessioning of specimens into the Laboratory database, Processing and analysis in appropriate department or work areas, review and verification of results, Reporting of results and/or diagnoses for clinical health care treatment, Analysis and reporting of quality control data used in generating results and Providing management statistical data as well as requirements for accreditation by regulating bodies and agencies

Radiology Module

Radiology / Nuclear Medicine package is a comprehensive software package, designed to assist with the functions related to processing patients for imaging examinations. The Radiology / Nuclear Medicine package automates the entire range of diagnostic functions performed in imaging departments, including request entries by clinical staff, registration of patients for exams, processing of exams, recording of reports/results, verification of reports on-line, displaying/printing results for clinical staff, automatic tracking of requests/exams/reports, and generation of management statistics/reports, both recurring and ad hoc. The Radiology / Nuclear Medicine package automates many tedious tasks previously performed manually, providing faster, more efficient and accurate data entry and more timely results reporting. One of the important features provided by VistA is

VistA Imaging

The Veterans Administration has also developed VistA Imaging, a coordinated system for communicating with PACS (radiology imaging) systems and for integrating others types of image-based information, such as, pathology slides, and scanned documents, into the VistA electronic medical records system. This type of integration of information into a medical record is critical to efficient utilization.

Surgery Module

The Surgery package is designed to be used by Surgeons, Surgical Residents, Anesthetists, Operating Room Nurses and other surgical staff. The Surgery package is part of the patient information system that stores data on the Department of Veterans Affairs (VA) patients who have, or are about to undergo, surgical procedures. This package integrates booking, clinical, and patient data to provide a variety of administrative and clinical reports.

Pharmacy Module

The Pharmacy package provides a method of management, dispensing, and administration of inpatient drugs within the hospital. Hospital Medications combines clinical and patient information that allows each medical center to enter orders for patients, dispense medications by means of Pick Lists, print labels, create Medication Administration Records (MARs), and create Management Reports. Hospital Medications also interacts with the Computerized Patient Record System (CPRS) and the Bar Code Medication Administration (BCMA) packages to provide more comprehensive patient care.

VistA was developed using the M or MUMPS language/database. The VA currently runs a majority of VistA systems on the proprietary Intersystem's Cache version of MUMPS, but an open source MUMPS (Massachusetts General Hospital Utility Multi-Programming System) database engine, called GT.M for Linux and Unix computers has also been developed. GT.M is an implementation of the Standard M programming system (M = MUMPS = Massachusetts General Hospital Utility Multi-Programming System). VistA is written in Standard M. GT.M is an implementation of M from Fidelity Information Services. In addition, the free and open source nature of GT.M allows redundant and cost-effective failsafe database implementations, increasing reliability for complex installations of VistA.

Factors

Usefulness

An EHR system must provide clear benefits to the medical staff (Anderson, 1997;Ash et al., 2000). Most of the systems often fail because they support the values of management, and they don't heed the values of staff and users (Lorenzi et al., 1997). In a survey which was conducted by the American Medical Association in 2001, only 13% of physicians responded that EHRs would make it easier to practice medicine or to manage the medical practice (Pearsaul, 2002). Successful EHR implementations have been associated with a focus on improving clinical processes and solving clinical problems with information technology (Doolan et al., 2003). Addressing physicians' immediate needs rather than emphasizing future predicted benefits of system use is critical in achieving EHR acceptance (Guthrie, 2001). Ongoing evaluation and modification based on medical staff feedback is key for continued use of the EHR (Doolan et al., 2003).

Ease of Use

While some studies found ease-of-use as an important factor influencing technology adoption among physicians, others did not. Morton & Wiedenbeck (2010) and several other studies reported usefulness to be more important than ease-of-use (Chau & Hu, 2002; Chismar & Wiley-Patton, 2003; Keil, Beranek, & Konsynski, 1995). A survey conducted by explored the reasons why an EHR system was underutilized by a group of primary care physicians. Thirty-five percent of physicians reported specific issues related to EHR usability(Linder and colleagues (2006)). The most common problems mentioned were issues with screen navigation, failure to access secondary functions, and concerns with loss of data. In an American study, EHR system-specific issues were explored by Felt-Lisk and 30 colleagues.

Attitude

Physicians' perception of, and attitudes towards new technologies is a crucial element in the implementation of new technology projects in the current healthcare system (Dansky,Gamm, Vasey, & Barsukiewicz, 1999; Ernstmann, et al., 2009). Physicians' perception of, and attitudes towards new technologies is a crucial element in the implementation of new technology projects

in the current healthcare system (Dansky,Gamm, Vasey, & Barsukiewicz, 1999; Ernstmann, et al., 2009). Other studies have reported findings regarding major predictors of attitudes towards adoption of technology. Some studies have found physicians with prior knowledge of computers and informatics concepts have more favorable attitudes towards computers in healthcare (Cork, Detmer, & Friedman, 1998; Detmer & Friedman, 1994; Gordana, et al., 2005). Other variables found to be positively correlated with attitude include systems training, clinical specialization, and job satisfaction (Cork, et al., 1998; Detmer & Friedman, 1994; Gordana, et al., 2005). Two separate studies by Gardner & Lundsgaarde (1994), and Brown and Coney (1994) measured the attitude of physicians towards accepting clinical information systems and other medical computer applications, and reported that age, gender, specialty, and general computer experience did not correlate with attitude (Brown & Coney, 1994; Gardner & Lundsgaarde, 1994).Physicians are accepting of information systems that improve job performance or patient care processes, but resist those that have a negative impact on their autonomy (Anderson & Aydin, 1994; Teach & Shortliffe, 1981). Brown and Coney (1994) evaluated physician attitudes toward clinical information systems and found computer skills and experience to be predictors of computer acceptance. Age, gender and attitudes toward physician data entry were found to be non significant.

Theoretical Framework

Introduction

Technology implementation has touched every sector. Healthcare sector is also no exception. Healthcare sector is infusing technology by introducing the concept of EHR to provide medical records in electronic form. The whole idea is to make the processes more tuned without compromising the quality of patient care. But the fact is that healthcare professionals are not ready to accept & use the new system. There are several factors associated with it. Some studies have been conducted Pre-implementation & Post- implementation of HER. In these studies to show the acceptance & rejection of EHR with the factors associated with it, some models have been created. The following study has also made an attempt to identify the factors influencing the attitudes towards the acceptance of EHR. Also an attempt has been made to represent the factors in the form of a model. For this the framework of Universally accepted model TAM was used.

TAM has proven one the most widely used behavioral models in the information technology (IT) field and consistently demonstrates validity, reliability, robustness and simplicity. Additional studies concluded that TAM proved superior to other models when examining physician acceptance of information technology. It proved parsimonious yet incorporated a robust register of psychometric measures. [11] TAM was proposed by Fred Davis in 1985 at the MIT Sloan School of Management. [18] He proposed a conceptual model for technology acceptance in which he proposed that actual system use is predicted by user motivation which in turn is influenced by system features & capabilities.

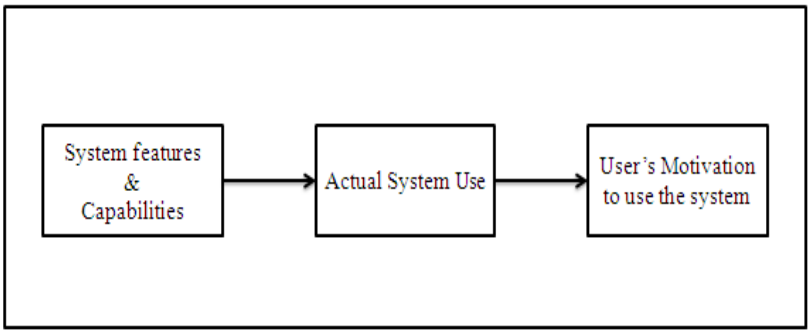


Figure 3.Conceptual Model for TAM

Davis used "Theory of Reasoned Action" made by Fishbein and Ajzen in 1975 and other related research studies and refined his conceptual model to propose TAM.

Origin & Evolution of TAM

Theory of Reasoned Action

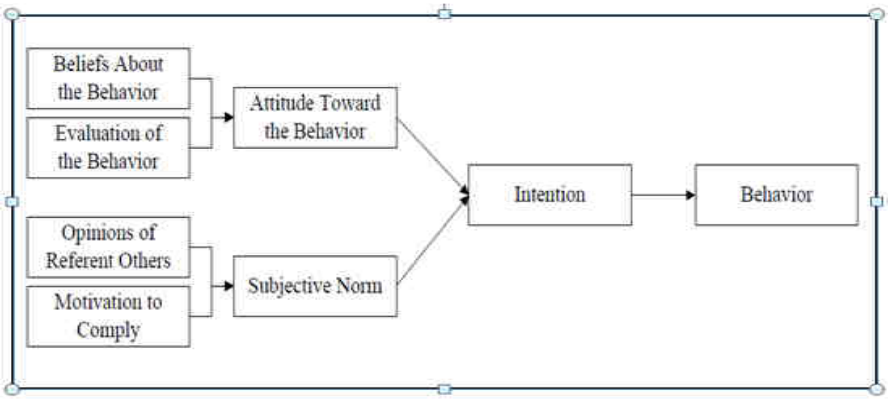


Figure 4. Model : Theory of Reasoned Action

According to this model a person's actual behavior could be determined by his or her Intention.[25] They referred to intention that a person has prior to an actual behavior as the behavioral intention of that person and they defined it as one's intention to perform a behavior. They further proposed that Behavioral Intention could be determined by considering both the attitude that a person has towards the actual behavior and the subjective norm associated with that particular behavior. They defined both attitude towards the behavior and the subjective norm for a particular behavior:

Attitude towards a given behavior is defined as a person's positive or negative feelings about performing actual behavior.

Subjective norm is defined as the person's perception that most people who are important to him or her think he or she should or should not perform the behavior.

Attitude towards behavior is further influenced by beliefs about the behavior & also evaluation of behavior. Whereas, subjective norm is influenced by opinion of referent others & motivation to comply. The Theory of Reasoned Action thus, provided a model that could explain and predict the actual behavior of an individual.

Development of TAM

Ten years later Davis used this theory and modified it to make technology Acceptance Model, so that it can be used in the context of user acceptance of information system. Davis made two changes to Theory of Reasoned Action model. First is , he didn't take subjective norm into account in predicting the actual behavior of a person as Fishbein & Ajzen were themselves acknowledged that as the least understood aspect of TRA. So, he considered only attitude of a person towards given behavior. Second is, instead of taking several individual salient beliefs to determine attitude towards a given behavior. He referred to several other related studies & considered only perceived ease of use & perceived usefulness to predict the attitude of a user towards the usage of the system.

After referring to many such related studies it was concluded that people tend to use or not use a system to the extent that they believe it will help them to perform their job better and also that the beliefs of the efforts required to use a system can directly affect system usage behavior. Davis defined perceived ease of use & perceived usefulness as follows:

Perceived Ease of Use: The degree to which an individual believes that using particular system would be free of physical & mental effort.

Perceived Usefulness: The degree to which an individual believes that using a particular system would enhance his or her job performance.

For proving the association of perceived ease of use & usefulness with the attitude of the user towards the system, he decided to measure both of them . He developed measurement scales for them and proceeded with his experiments. By analyzing the results of the experiments he found that there is a positive correlation between the scales & self-predicted future usage. Moreover , Davis (1985) used regression analysis to determine the relationships which existed in the TAM model. He suggested that in contrast to what he initially predicted, perceived usefulness & perceived ease of use have a direct influence on attitude towards using which is influenced by system features. Perceived ease of use influences perceived usefulness which directly influences actual system use . Also, system directly influences attitude towards using the system.

This is depicted in the model below:

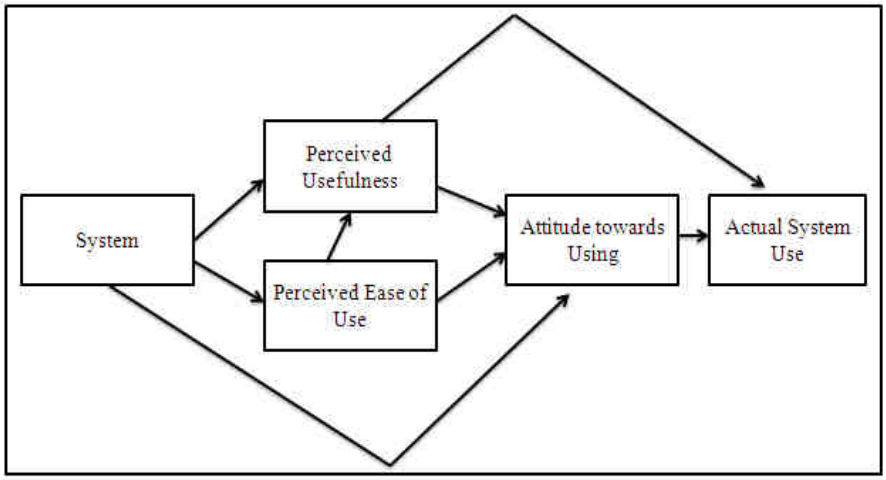


Figure 5. New Relationship formulation in TAM

Evolution of Final Version of TAM

On further development in TAM , behavioral intention as a new variable was introduced into it that would be directly influenced by perceived usefulness of the system. [19] According to

Davis, there would be cases when an individual might form a strong behavioral intention to use the system without forming any attitude. This would give rise to a modified form of TAM which is shown below:

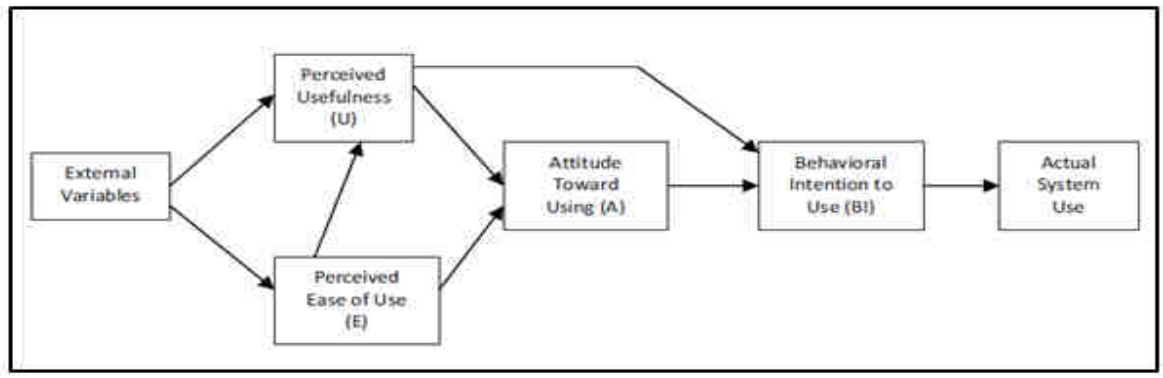


Figure 6. First Modified version of TAM

Davis , bagozzi and warshaw used the above model and conducted a longitudinal study with 107 users to measure their intention to use the system after one hour of the introduction of system and then again 14 weeks later. In both the cases , the results indicated a strong relationship between reported intention & self –reported system usage with perceived usefulness responsible for the greatest influence on the intention of the people. However, perceived ease of use was found to have small significant relationship which subsided over time. But the main finding was that both perceived ease of use & perceived usefulness have a direct influence on the behavioral Intention.. This eliminated the need for attitude construct in the model. The resultant final version of TAM model by eliminating attitude construct & introducing behavioral intention is shown below:

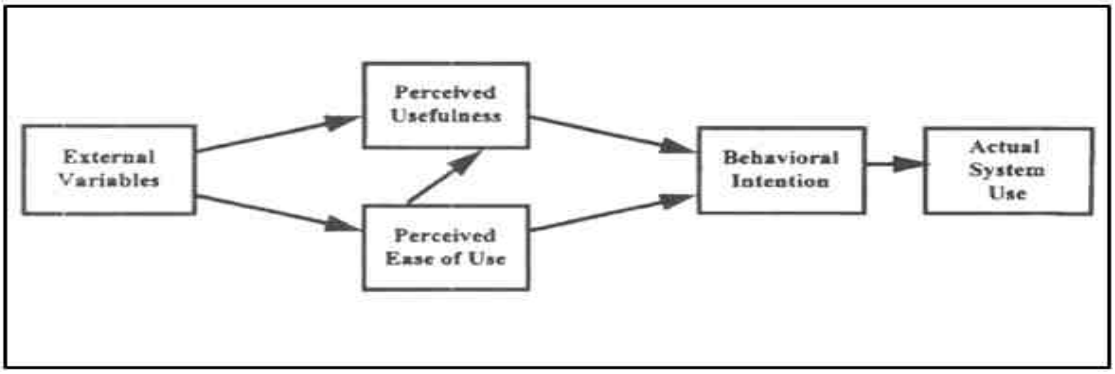


Figure 7. Final version of TAM

Thus, by eliminating attitude construct & introducing Behavioral Intention construct, the results which were obtained for the direct influence of perceived usefulness on actual system used in Table 3 could be explained very well. The other addition to TAM model was that there was consideration of some other factors named as external variables that might influence the beliefs of a person towards a system. External variables included system characteristics, user training, nature of implementation process. [51] This is how TAM was made which has now become a Universally accepted model to predict the acceptance & rejection of the information system.

3. Problem Statement

Traditional usage of paper and files to carry healthcare business has shown some disadvantages. Paper records and files may get damaged, lost and are constrained from being shared with their colleagues unless they are copied, hand-carried, mailed, or faxed to them (Goldsmith, Bluementhal, & Rishel, 2003). These constraints pose a significant barrier for physicians in providing timely needed services for their patients. The best way to avoid the constraints & provide better information management in hospitals is to produce electronic medical records which if once formed can be maintained for the whole life. This is done in hospitals by the implementation of EHR. It is very beneficial for patients, professionals, organizations & general public as well. EHR enables the patient to share its health related information with other healthcare professionals & provides the patient to have access to its own data to take health related decisions. Moreover, it promises to improve healthcare quality, efficiency & safety. But these improvements are highly dependent on the acceptance of EHR. There are several factors responsible for the acceptance of EHR.

But the clinical staff's are reluctant to accept the system due to their pre disposition to the old system of using paper records. The top management of the hospital should know their concerns and also their perceptions about new system. Top management can make them accept the system by solving their concerns about the new system. Complete adoption of any IT system requires full support from their staff's. The management should look into the factors which can increase the

acceptance rate and motivate their staffs to adopt the new system. Once the users start using the system, over a period users may have changes in their perception about the system. Using the system over a period of time may decrease the rate of reluctance. But very few attempts have been done to know about the perceptions and also the change in perceptions over a period of time and concerns of the users about the system. Also very few studies have been conducted till now to study the change pattern among physicians.

4. Rationale of the Study

After implementation of EHR in the hospital, the crucial thing is to know the extent of its clinical adoption. This is an essential requirement for the top management of the hospital. Knowing the extent of adoption can help them to determine the success of clinical transformation in the hospital. As discussed above, the acceptance of EHR depends upon different factors. Several studies have been conducted during the pre-implementation phase of EHR to determine the physician's perception about EHR. This perception in turn influences attitude and acceptance of the system. There is a need to determine the factors that affect the attitude and what actually influence the clinical staff towards the usage of EHR and also to analyse whether there is any changes in the perception, attitude and acceptance after using the application over a period of time. This study has been conducted pre implementation, 3 months after implementation and 6 months after implementation of EHR. Moreover, this study will provide a clear idea about whether attitude and acceptance depends on perception. The acceptance of EHR will directly or indirectly decide the success of implementation/ adoption.

5. Objectives

General objective

To Study the change in Physician's perception about Electronic Health records on its usage over a period of time

Specific Objectives

- To compare the physician's perception on ease of use about EHR Pre Go Live and Post Go Live.
- To compare the physician's perception on usefulness about EHR Pre Go Live and Post Go Live.
- To compare the physician's perception about workload/ time Pre Go Live and Post Go Live.
- To compare the physician's attitude on EHR and acceptance of EHR Pre Go Live and Post Go Live.
- To study the influence of perception on usefulness about EHR on attitude of the user.
- To study the influence of perception on ease of use of EHR on attitude of the user.

6. Research Methodology

Study Design

This study was conducted in ABC Multispecialty hospital owned by ABC Business Group at XYZ location. This hospital was a 400 bedded hospital with 500 physicians which provides state of art of medical care and services. The group was keen to implement open source EHR in their chain of hospitals. The study was designed as longitudinal study and was carried out over a period of nine months. The survey for the study was conducted three times. Same samples were used for all the three studies. The study was conducted as follows

- Wave 1 – June 2011 Before Go Live of EHR (after scheduled training sessions)
- Wave 2 – November 2011 3 months after Go Live
- Wave 3 – February 2012 6 months after Go Live

- Go Live – Last Week of July 2011

The purpose of this study is to analyze whether there is any changes in physician's perception about EHR on usage over a period of time. Perception is in turn very important as that decides the attitude and acceptance of EHR by physicians. The corner stone of the study lies in the TAM model developed by Davis (1989). This study also tests whether workload/time is a factor which decides attitude and acceptance of EHR. Several statistical approaches have been applied to study and identify the relationship among the technology acceptance, various demographic characteristics, dependent & independent variables. The study depends mainly on the primary data collected through a well-framed and structured questionnaire to elicit the well-considered opinions of the respondents.

Variables

The following are the various variables used in the study. This includes both dependent and independent variables. The dependent and independent variables are not fixed. This is decided depending upon the relationship or research question to be analyzed. The variables are as follows:

1. Perception about usefulness
2. Perception about ease of use
3. Workload/ Time
4. Attitude
5. Acceptance
6. Demographic Characteristics
    a. Age group
    b. Gender
    c. Highest Qualification
    d. Prior experience on EHR

Sampling Method

A sampling method is a definite plan for obtaining a sample from a given population. Here in this research samples were selected by simple random sampling method. In a simple random sample ('SRS') of a given size, all such subsets of the frame are given an equal probability. Each element of the frame thus has an equal probability of selection: the frame is not subdivided or partitioned. This method also helps in making generalizations from the results back to the population.

Simple random sampling is always an EPS design (equal probability of selection), but not all EPS designs are simple random sampling. Random sampling is the purest form of probability sampling. Each member of the population has an equal and known chance of being selected. When there are very large populations, it is often difficult or impossible to identify every member of the population, so the pool of available subjects becomes biased.

Study setting

The study was focused around an ABC Super Specialty hospital in which EHR has been implemented few months back. It is a 400 bedded hospital & consists of 15-20 departments. It comprises of approximately 500 physicians, 1200 nurses, 50 pharmacists including IP & OP and other administrative staff as well.

Nature of Respondents

The sample consists of the respondents who are the regular staff from various different departments of the same hospital described above. It doesn't include any of the visiting staff. The respondents in the study are physicians which include Junior Residents, Senior Residents, Consultants, and Senior Consultants. The Physicians who were included in the training schedules were selected for the study. The survey was conducted after the first scheduled training session before the implementation completed.

Sample size

A minimum sample size of 100 is needed for any kind of quantitative research study to get a significant result according to Kent (1999). Hence a sample size of 100 was targeted. In this study, the relevant data was collected using self- administered questionnaires. These responses were collected from the respondents through direct interview from Doctor's duty room. Out of the 100 respondents of Wave 1, many left the organization or were transferred to other locations. Finally 60 respondents were considered for analysis who gave responses for all the three studies.

So the final size used for analysis is sixty.

Data Collection Techniques

Primary data collection method used for data collection of this study. Primary data are those which are collected freshly and for the first time and also original in character. Usually there are several methods of collecting primary data in surveys and researches. Here in this study primary data were collected with the help of questionnaire which consisted of closed ended questions. The responses for these questions were on Likert scale.

Likert scales are developed by utilizing the item analysis approach where in a particular item is evaluated on the basis of how well it discriminates between those persons whose total score is high and those whose score is low. This scale was used as it is easy to construct and is considered more reliable. All respondents answer each statement included in the instrument. This scale takes much less time to construct and is frequently used in research. This can as well correlate scores on the scale to other measures without any concern for the absolute value of what is favorable and what is unfavorable.

The questionnaire consists of only closed ended questions. 5 Point Likert scale used to rate all the questions i.e.

- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

Each point on the scale carries a score. Strongly Disagree was given least score (1), Disagree (2), Neutral (3), Agree (4), Strongly Agree (5).

The questionnaire consisted of questions on various variables explained earlier in methodology. The questionnaire was taken directly to the physicians in the hospital and given to the physicians in the duty doctor's room. The responses were filled by the physicians themselves.

Quantitative Analysis Techniques

This describes the statistical methods used for analyzing the data. Data were entered from the questionnaire into the SPSS data file for statistical analysis.

Factor Analysis

There are two types of Factor analysis i.e. Exploratory factor analysis & Confirmatory factor analysis.

EFA could be described as orderly simplification of interrelated measures. EFA, traditionally, has been used to explore the possible underlying factor structure of a set of observed variables without imposing a preconceived structure on the outcome (Child, 1990). By performing EFA, the underlying factor structure is identified.

CFA is a statistical technique used to verify the factor structure of a set of observed variables. CFA allows the researcher to test the hypothesis that a relationship between observed variables and their underlying latent constructs exists. The researcher uses knowledge of the theory, empirical research, or both, postulates the relationship pattern a priori and then tests the hypothesis statistically.

Factor Analysis and Principal Components Analysis are both used to reduce a large set of items to a smaller number of dimensions and components. These techniques are commonly used when developing a questionnaire to see the relationship between the items in the questionnaire and underlying dimensions. It is also used in general to reduce a larger set of variables to a smaller set of variables that explain the important dimensions of variability. Specifically, Factor analysis aims to find underlying latent factors. Principal component factor analysis with varimax rotation was used to assess the construct validity of the instrument. Construct validity of the instrument is established when the convergent and discriminant validity of the constructs used in the instrument are found satisfactory. Thus, principal components analysis aims to summarize observed variability by a smaller number of components.

Purpose of factor analysis

- Latent factors (Factor Analysis)–Uncover latent factors underlying a set of variables
- Variable reduction (Principal Component Analysis)–Reduce a set of variables to a smaller number, while still accounting for “most” of the variance.

Reliability

The reliability of all the variables were assessed by the chronbach’s alpha reliability coefficient.

Cronbach's Alpha testing reviews the reliability of scales used in a study. Ideally, the Cronbach's Alpha coefficient of a scale should be above .7

A commonly accepted rule of thumb for describing internal consistency using Cronbach's alpha is as follows

Table 1. Cronbach's alpha (α) Value Classifications

Cronbach's alpha	Internal consistency
$\alpha \geq .9$	Excellent
$.9 > \alpha \geq .8$	Good
$.8 > \alpha \geq .7$	Acceptable
$.7 > \alpha \geq .6$	Questionable
$.6 > \alpha \geq .5$	Poor
$.5 > \alpha$	Unacceptable

CI s 95% was calculated using the method suggested by Dawn lacobucci & Adam Duhachek(2003).

Correlation of combined factors

Correlation analysis is used to measure and describe the linear relationship between two variables. SPSS was used to calculate Pearson correlation coefficients between factors obtained after factor analysis. Correlations are classified according to the strength of their r values.

When "r" value is higher than 0.300 is considered to have a moderate Positive Association. the value higher than 0.700 is considered to have very strong positive correlation.Following table shows the Correlation value classifications:

Table 2. correlation (r) Value classifications

"r" Value	Association
+ .70 or Higher	A Very Strong Positive Association
+.50 to +.69	A Substantial Positive Association
+.30 to +.49	A Moderate Positive Association
+.10 to +.29	A Low Positive Association
+.01 to +.09	A Negligible Positive Association
.00	~ No Association ~
-.01 to -.09	A Negligible Negative Association
-.10 to -.29	A Low Negative Association
-.30 to -.49	A Moderate Negative Association
-.50 to -.69	A Substantial Negative Association
- .70 or Lower	A Very Strong Negative Association

Correlation analyses were conducted on all the factors obtained and with overall acceptance variable.

ANOVA

An ANOVA is an analysis of the variation present in an experiment. It is a test of the hypothesis that the variation in an experiment is no greater than that due to normal variation of individuals' characteristics and error in their measurement. In this the variation will come from a number of sources depending upon the layout of the experiment. The concept behind experimental design and the formulation of an ANOVA model is to identify the sources of variation and construct the proper tests to compare them.

We are using here one way ANOVA. In this we focus on the significance value. If the value of significance is <0.5, then the null hypothesis is rejected & vice versa.

7. Result and Analysis

In Research after data collection, it has to be processed and analysed in accordance with the outline laid at the time of developing research plan. All the data collected were transferred to SPSS version 16.0 for analysis. On analysis following findings were found.

Demographic Characteristics

The independent variables were selected on grounds of theoretical and prior research. These variables included age group, gender, highest qualification, prior ehr usage experience. While age groups, experience can be specified in a number of ways, the categories utilized in this work were limited by inconsistencies in the coding of the original data sets. The categories utilized in this work allow uniform classification across studies. The variables are coded as follows:

1) Age	:	21 to 30 Years of Age
		31 to 40 Years of Age
		41 to 50 Years of Age
		Above 50 Years
2) Gender	:	Male and Female
3) Highest Qualification	:	Graduation
		Post Graduate Diploma
		Post Graduation
		Doctorate
4) Prior EHR usage experience	:	Yes, No

Descriptive statistics included percentage rates for categorical variables, means and standard deviations. Descriptive statistics allow researchers to present the data acquired in a structured, accurate and summarized manner (Huysamen, 1990). The descriptive statistics utilized in the current research to analyze the demographic data included frequencies, percentages, means and standard deviations. Demographic results of the respondents have been computed and presented in the following table.

Characteristics of respondents

Responses were collected from 60 physicians in ABC Hospital who were supposed to attend the training session as per the schedule.

- Age Group

The respondents were asked to enter their age group. Based on the data entered the age was grouped into 4 categories. There were no physicians who belonged to the 4th category which was age group above 50 years of age.

Table 3 Frequency of Respondents - Age Group

	Age Group	Frequency
1	21 - 30 Years of Age	**26**
2	31 - 40 Years of Age	**30**
3	41 - 50 Years of Age	**4**
	Total	**60**

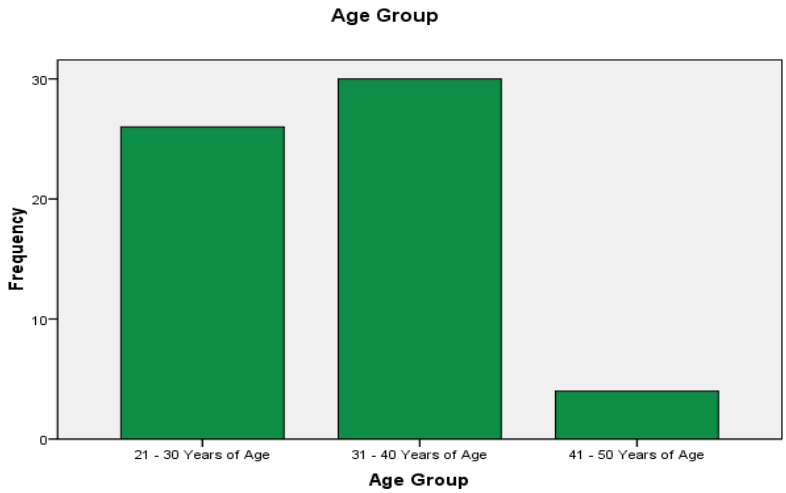


Figure 8 Graph Showing Frequency of Respondents - Age Group

- Gender

The respondents were asked to enter their gender. This survey had 44 male and 16 female respondents.

Table 4 Frequency of Respondents - Gender

	Gender	Frequency
1	Male	**44**
2	Female	**16**
	Total	**60**

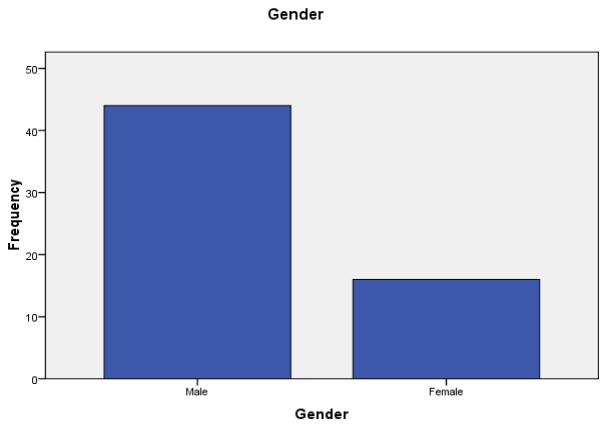


Figure 9 Graph Showing Frequency of Respondents - Gender

- Highest Qualification

The distribution of the respondents based on highest qualification indicated the less availability of the physicians with Doctorate in the survey. All the responses

Table 5. Frequency of Respondents - Highest Qualification

		Frequency
1	Graduation	**22**
2	Post Graduation Diploma	**11**
3	Post Graduation	**27**
	Total	**60**

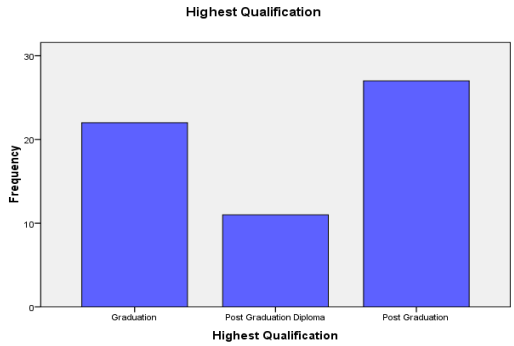


Figure 10 Graph Showing Frequency of Respondents - Highest Qualification

- Prior EHR Usage Experience

Table 6. Frequency of Respondents - Prior experience of using EHR

		Frequency
1	Yes	**7**
2	No	**53**
	Total	**60**

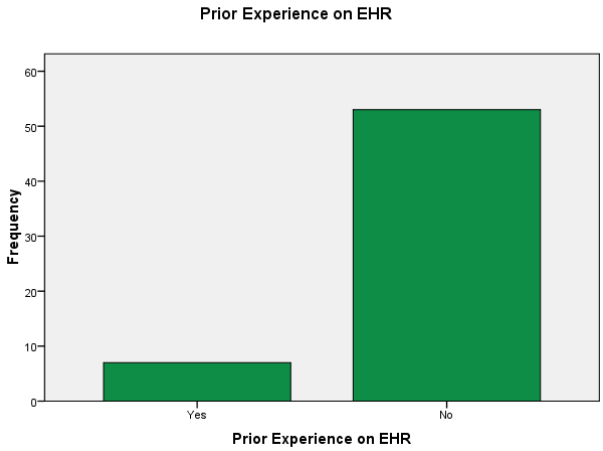


Figure 11 Graph Showing Frequency of Respondents - Prior experience of using EHR

The above table shows that only 7 physicians out of 60 physicians had prior experience of using EHR. In India most of the hospitals have recently started implementing EHR in their facilities. In medical colleges graduates are following the traditional pattern of entering case histories in paper format.

Cross Tabulations

Cross tabulations were made between age group and highest qualification and also gender and highest qualification

Table 7. Crosstabulation Age Group and Highest Qualification

Age Group * Highest Qualification Cross tabulation

Count					
		Highest Qualification			
		Graduation	Post Graduation Diploma	Post Graduation	Total
Age Group	21 - 30 Years of Age	18	6	2	26
	31 - 40 Years of Age	4	4	22	30
	41 - 50 Years of Age	0	1	3	4
Total		22	11	27	60

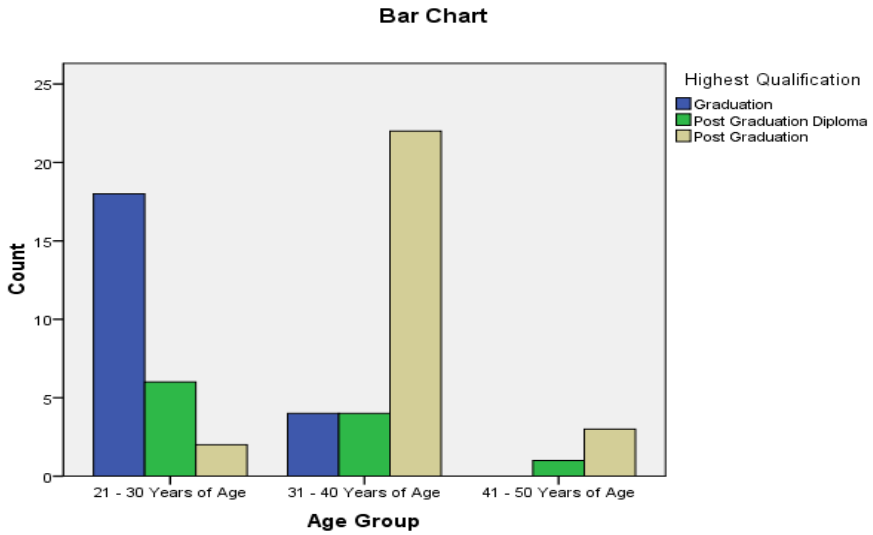


Figure 12 Bar Diagram showing Crosstabulation Age Group and Highest Qualification

Table 8. Crosstabulation Gender and Highest Qualification

Gender * Highest Qualification Cross tabulation

Count					
		Highest Qualification			
		Graduation	Post Graduation Diploma	Post Graduation	Total
Gender	Male	11	8	25	44
	Female	11	3	2	16
Total		22	11	27	60

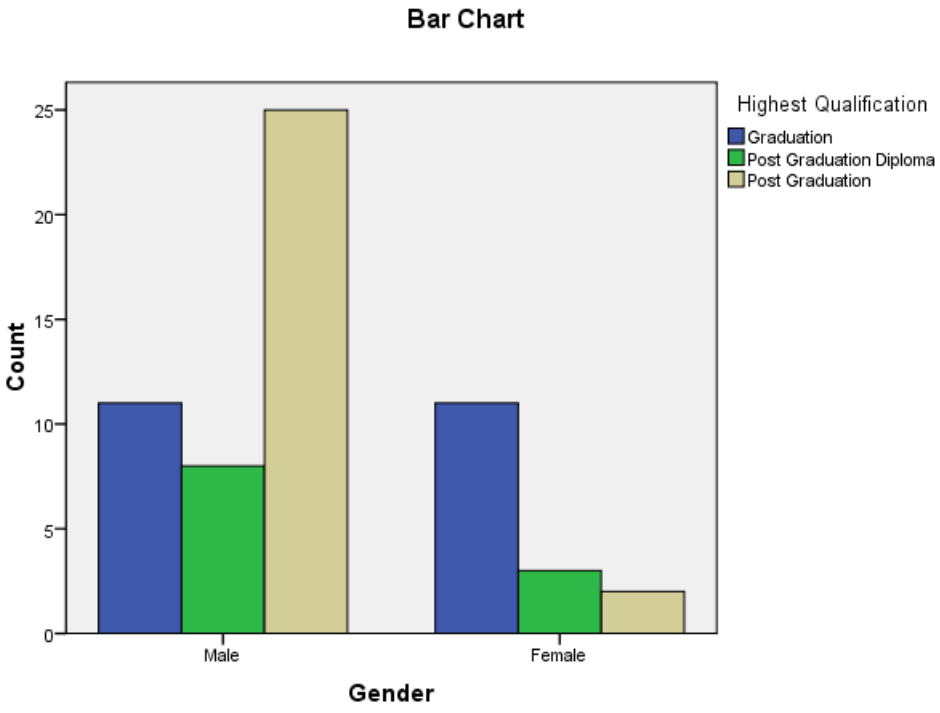


Figure 13 Bar Diagram showing Crosstabulation Gender and Highest Qualification

Objective

- To compare the physician's perception on ease of use about EHR Pre Go Live and Post Go Live.
- To compare the physician's perception on usefulness about EHR Pre Go Live and Post Go Live.
- To compare the physician's perception about workload/ time Pre Go Live and Post Go Live.
- To compare the physician's attitude on EHR and acceptance of EHR Pre Go Live and Post Go Live.

Mean Scores Comparison

Table 9. Mean Score Comparison Table Pre Go Live and Post Go Live

		Mean Response		
Code	**Questions**	**Wave 1**	**Wave 2**	**Wave 3**
A1	Computers are necessary for delivering quality healthcare	**3.45**	**3.52**	**4.1**
A2	CPRS will reduce the patient record retrieval time	**3.5**	**3.12**	**4.22**
A3	New system will decrease gap betwen different stake holders	**3.38**	**2.45**	**3.48**
A4	New System will increase coordination between different stake holders	**3.45**	**2.45**	**3.55**
A5	CPRS will optimize patient safety	**3.45**	**2.15**	**3.43**
A6	CPRS will increase workload	**3.73**	**4.77**	**3.08**
A7	CPRS will increase consultation timings	**3.87**	**4.77**	**2.92**
A8	CPRS will decrease the number of patients consulted	**3.55**	**4.12**	**2.97**
A9	CPRS is Userfriendly	**3**	**1.3**	**3**
A10	CPRS will reduce medication errors	**3.65**	**2.1**	**3.37**
A11	CPRS is Useful	**3.43**	**2.1**	**3.43**
AA1	I am satisfied with CPRS	**3.33**	**2.15**	**3.15**
AA2	I will encourage my colleagues for using CPRS	**3.33**	**2.08**	**3.17**
AA3	CPRS will support physicians and nurses in providing efficient care	**3.55**	**2.3**	**3.6**
AOA1	Overall my attitude about CPRS is positive	**3.23**	**2**	**3.13**

A1 **Computers are necessary for delivering quality healthcare**

	A1
Wave 1	3.45
Wave 2	3.52
Wave 3	4.1

Mean Responses

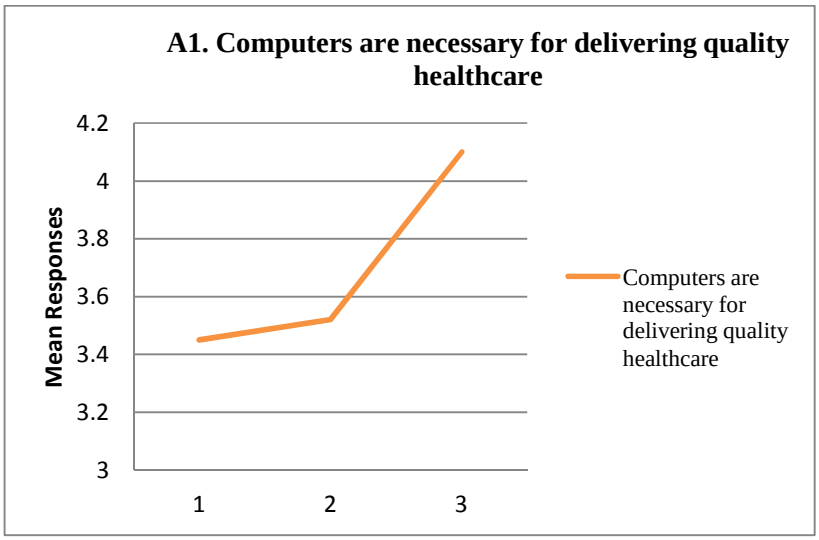


Figure 14 Mean Score Graph- Computers are necessary for delivering quality healthcare

A2 **CPRS will reduce the patient record retrieval time**

	A1
Wave 1	3.45
Wave 2	3.52
Wave 3	4.1

Mean Responses

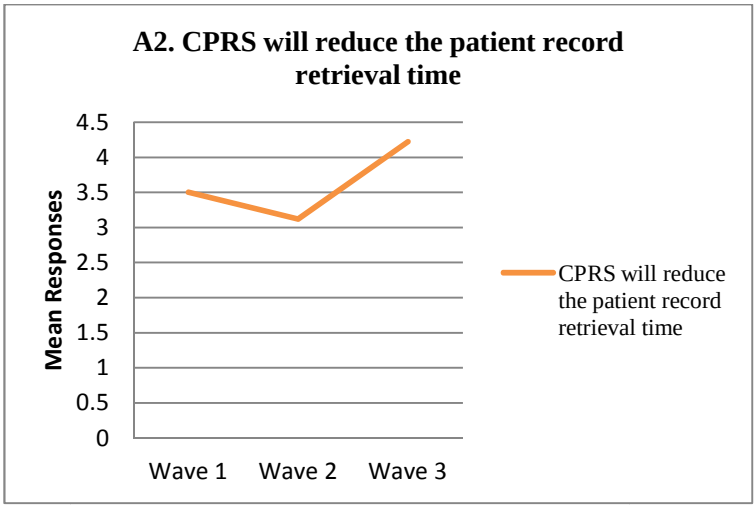


Figure 15 Mean Score Graph- CPRS will reduce the patient record retrieval time

A3 **New system will decrease gap between different stake holders**

	A3
Wave 1	3.38
Wave 2	2.45
Wave 3	3.48

Mean Responses

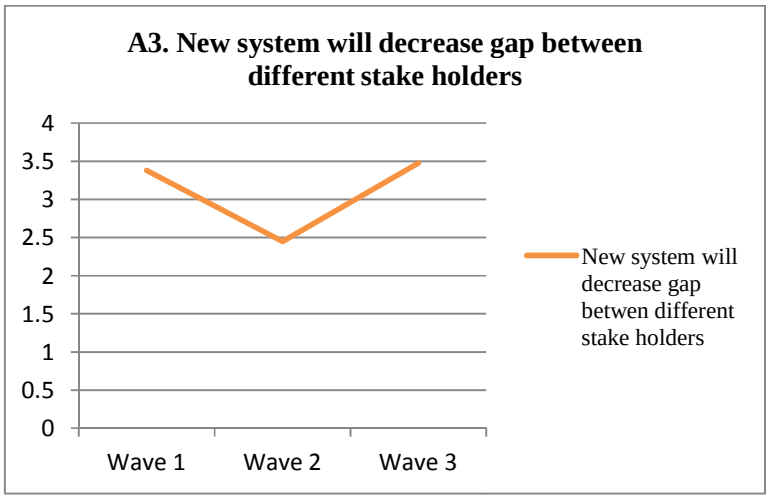


Figure 16 Mean Score Graph- New system will decrease gap betwen different stake holders

A4 **New System will increase coordination between different stakeholders**

	A4
Wave 1	3.45
Wave 2	2.45
Wave 3	3.55

Mean Responses

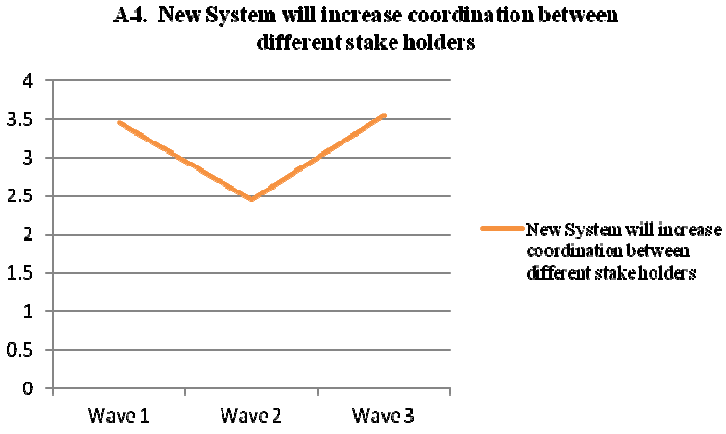


Figure 17 Mean Score Graph- New System will increase coordination between different stake holders

A5. CPRS will optimize patient safety

	A5
Wave 1	3.45
Wave 2	2.15
Wave 3	3.43

Mean Responses

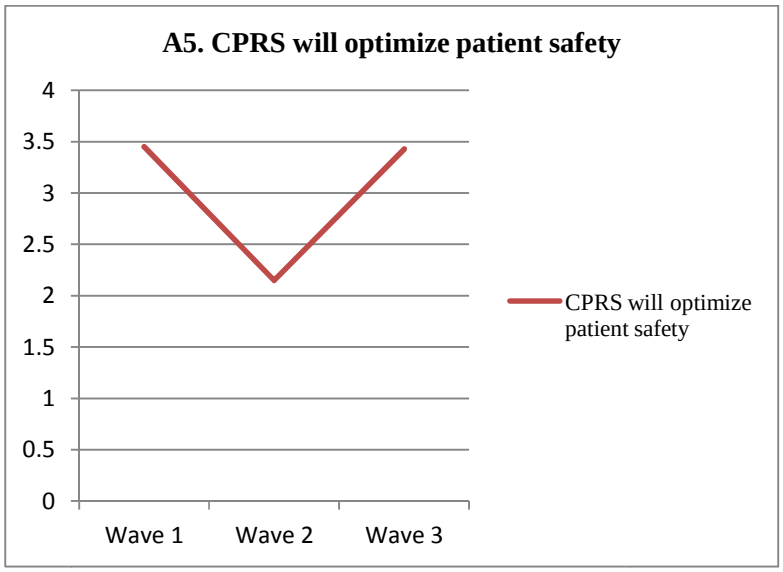


Figure 18 Mean Score Graph- CPRS will optimize patient safety

A6 **CPRS will increase workload**

	A6
Wave 1	3.73
Wave 2	4.77
Wave 3	3.08

Mean Responses

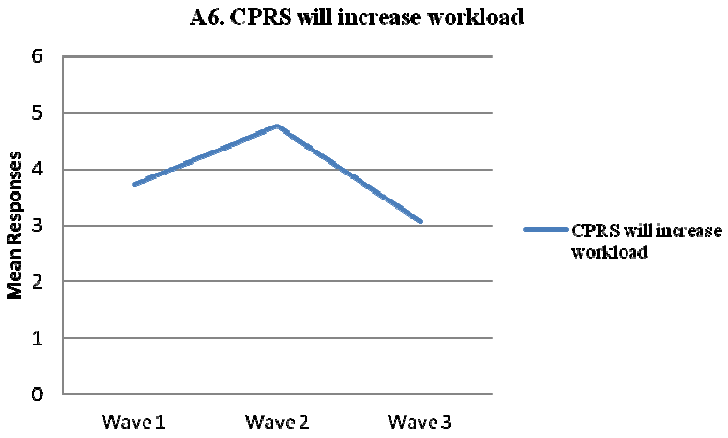


Figure 19 Mean Score Graph- CPRS will increase workload

A7 **CPRS will increase consultation timings**

	A7
Wave 1	3.87
Wave 2	4.77
Wave 3	2.92

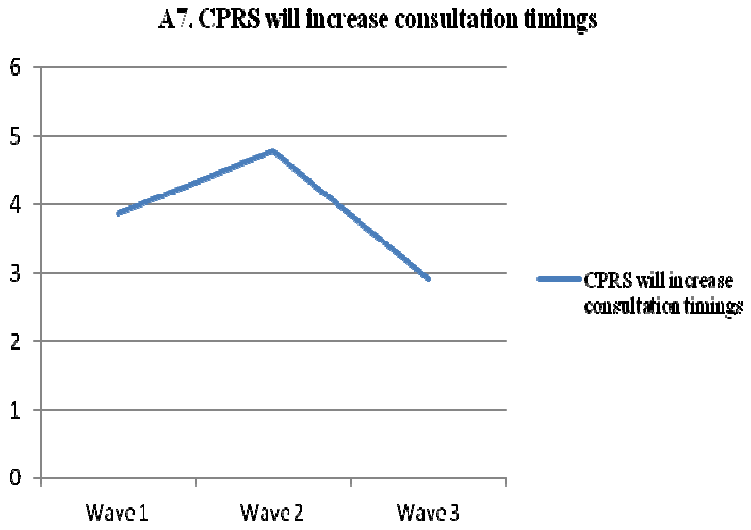


Figure 20 Mean Score Graph- CPRS will increase consultation timings

A8 **CPRS will decrease the number of patients consulted**

	A8
Wave 1	3.55
Wave 2	4.12
Wave 3	2.97

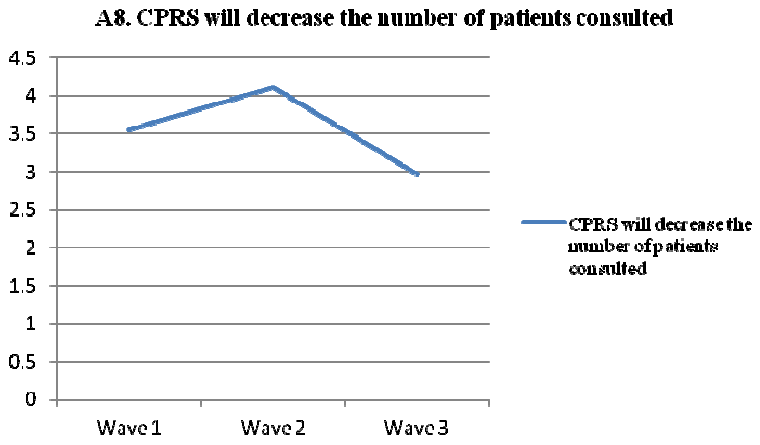


Figure 21 Mean Score Graph- CPRS will decrease the number of patients consulted

A9 **CPRS is User friendly**

	A9
Wave 1	3
Wave 2	1.3
Wave 3	3

Mean Responses

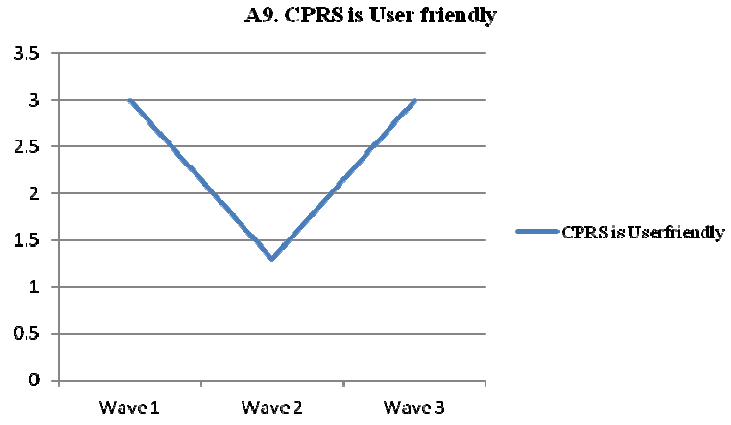


Figure 22 Mean Score Graph- CPRS is Userfriendly

A10 **CPRS will reduce medication errors**

	A10
Wave 1	3.65
Wave 2	2.1
Wave 3	3.37

Mean Responses

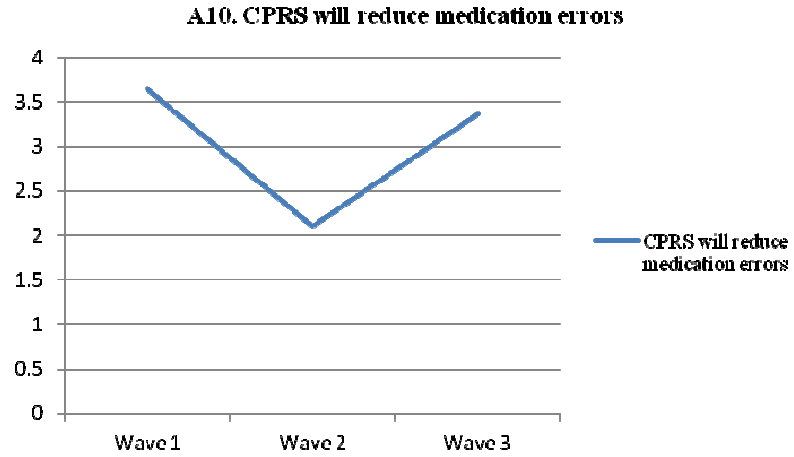


Figure 23 Mean Score Graph- CPRS will reduce medication errors

A11 CPRS id useful

	A11
Wave 1	3.43
Wave 2	2.1
Wave 3	3.43

Mean Responses

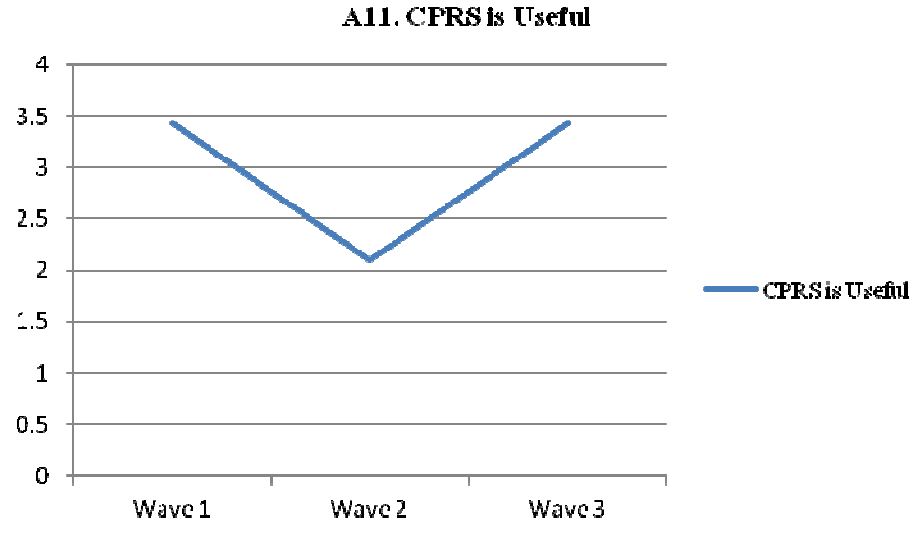


Figure 24 Mean Score Graph- CPRS is Useful

AA1 **I am satisfied with CPRS**

	AA1
Wave 1	3.33
Wave 2	2.15
Wave 3	3.15

Mean Responses

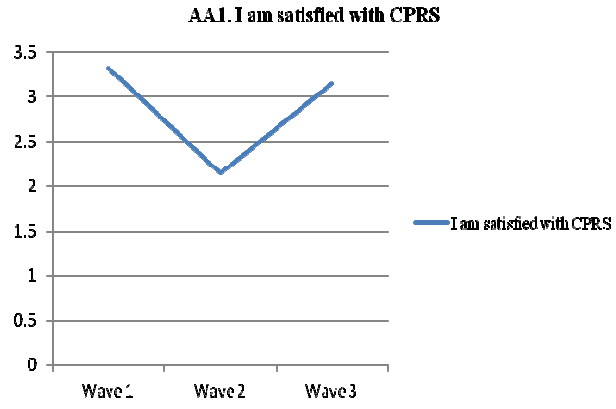


Figure 25 Mean Score Graph- I am satisfied with CPRS

AA2 **Will encourage my colleagues for using CPRS**

	AA2
Wave 1	3.33
Wave 2	2.08
Wave 3	3.17

Mean Responses

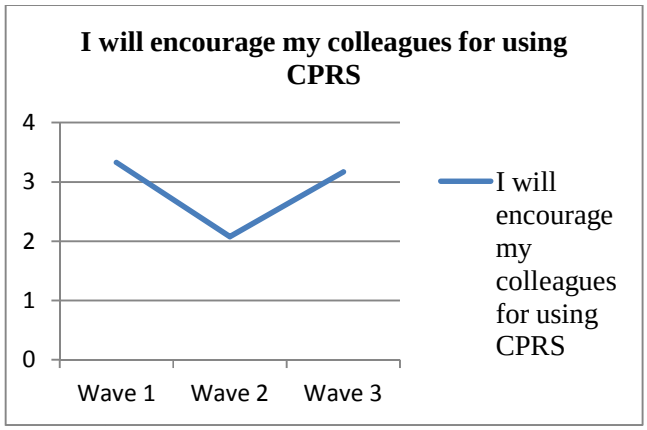


Figure 26 Mean Score Graph- I will encourage my colleagues for using CPRS

AA3 **CPRS will support physicians and nurses in providing efficient care**

	AA3
Wave 1	3.55
Wave 2	2.3
Wave 3	3.6

Mean Responses

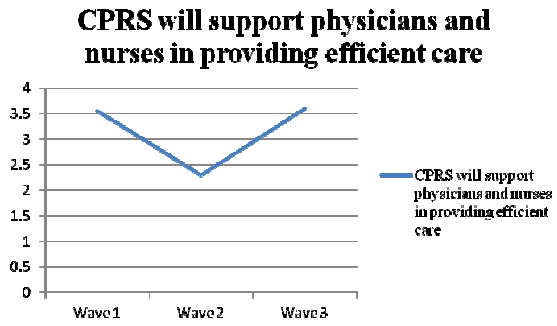


Figure 27 Mean Score Graph- CPRS will support physicians and nurses in providing efficient care

AOA1 **Overall my attitude about CPRS is positive**

	AOA1
Wave 1	3.23
Wave 2	2
Wave 3	3.13

Mean Responses

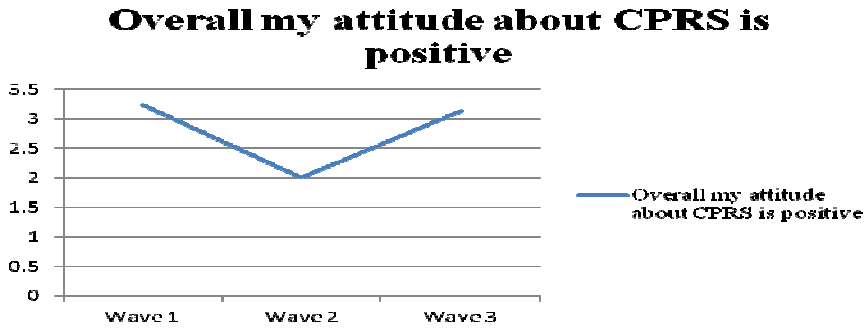


Figure 28 Mean Score Graph- Overall my attitude about CPRS is positive

Factor Analysis, KMO & Bartlett's test and Reliability test.

As the factors were already identified from literature reviews and questions framed according to those identified factors. Factor analysis were conducted on those sets of questions to confirm that that were the components of a single factor. Confirmatory factor analysis (CFA) was conducted to verify the factor structure of a set of observed variables. CFA allowed confirming that there is a relationship between observed variables and their underlying latent constructs exists. Principal Components Analysis was conducted to reduce a set of variables to a single factor. 12 CFA were conducted to confirm the sub factors identified in the study. In this a Total variance table is obtained. There are two columns in Total variance explained table, namely (1) Initial Eigen values, (2) Extraction Sums of Squared loadings. The Initial Eigen values column shows the Eigen values of all components, the percentage of variance, and the cumulative percentage of the variance explained. Then SPSS extracts one factor as shown in second column Extraction Sums of Squared loadings. The rest of the components' values not meant for extraction were discarded by SPSS in this column. Then a component Matrix is made. There after KMO & Bartlett's test is done. This is done to test the validity of the scales used. Finally Cronbach's Alpha Reliability Test is done to check the reliability of the scales used. Each analysis conducted on various sub-factors considered under the major factors. These analyses for the various factors are mentioned below:

Factor Analysis & Reliability test

Wave 1

Perception about usefulness: Principal Component Analysis extraction method was conducted on Questions A2, A3, A4, A5 and A10. On analysis it was observed that variance value lies above the accepted value that suggests that the Factor Analysis is accepted. The following component matrix shows that all the five statements can be taken as a single factor. Variance observed on analysis was 68.339% and all the five variables contributed to a single factor named as Perception about Usefulness.

Variance

Table10.Total Variance - Perception Usefulness Wave 1

Total Variance Explained (Perception Usefulness)

Component	Initial Eigen values			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.417	68.339	68.339	3.417	68.339	68.339
2	.614	12.288	80.626			
3	.505	10.105	90.732			
4	.303	6.064	96.796			
5	.160	3.204	100.000			

Extraction Method: Principal Component Analysis.

Table11.Component Matrix - Perception Usefulness Wave 1

	Component
	1
New System will increase coordination between different stake holders	.895
New system will decrease gap between different stake holders	.890
CPRS will reduce medication errors	.797
CPRS will reduce the patient record retrieval time	.774
CPRS will optimize patient safety	.768

Extraction Method: Principal Component Analysis.

KMO & Bartlett's Test

The value for Kaiser-Meyer-Olkin measure for the set of variables should exceed 0.50, and it exceeds the critical value as shown:

Table12. KMO and Bartlett's Test - Perception Usefulness Wave 1

KMO and Bartlett's Test (Perception Usefulness)

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.817
Bartlett's Test of Sphericity	Approx. Chi-Square	167.562
	Df	10
	Sig.	.000

A value of .817 for the set of variables used in this study is considered good, and a value close to 1 indicates that the correlation pattern for this set of variables is good and would load with a distinct pattern of factors (Field, 2005).

Reliability Test

On reliability test, five items returned a Cronbach's Alpha of 0.879, which is substantially above the 0.7 threshold. The four items were combined into a single factor and named as Usefulness and was used for the correlation analysis. The table displayed in SPSS output file is shown below:

Table13. Reliability Statistics - Perception Usefulness Wave 1

Reliability Statistics

Cronbach's Alpha	N of Items
.879	5

Perception about ease of use: Principal Component Analysis extraction method was conducted on Questions A9 and A11. On analysis it was observed that variance value lies above the accepted value that suggests that the Factor Analysis is accepted. The following component matrix shows that all the two statements can be taken as a single factor. Variance observed on analysis was 75.983% and all the two variables contributed to a single factor named as Perception about ease of use

Total Variance

Table14. Total Variance - Perception Ease of Use Wave 1

Total Variance Explained (Perception Ease of Use)

Component	Initial Eigen values			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.520	75.983	75.983	1.520	75.983	75.983
2	.480	24.017	100.000			

Extraction Method: Principal Component Analysis.

.

Table15 Component Matrix - Perception Ease of Use Wave 1

Component Matrix

	Component
	1
CPRS is Useful	.872
CPRS is User friendly	.872

Extraction Method: Principal Component Analysis.

KMO & Bartlett's Test

The value for Kaiser-Meyer-Olkin measure for the set of variables should exceed 0.50, and it exceeds the critical value as shown in

Table16 KMO and Bartlett's Test - Perception Ease of Use Wave 1

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.500
Bartlett's Test of Sphericity	Approx. Chi-Square	18.100
	df	1
	Sig.	.000

A value of .500 for the set of variables used in this study is considered good.

Reliability Test

Table17Reliability Statistics - Perception Ease of Use Wave 1

Reliability Statistics

Cronbach's Alpha	N of Items
.684	2

On reliability test, two items returned a Cronbach's Alpha of 0.684, which is substantially above the 0.65 threshold. The two items were combined into a single factor and named as ease of use and was used for the correlation analysis. The table displayed in SPSS output file is shown above

Perception about Workload: Principal Component Analysis extraction method was conducted on Questions A6 and A7. On analysis it was observed that variance value lies above the accepted value that suggests that the Factor Analysis is accepted. The following component matrix shows that all the two statements can be taken as a single factor. Variance observed on analysis was 72.659% and all the two variables contributed to a single factor named as Perception about workload.

Table18 Total Variance - Perception Workload Wave 1

Total Variance Explained

Component	Initial Eigen values			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.453	72.659	72.659	1.453	72.659	72.659
2	.547	27.341	100.000			

Extraction Method: Principal Component Analysis.

Table19 Component Matrix - Perception Workload Wave 1

Component Matrix

	Component
	1
CPRS will increase consultation timings	.852
CPRS will increase workload	.852

Extraction Method: Principal Component Analysis.

The value for Kaiser-Meyer-Olkin measure for the set of variables should exceed 0.50, and it exceeds the critical value as shown in

Table20 KMO and Bartlett's Test - Perception Workload Wave 1

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.500
Bartlett's Test of Sphericity	Approx. Chi-Square	13.218
	Df	1
	Sig.	.000

Table21 Reliability Statistics - Perception Workload Wave 1

Reliability Statistics

Cronbach's Alpha	N of Items
.619	2

On reliability test, two items returned a Cronbach's Alpha of 0.619, which is substantially below the 0.65 threshold. The two items were combined into a single factor and named as Workload Perception and was used for the correlation analysis. The table displayed in SPSS output file is shown below. So the factor was rejected as not reliable.

Attitude Factor

Table22 Total Variance - Attitude Wave 1

Total Variance Explained

Component	Initial Eigen values			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.447	81.583	81.583	2.447	81.583	81.583
2	.406	13.546	95.129			
3	.146	4.871	100.000			

Extraction Method: Principal Component Analysis.

Attitude: Principal Component Analysis extraction method was conducted on Questions AA1, AA2, AA3. On analysis it was observed that variance value lies above the accepted value that suggests that the Factor Analysis is accepted. The following component matrix shows that all the three statements can be taken as a single factor. Variance observed on analysis was 81.583% and all the three variables contributed to a single factor named as Attitude.

The value for Kaiser-Meyer-Olkin measure for the set of variables should exceed 0.50, and it exceeds the critical value as shown in

Table23 Component Matrix - Attitude Wave 1

Component Matrix

	Component
	1
I am satisfied with CPRS	.934
I will encourage my colleagues for using CPRS	.928
CPRS will support physicians and nurses in providing efficient care	.844

Extraction Method: Principal Component Analysis.

Table24 KMO and Bartlett's Test - Attitude Wave 1

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.702
Bartlett's Test of Sphericity	Approx. Chi-Square	110.255
	df	3
	Sig.	.000

Table25 Reliability Statistics - Attitude Wave 1

Reliability Statistics

Cronbach's Alpha	N of Items
.886	3

On reliability test, two items returned a Cronbach's Alpha of 0.886, which is substantially above the 0.7 threshold. The three items were combined into a single factor and named as Attitude and was used for the correlation analysis. The table displayed in SPSS output file is shown above

Wave 2

Perception about usefulness: Principal Component Analysis extraction method was conducted on Questions B2, B3, B4, B5 and B10. On analysis it was observed that variance value lies above the accepted value that suggests that the Factor Analysis is accepted. The following component matrix shows that all the five statements can be taken as a single factor. Variance observed on analysis was 87.766% and all the five variables contributed to a single factor named as Perception about Usefulness.

Table 26 Total Variance - Perception Usefulness Wave 2

Total Variance Explained

Component	Initial Eigen values			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.388	87.766	87.766	4.388	87.766	87.766
2	.555	11.093	98.859			
3	.046	.921	99.780			
4	.011	.220	100.000			
5	-2.175E-16	-4.349E-15	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix

	Component
	1
New system has decreased the gap between different stake holders	.969
New system has increased coordination between different stake holders	.969
CPRS has reduced patient record retrieval time	.930
CPRS has optimized patient safety	.908
CPRS has reduced medication errors	.906

Extraction Method: Principal Component Analysis.

Table 28 Reliability Statistics - Perception Usefulness Wave 2

Reliability Statistics

Cronbach's Alpha	N of Items
.958	5

On reliability test, five items returned a Cronbach's Alpha of 0.958, which is substantially above the 0.7 threshold. The four items were combined into a single factor and named as Usefulness and was used for the correlation analysis. The table displayed in SPSS output file is shown above

Perception about ease of use

Perception about ease of use: Principal Component Analysis extraction method was conducted on Questions B9 and B11. On analysis it was observed that variance value lies above the accepted value that suggests that the Factor Analysis is accepted. The following component matrix shows that all the two statements can be taken as a single factor. Variance observed on analysis was 94.307% and all the two variables contributed to a single factor named as Perception about ease of use

Table 29 Total Variance - Perception Ease of Use Wave 2

Total Variance Explained

Component	Initial Eigen values			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.886	94.307	94.307	1.886	94.307	94.307
2	.114	5.693	100.000			

Extraction Method: Principal Component Analysis.

Table 30 Component Matrix - Perception Ease of Use Wave 2

Component Matrix

	Component
	1
CPRS is useful	.971
CPRS is user friendly	.971

Extraction Method: Principal Component Analysis.

Table 31 KMO and Bartlett's Test - Perception Ease of Use Wave 2

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.500
Bartlett's Test of Sphericity	Approx. Chi-Square	88.450
	df	1
	Sig.	.000

The value for Kaiser-Meyer-Olkin measure for the set of variables should exceed 0.50, and it exceeds the critical value as shown in above table

Table 32 Reliability Statistics - Perception Ease of Use Wave 2

Reliability Statistics

Cronbach's Alpha	N of Items
.841	2

On reliability test, two items returned a Cronbach's Alpha of 0.841, which is substantially above the 0.65 threshold. The two items were combined into a single factor and named as ease of use and was used for the correlation analysis. The table displayed in SPSS output file is shown above

Perception about Workload: Principal Component Analysis extraction method was conducted on Questions B6 and B7. On analysis it was observed that variance value lies above the accepted value that suggests that the Factor Analysis is accepted. The following component matrix shows that all the two statements can be taken as a single factor. Variance observed on analysis was 100% and all the two variables contributed to a single factor named as Perception about workload.

Table 33 Total Variance - Perception Workload Wave 2

Total Variance Explained

Component	Initial Eigen values			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.000	100.000	100.000	2.000	100.000	100.000
2	1.367E-16	6.833E-15	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix

	Component
	1
CPRS has increased workload	1.000
CPRS has increased consultation timings	1.000

Extraction Method: Principal Component Analysis.

Reliability Statistics

Cronbach's Alpha	N of Items
1.000	2

On reliability test, two items returned a Cronbach's Alpha of 1.000, which is substantially below the 0.65 threshold. The two items were combined into a single factor and named as Workload Perception and was used for the correlation analysis. The table displayed in SPSS output file is shown above.

Attitude Factor

Principal Component Analysis extraction method was conducted on Questions BA1,BA2, BA3. On analysis it was observed that variance value lies above the accepted value that suggests that the Factor Analysis is accepted. The following component matrix shows that all the three statements can be taken as a single factor. Variance observed on analysis was 95.129% and all the three variables contributed to a single factor named as Attitude.

Table 36 Total Variance - Attitude Wave 2

Total Variance Explained

Component	Initial Eigen values			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.854	95.129	95.129	2.854	95.129	95.129
2	.104	3.460	98.589			
3	.042	1.411	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix

	Component
	1
I am satisfied with CPRS	.985
I encourage my colleagues for using CPRS	.974
CPRS supports physician and nurses in providing efficient care	.967

Table 38 KMO and Bartlett's Test - Attitude Wave 2

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.753
Bartlett's Test of Sphericity	Approx. Chi-Square	250.330
	Df	3
	Sig.	.000

The value for Kaiser-Meyer-Olkin measure for the set of variables should exceed 0.50, and it exceeds the critical value as shown in above table

Table 39 Reliability Statistics - Attitude Wave 2

Reliability Statistics

Cronbach's Alpha	N of Items
.972	3

On reliability test, two items returned a Cronbach's Alpha of 0.972, which is substantially above the 0.7 threshold. The three items were combined into a single factor and named as Attitude and was used for the correlation analysis. The table displayed in SPSS output file is shown above

Wave 3

Perception about Usefulness

Principal Component Analysis extraction method was conducted on Questions C2, C3, C4, C5 and C10. On analysis it was observed that variance value lies above the accepted value that suggests that the Factor Analysis is accepted. The following component matrix shows that all the five statements can be taken as a single factor. Variance observed on analysis was 56.688% and all the five variables contributed to a single factor named as Perception about Usefulness.

Table 40 Total Variance - Perception Usefulness Wave 3

Total Variance Explained

Component	Initial Eigen values			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.834	56.688	56.688	2.834	56.688	56.688
2	.972	19.443	76.131			
3	.621	12.417	88.547			
4	.511	10.214	98.761			
5	.062	1.239	100.000			

Extraction Method: Principal Component Analysis.

Table 41 Component Matrix - Perception Usefulness Wave 3

Component Matrix

	Component
	1
New system has decreased the gap between different stake holders	.906
New system has increased coordination between different stake holders	.885
CPRS has optimized patient safety	.764
CPRS has reduced medication errors	.654
CPRS has reduced patient record retrieval time	.467

Table 42 KMO and Bartlett's Test - Perception Usefulness Wave 3

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.660
Bartlett's Test of Sphericity	Approx. Chi-Square	164.796
	df	10
	Sig.	.000

The value for Kaiser-Meyer-Olkin measure for the set of variables should exceed 0.50, and it exceeds the critical value as shown in above table

Table 43 Reliability Statistics - Perception Usefulness Wave 3

Reliability Statistics

Cronbach's Alpha	N of Items
.797	5

On reliability test, five items returned a Cronbach's Alpha of 0.797, which is substantially above the 0.7 threshold. The four items were combined into a single factor and named as Usefulness and was used for the correlation analysis. The table displayed in SPSS output file is shown above

Perception about ease of use

Principal Component Analysis extraction method was conducted on Questions C9 and C11. On analysis it was observed that variance value lies above the accepted value that suggests that the Factor Analysis is accepted. The following component matrix shows that all the two statements can be taken as a single factor. Variance observed on analysis was 76.190% and all the two variables contributed to a single factor named as Perception about ease of use

Total Variance Explained

Component	Initial Eigen values			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.524	76.190	76.190	1.524	76.190	76.190
2	.476	23.810	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix

	Component
	1
CPRS is useful	.873
CPRS is user friendly	.873

Extraction Method: Principal Component Analysis.

Table 46 KMO and Bartlett's Test - Perception Ease of Use Wave 3

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.500
Bartlett's Test of Sphericity	Approx. Chi-Square	18.440
	df	1
	Sig.	.000

The value for Kaiser-Meyer-Olkin measure for the set of variables should exceed 0.50, and it exceeds the critical value as shown in above table

Table 47 Reliability Statistics - Perception Ease of Use Wave 3

Reliability Statistics

Cronbach's Alpha	N of Items
.687	2

On reliability test, two items returned a Cronbach's Alpha of 0.687, which is substantially above the 0.65 threshold. The two items were combined into a single factor and named as ease of use and was used for the correlation analysis. The table displayed in SPSS output file is shown above

Perception Workload

Principal Component Analysis extraction method was conducted on Questions C6 and C7. On analysis it was observed that variance value lies above the accepted value that suggests that the Factor Analysis is accepted. The following component matrix shows that all the two statements can be taken as a single factor. Variance observed on analysis was 85.309% and all the two variables contributed to a single factor named as Perception about workload.

Table 48 Total Variance - Perception Workload Wave 3

Total Variance Explained

Component	Initial Eigen values			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.706	85.309	85.309	1.706	85.309	85.309
2	.294	14.691	100.000			

Extraction Method: Principal Component Analysis.

Table 49 Component Matrix - Perception Workload Wave 3

Component Matrix

	Component
	1
CPRS has increased workload	.924
CPRS has increased consultation timings	.924

Extraction Method: Principal Component Analysis.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.500
Bartlett's Test of Sphericity	Approx. Chi-Square	39.707
	df	1
	Sig.	.000

The value for Kaiser-Meyer-Olkin measure for the set of variables should exceed 0.50, and it exceeds the critical value as shown in above table

Table 51 Reliability Statistics - Perception Workload Wave 3

Reliability Statistics

Cronbach's Alpha	N of Items
.825	2

On reliability test, two items returned a Cronbach's Alpha of 0.825, which is substantially below the 0.65 threshold. The two items were combined into a single factor and named as Workload Perception and was used for the correlation analysis. The table displayed in SPSS output file is shown above

Attitude Factor

Principal Component Analysis extraction method was conducted on Questions CA1,CA2, CA3. On analysis it was observed that variance value lies above the accepted value that suggests that the Factor Analysis is accepted. The following component matrix shows that all the three statements can be taken as a single factor. Variance observed on analysis was 74.462% and all the three variables contributed to a single factor named as Attitude.

Table 52 Total Variance - Attitude Wave 3

Total Variance Explained

Component	Initial Eigen values			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.234	74.462	74.462	2.234	74.462	74.462
2	.459	15.296	89.758			
3	.307	10.242	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix

	Component
	1
I am satisfied with CPRS	.890
I encourage my colleagues for using CPRS	.869
CPRS supports physician and nurses in providing efficient care	.829

Extraction Method: Principal Component Analysis.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.707
Bartlett's Test of Sphericity	Approx. Chi-Square	66.043
	df	3
	Sig.	.000

The value for Kaiser-Meyer-Olkin measure for the set of variables should exceed 0.50, and it exceeds the critical value as shown in above table

Reliability Statistics

Cronbach's Alpha	N of Items
.813	3

On reliability test, two items returned a Cronbach's Alpha of 0.813, which is substantially above the 0.7 threshold. The three items were combined into a single factor and named as

Attitude and was used for the correlation analysis. The table displayed in SPSS output file is shown above

Table 56 Summary Table of Factor Analysis and Reliability Test

S. No.	Factor	Chronbach's Alpha	No. of items
	Wave 1		
1	Perception about Usefulness	0.879	5
2	Perception about Ease of Use	0.684	2
3	Time	0.619	2
4	Attitude	0.886	3
	Wave 2		
1	Perception about Usefulness	0.958	5
2	Perception about Ease of Use	0.841	2
3	Time	1.000	2
4	Attitude	0.972	3
	Wave 3		
1	Perception about Usefulness	0.797	5
2	Perception about Ease of Use	0.687	2
3	Time	0.825	2
4	Attitude	0.813	3

Table 57 Summary Table of Factor Analysis

SPSS Codes	Factor	No. of Items	Factor Item Codes	% Variance	Cumulative %
	Wave 1				
AUse	Perception about Usefulness	5	A2,A3,A4,A5,A10	68.339	68.339
AEoU	Perception about Ease of Use	2	A9,A11	75.983	75.983
ATime	Time	2	A6,A7	72.659	72.659
AATT	Attitude	3	AA1,AA2,AA3	81.583	81.583
	Wave 2				
BUse	Perception about Usefulness	5	B2,B3,B4,B5,B10	87.766	87.766
BEoU	Perception about Ease of Use	2	B9,B11	94.307	94.307
BTime	Time	2	B6,B7	100.00	100.00
BATT	Attitude	3	BA1,BA2,BA3	95.129	95.129
	Wave 3				
CUse	Perception about Usefulness	5	C2,C3,C4,C5,C10	56.688	56.688
CEoU	Perception about Ease of Use	2	C9,C11	76.19	76.19
CTime	Time	2	C6,C7	85.309	85.309
CATT	Attitude	3	CA1,CA2,CA3	74.462	74.462

Hypothesis

H1: Perceived usefulness will influence physician acceptance of electronic health records.

H2: Perceived ease of use will influence physician acceptance of electronic health records

H3: Acceptance of electronic health records is dependent on satisfaction of patients

H4: Workload caused by electronic health records will influence acceptance

H5: Acceptance of electronic health records is dependent on highest qualification

H6: Acceptance of electronic health records is dependent on the age of the physician

Hypothesis Testing

H1: Perceived usefulness will influence physician acceptance of electronic health records.

Wave 1

Table 58 ANOVA (Perceived usefulness and Acceptance) Wave 1

ANOVA

Overall my attitude about CPRS is positive

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	12.233	33	.371	2.142	.024
Within Groups	4.500	26	.173		
Total	16.733	59			

On applying ANNOVA to the variables in this relationship, we found that the value of significance is < 0.05. This shows that the hypothesis is accepted.

Wave 2

ANOVA

Overall my attitude about CPRS is positive

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	43.799	9	4.867	23.854	.000
Within Groups	10.201	50	.204		
Total	54.000	59			

On applying ANNOVA to the variables in this relationship, we found that the value of significance is < 0.05. This shows that the hypothesis is accepted.

Wave 3

ANOVA

Overall my attitude about CPRS is positive

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	9.243	30	.308	1.570	.114
Within Groups	5.690	29	.196		
Total	14.933	59			

On applying ANNOVA to the variables in this relationship, we found that the value of significance is < 0.05. This shows that the hypothesis is rejected.

Inference:

The hypothesis is significant Hypothesis is accepted for Wave 1 and Wave 2 , rejected for Wave 3.

From this we can infer that acceptance of ehr is influenced by perceived usefulness in initial days of implementation but over a period of time perception about usefulness is not dependent.

H2: Perceived ease of use will influence physician acceptance of electronic health records

Wave 1

ANOVA

Overall my attitude about CPRS is positive

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5.912	13	.455	1.933	.051
Within Groups	10.822	46	.235		
Total	16.733	59			

On applying ANNOVA to the variables in this relationship, we found that the value of significance is >0.05. This shows that the hypothesis is rejected.

Wave 2

ANOVA

Overall my attitude about CPRS is positive

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	39.829	3	13.276	52.465	.000
Within Groups	14.171	56	.253		
Total	54.000	59			

On applying ANNOVA to the variables in this relationship, we found that the value of significance is < 0.05. This shows that the hypothesis is accepted.

Wave 3

ANOVA

Overall my attitude about CPRS is positive

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5.838	8	.730	4.092	.001
Within Groups	9.095	51	.178		
Total	14.933	59			

On applying ANNOVA to the variables in this relationship, we found that the value of significance is < 0.05. This shows that the hypothesis is accepted.

Inference

The hypothesis is accepted for wave 2 and wave 3 . We can infer that physicians realize that ehr is easy to use and on usage of application this will influence acceptance of ehr. After training the physician's felt that it’s not user friendly and system is difficult to use**.**

H3: Acceptance of electronic health records is dependent on satisfaction of patients

Wave 1

System was not live, so not tested.

Wave 2

ANOVA

Overall my attitude about CPRS is positive

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	29.891	2	14.946	35.336	.000
Within Groups	24.109	57	.423		
Total	54.000	59			

On applying ANNOVA to the variables in this relationship, we found that the value of significance is < 0.05. This shows that the hypothesis is accepted.

Wave 3

ANOVA

Overall my attitude about CPRS is positive

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.307	3	.769	3.411	.024
Within Groups	12.626	56	.225		
Total	14.933	59			

On applying ANNOVA to the variables in this relationship, we found that the value of significance is < 0.05. This shows that the hypothesis is accepted.

Inference:

Acceptance of electronic health records is dependent on satisfaction of patients. The hypothesis is proved in both the waves. This means that satisfaction of patients will influence acceptance of ehr.

H4: Workload caused by electronic health records will influence acceptance

Wave 2

ANOVA

Overall my attitude about CPRS is positive

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	17.679	2	8.840	13.872	.000
Within Groups	36.321	57	.637		
Total	54.000	59			

On applying ANNOVA to the variables in this relationship, we found that the value of significance is < 0.05. This shows that the hypothesis is accepted.

Wave 3

ANOVA

Overall my attitude about CPRS is positive

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.276	10	.328	1.377	.219
Within Groups	11.657	49	.238		
Total	14.933	59			

On applying ANNOVA to the variables in this relationship, we found that the value of significance is .>0.05. This shows that the hypothesis is rejected.

H5: Acceptance of electronic health records is dependent on highest qualification

Wave 1

ANOVA

Overall my attitude about CPRS is positive

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.195	2	.097	.335	.716
Within Groups	16.539	57	.290		
Total	16.733	59			

On applying ANNOVA to the variables in this relationship, we found that the value of significance is .>0.05. This shows that the hypothesis is rejected.

Wave 2

ANOVA

Overall my attitude about CPRS is positive

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.000	2	.000	.000	1.000
Within Groups	54.000	57	.947		
Total	54.000	59			

On applying ANNOVA to the variables in this relationship, we found that the value of significance is .>0.05. This shows that the hypothesis is rejected.

Wave 3

ANOVA

Overall my attitude about CPRS is positive

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.268	2	.134	.522	.596
Within Groups	14.665	57	.257		
Total	14.933	59			

On applying ANNOVA to the variables in this relationship, we found that the value of significance is .>0.05. This shows that the hypothesis is rejected.

Hypothesis rejected in all 3 waves, which tells acceptance doesn't depend on Highest Qualification.

H6: Acceptance of electronic health records is dependent on the age of the physician

Wave 1

ANOVA

Overall my attitude about CPRS is positive

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.482	2	.241	.845	.435
Within Groups	16.251	57	.285		
Total	16.733	59			

Wave 2

ANOVA

Overall my attitude about CPRS is positive

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.335	2	1.667	1.876	.163
Within Groups	50.665	57	.889		
Total	54.000	59			

Wave 3

ANOVA

Overall my attitude about CPRS is positive

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.422	2	.211	.828	.442
Within Groups	14.512	57	.255		
Total	14.933	59			

On applying ANNOVA to the variables in this relationship, we found that the value of significance is .>0.05. This shows that the hypothesis is rejected.

Hypothesis rejected Acceptance doesn't depend on age group..

Correlation Analysis

Wave 1

Table 74 Correlation analysis Factors Wave 1

	Usefulness	Ease of Use	Workload	Attitude	Overall
Perception Usefulness	1	**.664****	-0.052	**.749****	**.591****
Perception Ease of Use	.664**	1	-0.238	**.488****	**.346****
Perception Time/ Workload	-0.052	-0.238	1	0.201	0.021
Attitude	.749**	.488**	0.201	1	**.738****
Overall CPRS is positive	.591**	.346**	0.021	.738**	1

Wave 2

Table 75 Correlation analysis Factors Wave 2

	Usefulness	Ease of Use	Workload	Attitude	Overall
Perception Usefulness	1	**.841****	-0.626	**.841****	**.821****
Perception Ease of Use	.841**	1	-0.68	**.796****	**.763****
Perception Time/ Workload	-0.626	-0.68	1	-0.524	-0.496
Attitude	.841**	.796**	-0.524	1	**.946****
Overall CPRS is positive	.821**	.763**	-0.496	.946**	1

Wave 3

Table 76 Correlation analysis Factors Wave 3

	Usefulness	Ease of Use	Workload	Attitude	Overall
Perception Usefulness	1	**.530****	-0.334	**.444****	**.515****
Perception Ease of Use	.530**	1	-0.287	**.431****	**.469****
Perception Time/ Workload	-0.334	-0.287	1	0.005	-0.82
Attitude	.444**	.431**	0.005	1	**.731****
Overall CPRS is positive	.515**	.469**	-0.82	.731**	1

Pre Go Live Correlation

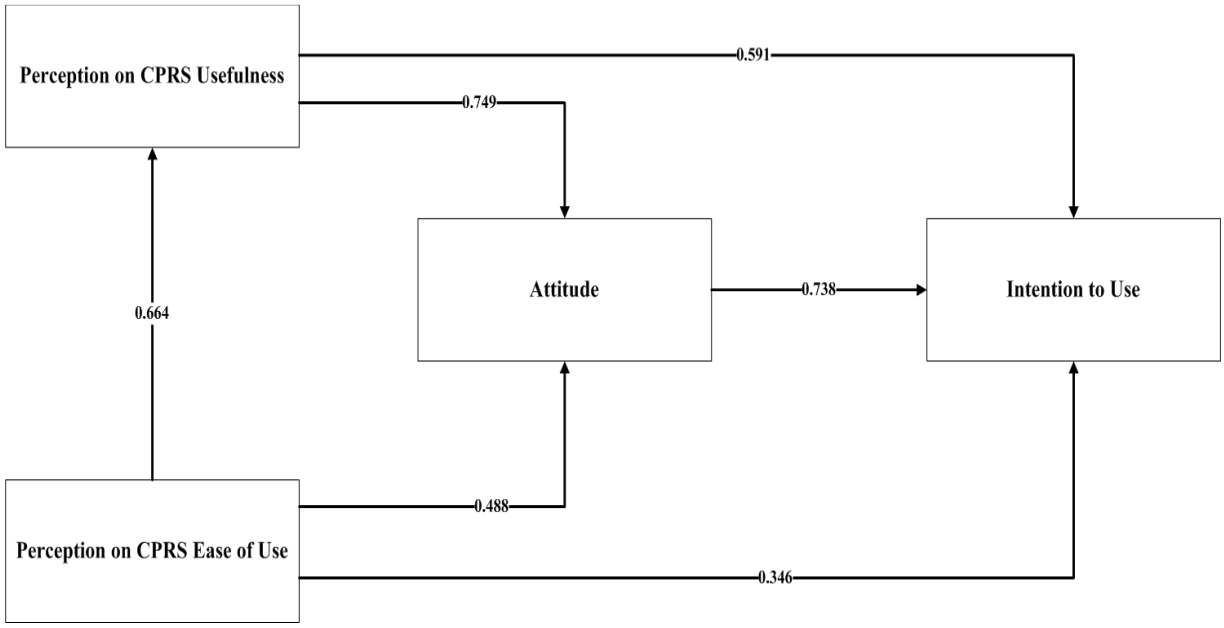


Figure 29 Correlation Model Pre Go Live

90 Days Post Go Live

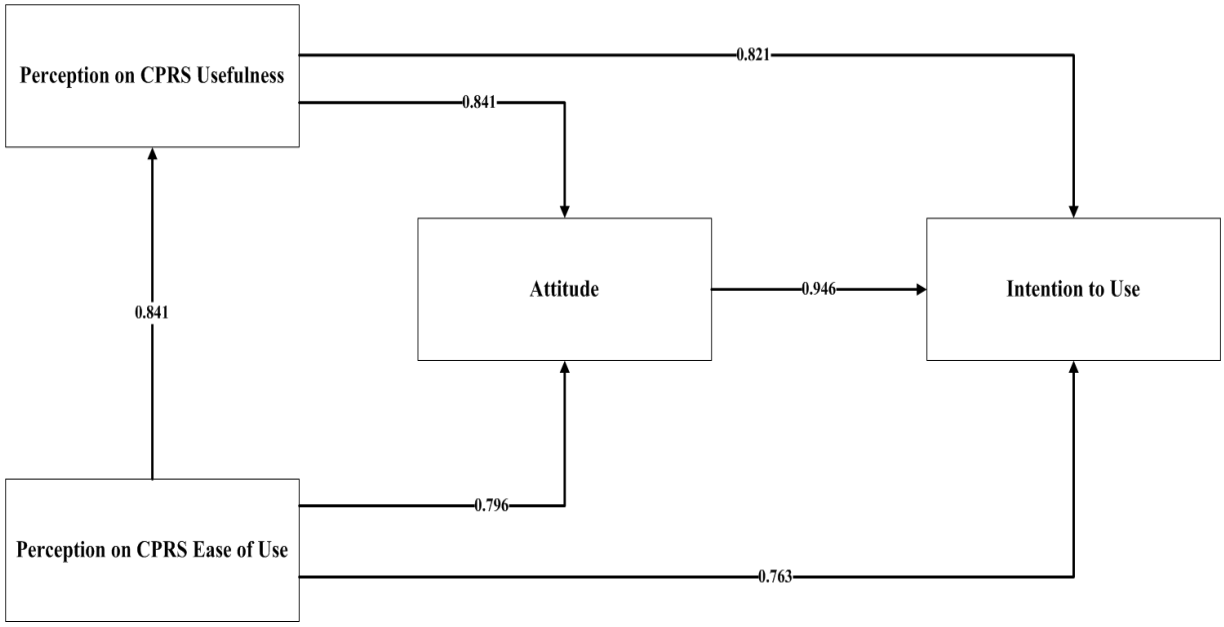


Figure 30 Correlation Model 90 Days Post Go Live

180 Days Post Go Live

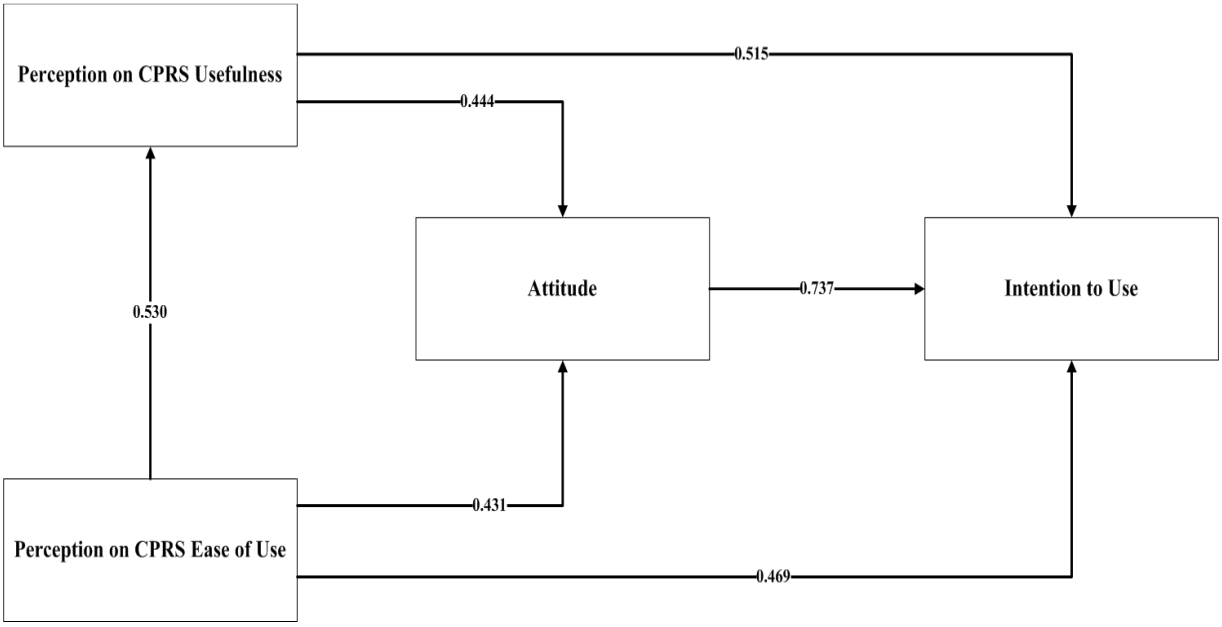


Figure 31 Correlation Model 180 Days Post Go Live

8. Discussions

In this we will discuss the main findings of this research project & how they are connected to the existing literature on acceptance of EHR.

Some studies found ease-of-use as an important factor influencing technology adoption among physicians, others did not.[41] But our study reveals that ease of use & Acceptance of EHR by clinical staff is associated which shows that ease of use leads to acceptance of EHR by the clinical staff. Attitude is influenced by many factors in this study. It has shown positive association with usefulness, ease of use & very strong association with EMR Acceptance. But, it has shown no association with professional autonomy. The same results have been depicted in other studies as well. The previously conducted studies also show that there is a negative association of professional autonomy with attitude.[4,7]

9. Conclusion

Throughout the world there has been a paradigm shift where healthcare sector have realized the importance of using ICT in hospitals & other healthcare organizations. It is believed that it will embrace the goal to deliver high quality care with greater efficiency & accuracy. ICT includes a set of effective tools to collect, store, process & exchange health related information. It is believed that ICT could improve safety, quality & cost efficiency of healthcare services. It may happen that depending upon the treatment the patient may have to visit multiple providers throughout the treatment. This requires timely & efficient exchange of information. With ICT in place in the clinical setting , the issue of efficient exchange of information can be easily mitigated. However, implementation of ICT in the healthcare setting is a major challenge. To make ICT implementation a success in a clinical setting, one of the most important factor is the acceptance & use of ICT in the same.

The aim of the study was to study the change in perception about ehr over a period of time and to identify how these influence the attitude of the healthcare professionals i. e physicians & nurses towards the acceptance of EHR. The data gathered was analyzed. Then a model is made which

shows the attitude and the acceptance of EHR by the clinical staff. The model depicts that Attitude of the clinical staff s is directly & ultimately leading to the acceptance of EHR by them. The attitude in turn is being positively influenced by the perception.

10.Lessons Learned

- ✓ Success of Implementation is directly related to end user interest and commitment.
- ✓ Even after providing adequate training and putting effort, issues can exist because the acceptance depends on the user attitudes and perception.
- ✓ Workflow changes/ clinical transformation are difficult in established locations.
- ✓ IT support team with sound technical and functional knowledge should be on site.
- ✓ Lack of motivation & peer influence creates reluctance to the usage of the new system.
- ✓ Lack of communication about vision & benefits creates ambiguity in the minds of users.
- ✓ Lack of infrastructure makes the users irritated.
- ✓ According to physicians more time is consumed in making records in the system.

11.Recommendations

1. Recommendation 1

- We recommend informing the providers about the solution to this problem at the time of training. They need to be informed that templates of their choice can be made default. They should be taught the process to make the particular templates as default, so that the department template of that particular provider comes at the top. By doing this the provider will find it easy to select the template. This will make user feel the system as user friendly and will be more inclined towards using the system.
- We also recommend teaching, practicing and reinforcing the shortcut methods / entering the fields in the template with the help of key board. (Now they uses the mouse for entering the fields and key board for text which consumes time)

2. Recommendation 2

- When the users are called for the training sessions, the very first thing they need to be communicated is the Vision in detail (Communicating the Vision).
- After that they need to be given a brief overview of the complete system by communicating them about all the different modules in that system.
- They need to be made aware of the benefits of the complete system.
- The entire change in work flows can be demonstrated during the training sessions and also reinforced with in the mind of the users. This will help to avoid confusion during Go- live.
  - Proper and systematic training should be given to all users & stakeholders

3. Recommendation 3

- There should be a strong leadership in pharmacy which keeps a check that the pick list is being delivered at the scheduled time to the wards.

4. Recommendation 4

- Identifying Super Users/ Trainers
- Choose the person who is having good communication & leadership skills, sound computer knowledge and work processes. As the success of implementation depends on training, these criteria's should be followed
- Super user & End user training
  - ✓ There should be a systematic training for both the users.
  - ✓ After a detailed theory session, they can be shown with the live scenarios.
  - ✓ Hands on practice can be done along with theory sessions.
  - ✓ But after the entire theory sessions few practical session should be there, in which the user will enter the patient records into the system systematically.

5. Recommendation 5

- Providing Training materials & Quick reference guides

✓ All the Super users & End users can be provided with the suitable training materials and quick reference guides which should contain step by step process of operating the system.

✓ They can be provided with the animated presentations. The users can refer to these documents whenever they forget any step while operating the system. This will be of great help to them and feel comfortable in using the system.

6. Recommendation 6

- **Induction/ Orientation programmes**

In induction/ orientation programmes, the new employees need to be informed each and everything about the new system in place starting from vision to the work process in practice, benefits etc. This will avoid any kind of ambiguity from the mind of the user.

- **Peer Influence**

The HOD needs to motivate the users about using the system.

14.References

1. ^ "About Dell|History | Dell Österreich". Euro.dell.com. Retrieved September 5, 2010.
2. ^ Koehn, Nancy Fowler (2001). Brand New: How Entrepreneurs Earned Consumers' Trust from Wedgwood to Dell. Harvard Business Press. p. 287. ISBN 978-1-57851-221-8. Retrieved October 14, 2008.
3. ^ [a] [b] Hansell, Saul; Vance, Ashlee (September 22, 2009). "Dell to Spend $3.9 Billion to Acquire Perot Systems". New York Times. from http://en.wikipedia.org/wiki/Perot_Systems
4. ^ "Dell to Buy Alienware, a Maker Of High-End PC's for Gamers". *New York Times*. Retrieved 13 April 2012.
5. ^ WhatIz website over trendyness of Alienware products, 10 November, 2011. visited 10 April, 2012
6. ^ [a] [b] Lee, Louise (March 23, 2006). "Dell Goes High-end and Hip". *BusinessWeek*. McGraw-Hill. Retrieved October 29, 2008.
7. ^ Gonsalves, Antone (November 5, 2007). "Dell's EqualLogic Buy Could Drive Down iSCSI Storage Prices".InformationWeek. United Business Media. Retrieved October 29, 2008.
8. ^ "Dell to buy Perot Systems for $3.9 billion". Finanznachrichten.de. September 22, 2009. Retrieved November 17, 2011.
9. ^ "Perot Systems". Hoover's. 2009. Retrieved January 4, 2010.
10. ^ Shah, Agam (February 11, 2010). "Dell Acquires Systems Management Company KACE". The New York Times
11. ^ "STOCKS NEWS US-3PAR shares soar as Dell acquires company". Finanznachrichten.de. August 16, 2010. Retrieved November 17, 2011.
12. ^ "Dell gives up bidding war for 3Par Inc.". *Winston-Salem Journal*. Associated Press. September 3, 2010. Retrieved September 3, 2010.[*dead link*]
13. ^ "Dell Acquires SaaS Company, Boomi". SiliconANGLE. Retrieved November 3, 2010.
14. ^ USA Today, page B1, published March 14, 2008, "Dell buys security specialist SonicWall"

15. ^ InformationAge.com website: Dell buys thin client market leader Wyse, 2 April, 2012. Visited: 3 April, 2012
16. ^ Dell press-release Dell Acquires Clerity Solutions, Launching New Applications Modernization Services, 3 April, 2012
17. Afreen F. *To Analyze the Scope and Acceptance of Electronic Medical Records among doctors in India.* A study in Institute of Management Studies [Thesis]. Ghaziabad, 2011.
18. Aldosari, B. *Factors affecting physicians' attitudes about the medical information system usage and acceptance through the mandated implementation of integrated medical information system at the Saudi Arabia National Guard Health System, a modified technology acceptance model [Thesis]*. Publication No. ATT 30976022003,2003.
19. Anderson J. G, Aydin C. E. & Jay S. J. *Evaluating health care information systems: Methods and applications,*1994, 69-115.
20. Anderson, J. G. *Clearing the way for physicians' use of clinical information systems*. Communications of the ACM, 1997, 40(8):83-90.
21. Ash, J. S. & Bates, D. W. *Factors and Forces Affecting EHR System Adoption: Report of a 2004 ACMI Discussion*. Journal of the American Medical Informatics Association, 2005, 12(1):8-12.
22. Ash, J. S., Anderson, J. G., Gorman, P. N., Zielstorff, R. D., Norcross, N., Pettit, J., et al. *Managing change: Analysis of a hypothetical case*. Journal of the American Medical Informatics Association, 2000,7(2):125-134.
23. Aydin, C. E. *Survey methods for assessing social impacts of computers in health care organizations*, (1994).
24. Ball, Marion J, Bell, Beverly L, Hyatt, Susan J. *Electronic Health Records: A Global Perspective.* A Work Product of the HIMSS Enterprise Systems Steering Committee and the Global Enterprise Task Force. 2008.
25. *Barriers to electronic health record use during patient visits*. In: Linder, J. A., Schnipper, J. L., Tsurikova, R., Melnikas, A. J., Volk, L. A. & Middleton, B. Proceedings of AMIA Symposium, 2006: 499-503
26. Brown, S. H. & Coney, R. D. *Changes in physicians' computer anxiety and attitudes related to clinical information system use*. Journal of the American Medical Informatics Association,(1994),1(5):381-394.

27. Chau, P. Y. K. & Hu, P. J. *Investigating healthcare professionals' decisions to accept telemedicine technology: An empirical test of competing theories*. Information & Management, 2002, 39(4):297-311.

28. Chuttur, M.Y. *Overview of Technology Acceptance Models: Origins, Developments & Future Directions [Thesis]*. Indiana University, USA, 2009.

29. *Comparisons of Physicians' and Nurses' Attitudes towards Computers Connecting Medical Informatics and Bio-Informatics.* In:Gordana, B., Ivor, K., Dejvid, Z., Ileana, L., Lidija, B.-Z. & Mladen, P. Proceedings of MIE2005 - The XIXth International Congress of the European Federation for Medical Informatics, 2005:608-613.

30. Cork, R. D., Detmer, W. M. & Friedman, C. P. *Development and Initial Validation of an Instrument to Measure Physicians' Use of, Knowledge about, and Attitudes Toward Computers*. Journal of the American Medical Informatics Association,(1998), 5(2):164-176.

31. Daigrepont J, McGrath D. Article on *EHR Critical Success Factors, Complete Guide and Toolkit to Successful EHR Adoption.* Chicago, 2011: 13-21.

32. Dansky, K., Gamm, L., Vasey, J., & Barsukiewicz, C. *Electronic medical records: Are physicians ready*? Journal of Healthcare Management 44,1999, 440–455.

33. Dansky, K. H., Gamm, L. D., Vasey, J. J. & Barsukiewicz, C. K. *Electronic medical records: Are physicians ready*? Journal of Healthcare Management, 1999, 44(6):440-455.

34. Davis, F. *A Technology Acceptance Model for empirically testing new end user information systems: Theory & results[Thesis]*. MIT Sloan School of Management, Cambridge, 1985.

35. Davis, F , bagozzi, R.P & Warshaw, P.R. *User Acceptance of Computer Technology:A comparison of two theoritiacl models.* Management Science, 1989, 35(8) : 982-1003.

36. Detmer, W. M. & Friedman, C. P. *Academic physicians' assessment of the effects of computers on health care*. Journal of the American Medical Informatics Association, Supplement,1994, 558-562.

37. Doolan, D. F., Bates, D. W. & James, B. C. *The use of computers for clinical care: A case series of advanced U. S. sites*. Journal of the American Medical Informatics Association,2003, 10(1):94-107.

38. *Does the Extended Technology Acceptance Model Apply to Physicians*. In: Chismar, W., G. & Wiley-Patton, S. Proceedings of the 36th Annual Hawaii International Conference on System Sciences (HICSS'03), 2003:Track 6 - Volume 6.

39. Electronic Medical Records : A Step into the future of Healthcare. 2010. (http://www.helium.com/items/1995112-electronic-medical-record-sytems-the-way-forward)

40. Ernstmann, N., Ommen, O., Neumann, M., Hammer, A., Voltz, R. & Pfaff, H. *Primary Care Physician's Attitude Towards the GERMAN e-Health Card Project—Determinants and Implications.* Journal of Medical Systems,2009, 33(3):181-188.

41. Fishbein, M & Ajzen I. *Belief , Attitude, Intention & Behavior: An introduction to theory & Research Reading*, 1975.

42. Felt-Lisk, S., Johnson, L., Fleming, C., Shapiro, R. & Natzke, B. Article on *Toward Understanding EHR Use in Small Physician Practices* , Health Care Financing Review: HCFA ORDS Publications, 2009.

43. Gadd, C. S. & Penrod, L. E. *Dichotomy between physicians' and patients attitudes regarding EMR use during outpatient encounters*. Journal of the American Medical Informatics Association,2000:275-279.

44. Garets D, Davis, M. *Electronic Medical Records vs. Electronic Health records: Yes there is a difference.* HIMSS Analytics, Chicago, 2006.

45. Garrett, P.; Brown, C. A.; Hart-Hester, S.; Hamadain, E.; Dixon, C.; Pierce, W. et al. *Identifying Barriers to the Adoption of New Technology in Rural Hospitals: A Case Report.* Perspectives in Health Information Management,2006,*3*(9).

46. Gardner, R. M. & Lundsgaarde, H. P. *Evaluation of user acceptance of a clinical expert system*. Journal of the American Medical Informatics Association,(1994) 1(6):428-438.

47. Gaster, B., Knight, C. L., DeWitt, D. E., Sheffield, J. V. L., Assefi, N. P. & Buchwald,D. *Physicians' use of and attitudes toward electronic mail for patient communication*. Journal of General Internal Medicine,2003, 18(5):385-389.

48. Greenhalgh, T., Robert, G., MacFarlane, F., Bate, P. & Kyriakidou, O. *Diffusion of innovations in service organizations: Systematic review and recommendations.* The Milbank Quarterly,2004,82(4):581-629.

49. Goldsmith, J., Bluementhal, D., & Rishel,W. *Federal health information policy: A case of arrested development.* Health Affairs,2003,*22*(4):44-55.

50. Gurley, L. *Advantages & Disadvantages of Electronic Medical Records.* American Academy of Medical Administrators. Cleveland, OH, 2004.

51. Johnson, K. B. *Barriers that impede the adoption of pediatric information technology*. Archives of Pediatrics and Adolescent Medicine, 2001, *155*:1374-1379.

52. Lorenzi, N. M., & Riley, R. T., eds. *Organizational aspects of health informatics: Managing technological change*. New York: Springer-Verlag,1995.

53. Lorenzi, N. M., Riley, R. T., Blyth, A. J. C., Southon, G. & Dixon, B. J. *Antecedents of the people and organizational aspects of medical informatics:Review of the literature.* Journal of the American Medical Informatics Association, 1997, 4:79-93.

54. Lorenzi, N. M., & Riley, R. T. *Managing change: An overview*. Journal of the American Medical Informatics Association, 2000, 7: 116-124.

55. Ludwick, D. A. & Doucette, J. *Primary care physicians' experience with electronic medical records: barriers to implementation in a fee-for-service environment.* Int. J. Telemedicine Appl., 2009,1-9.

56. Moeinedin, Fatemeh (Marjan).*Assessing Primary Care Physicians' Attitudes Towards Adoption of an Electronic Tool to Support Cancer Diagnosis.*Graduate Department of Health Policy, Management, and Evaluation[Thesis]. University of Toronto, 2011.

57. Morton,M.E. *Use & acceptance of Electronic Health Records: Factors affecting physician attitudes* [Thesis]. Drexel University,2008.

58. NBR Center for Health & Ageing (Health Information Technology & Policy Hub). *India HIT Case Study*. 2007.

59. Price, Audrey P. *Astudy of factors influencing physician adoption of electronic medical records technology* [Thesis]. Grenoble Ecole de Management, 2011.

60. PricewaterhouseCoopers. *Emerging Market report : Health in India*. 2007.

61. Rogoski, R. R. *Having it your way. Health Management Technology*,2003, *24*(5):12-16.

62. *Readiness Assessment: You Know You're Ready When.*…In: Schulte M, eds. Go-Live: Smart Strategies from Davies Award-Winning EHR Implementations. Chicago, 2011: 71 – 86.
63. Smith, Robert H. Article on *Decision & Information Technologies*, Center for Health information & Decision Systems, 2007,2(1B).
64. Sachidanandam,S. *Why physicians do or do not use CPOE systems: applying the technology acceptance model*. A Graduate College of Bowling Green State University[Thesis]. Minneapolis, University of Minnesota,2006.
65. *Understanding the Importance of Medical History.* DDS Safety Net, California Department of Developmental Services, 2010 (http://www.ddssafety.net/content/understanding-importance-medical-history
66. US Department Of Veterans Affairs. Vista Monograph [Internet]. Washingtondc):Va;2010 Mar5 [Cited2010 Mar 8]. Available From: Http://Www4.Va.Gov/Vista_Monograph/
67. Venkatesh, V, Davis, F.D. *A model of the Antecedents of perceived ease of use : development & test.* Decision Sciences, 1996, 27(3) : 451 – 481.
68. Wager, K. A. *Health information: Concepts, principles and practice.* Journal of American Health Information Management Association. Chicago:101-120.
69. Yarbrough, A. K. & Smith, T. B. (2007). *Technology Acceptance among Physicians.* Medical Care Research and Review,2007, 64(6):650-672.
70. *Suchitra Mohanty, Chapter 1 E-Healthcare Introducing a New Horizon in the Health System.
71. *N Janardhan Rao and Feroz Zaheer, Chapter 2, IT in Healthcare Time for a change, Book E-Healthcare Modernizing Healthcare by Debashree Mukherjee.ISBN 978-81-314-2373-8
72. Staff Perception Survey before and after EHR/CPOE Implementation, Jean Loes, Marcia Ward, Douglas Wakefield, John O'Brien
73. A Study of factors influencing physician adoption of Electronic Medical Records Technology, Audrey P. Price.

APPENDICES

To Study and Compare Physician's Perception on VistA CPRS Pre Go Live and Post Go Live

Respected Sir / Madam,

I am Post Graduate Students pursuing PGDHHM in Health Informatics (2nd Year) from IIHMR, New Delhi and Conducting Study on "Physicians Perception on Electronic Health Records". I'm conducting this as a part of our PG Course and so I request you to spare some of your precious time.

The following survey is intended to help us to better understand Physician's perceptions and attitudes on VistA CPRS. Those Physicians who has attended training sessions can take part in this survey. Specifically interested in learning about your expectations and understanding what impact the new VistA CPRS being installed will have with patient care, and how they will affect you. All responses will be kept strictly confidential. Completed surveys will be used for data entry and analysis. No individual data or responses will be reported. Only aggregated data will be used. Please check one (1) response for each question and give your Honest Opinion.

Thank you for sparing your valuable time.

Dr. Vipin Vasudev S Pai

Name, contact details, and position of the person completing the questionnaire

Name :

Age : Gender : Male / Female Highest Qualification:

Designation: Department:

Have you had prior experience outside of your facility with any electronic health records or computerized provider order entry systems? Yes____ No ____

If yes, about how many years of experience _____ From Where:_____

A	Do you use Computers in your daily life	Yes	No		
B	Do you find difficulty in using computers	Yes	No		
C	How often do you use computers (Frequency)	Not Using	Daily	Thrice a Week	
		Twice a Week	Once Weekly	Once Fort-nightly	Once Monthly
D	Do you have Access to Internet	Yes	No		
D1	If yes , Please Mention From where all You access	Home	Office	Cyber Café	

E	Please Mention for what purpose you use Internet	Routine Mail Checking
		Online Transactions
		Searching Journals and Publications
		Others :

T	Did you attend the training session on VistA CPRS	Yes	No
W	Did you understand the workflow of VistA CPRS	Yes	No

A1	Computers are necessary for delivering quality healthcare	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
A2	CPRS will reduce the patient record retrieval time	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
A3	New system will decrease gap betwen different stake holders	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
A4	New System will increase coordination between different stake holders	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
A5	CPRS will optimize patient safety	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
A6	CPRS will increase workload	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
A7	CPRS will increase consultation timings	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
A8	CPRS will decrease the number of patients consulted	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
A9	CPRS is Userfriendly	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
A10	CPRS will reduce medication errors	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
A11	CPRS is Useful	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

AA1	I am satisfied with CPRS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
AA2	I will encourage my colleagues for using CPRS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
AA3	CPRS will support physicians and nurses in providing efficient care	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
AOA1	Overall my attitude about CPRS is positive	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Thank you for completing this survey.

To Study and Compare Physician's Perception on VistA CPRS Pre Go Live and Post Go Live

Respected Sir / Madam,

I am Post Graduate Students pursuing PGDHHM in Health Informatics (2nd Year) from IIHMR, New Delhi and Conducting Study on "Physicians Perception on Electronic Health Records". I'm conducting this as a part of our PG Course and so I request you to spare some of your precious time.

The following survey is intended to help us to better understand Physician's perceptions and attitudes on VistA CPRS. Those Physicians who has attended training sessions can take part in this survey. Specifically interested in learning about your expectations and understanding what impact the new VistA CPRS being installed will have with patient care, and how they will affect you. All responses will be kept strictly confidential. Completed surveys will be used for data entry and analysis. No individual data or responses will be reported. Only aggregated data will be used. Please check one (1) response for each question and give your Honest Opinion.

Thank you for sparing your valuable time.

Dr. Vipin Vasudev S Pai

Name, contact details, and position of the person completing the questionnaire

Name :

Age : Gender : Male / Female Highest Qualification:

Designation: Department:

Have you had prior experience outside of your facility with any electronic health records or computerized provider order entry systems? Yes____ No ____

If yes, about how many years of experience _____ From Where:_____

1	Computers are necessary for delivering quality healthcare	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
2	CPRS has reduced patient record retrieval time	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
3	New system has decreased the gap between different stake holders	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
4	New system has increased coordination between different stake holders	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5	CPRS has optimized patient safety	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
6	CPRS has increased workload	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
7	CPRS has increased consultation timings	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
8	CPRS has decreased number of patients consulted	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
9	CPRS is userfriendly	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
10	CPRS has reduced medication errors	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
11	CPRS is useful	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

A1	I am satisfied with CPRS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
A2	I encourage my colleagues for using CPRS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
A3	CPRS supports physicians and nurses in providing efficient care	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
OA1	Overall my attitude about CPRS is positive	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

P1	Consistency with which patient care data are has become	Much Worse	Worse	No Change	Improved	Much Improved
P2	Accuracy and validity of patient care data recorded has become	Much Worse	Worse	No Change	Improved	Much Improved
P3	Amount of time spent in preparing Discharge documents has become	Much Worse	Worse	No Change	Improved	Much Improved
P4	EHR improved ability to give patient care with right information	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
P5	Patients are happy with new form of medical records	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

E1	Currently using smartphone	Yes	No
E1A	Yes, like to receive patient information on smartphone	Yes	No
E2	Accessing patient records from smartphone is useful	Yes	No

Thank you for completing this survey.