Internet Of Things As A Solution Enabler In Health Sector

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Abstract

India is a country where vast medical needs are not met. Internet of Things (IoT) has created a new horizon in health care sector which specifically aims at connecting the world via smart objects. IoT enabled devices are used in various industries such as Environmental Monitoring, Building and Home Automation, Medical and Healthcare Systems, Infrastructure Management, Transport Systems, Energy Management, Industrial Applications, etc. Healthcare industry is one of the biggest industries that provides health care products and incorporates the delivery of services to patients. These services are supported by electronic processs called as E-health. Using IoT devices remote health monitoring and notification can be done easily as well as quickly in case of emergency. Smart TV as a platform for E-Health Services can also be called as "Health-TV" which is one of the technology that provides IoT based e-Health Solutions to the patients. ICT industry mainly focuses on the easy access of remote health services such as medication reminder, health monitoring and health coaching at home. It also helps in independent living style for the patient like senior citizen, managing and accessing health services in a specific condition from home via Health TV. "Smart infusion pumps" is another technology which is used for treating patients more carefully and accurately. It collects data and then aggregates in a database which contains the records of the administration in the central server. They are basically network devices which connect hospitals and clinics through wireless local area network."Smart-o-meter" is a Web-based patient-centered decision support system for BP control using an iterative, user-centered design process so that it meets standards of feasibility and acceptability for patient navigators and participants.

The outcome or suggestion of this intensive research:

• The government should implement the health care technological solutions, as private organizations can't reach maximum masses of India.

• A shift from traditional methods to the conventional methods of health care practices in India is required so as to build a better environment for the people to live in.

• As many Indians are still hesitant of relying on internet based technology, especially IoT (fact from our survey over respondent in city PUNE, INDIA), a proper awareness session and demo session should be conducted in leading hospitals and institutes.

Keywords: Electronic Health Records, E-Prescribing, Tele-Health, Telemedicine, Remote Live Diagnostics, Smart Furniture, Bar Code Medication Administration, Computerized Provider Order Entry

1. Introduction

The Internet of Things (IoT) is the technology in which objects as well as human beings are provided with the unique identifiers and can transfer data over a large network without even requiring human-to-computer or human-to-human interaction. In networking concept, this refers to the ever-growing network which has physical objects with an IP address for connectivity to the internet, and the communication which occurs between these things and other devices of network and systems. [1] IoT has evolved from the convergence of micro electro-mechanical systems (MEMS), wireless technologies and Internet which are expected to offer connectivity of systems, devices, and services which goes beyond machine-to-machine communication (M2M) and thus, covers a large variety of domains, protocols and applications. [2]

E-Health is a kind of health care practice that is supported by communication and electronic processes. It is an electronic as well as a digitized process in the healthcare industry. In public health and business, it is an emerging field where medical informatics, referring to the information about health care devices delivered and enhanced through the Internet. There are various forms of E-health such as electronic health records (Hoerbst & Ammenwerth, n.d.), Virtual health care teams, e-Prescribing (Vaziri *et al.*, n.d.), m-Health, Tele-Health(Miyazaki, 2009), Telemedicine (Mishra & Kapoor, 2009), Medical research using Grids and Healthcare Information Systems, Consumer health informatics. E-Health industry is growing and hence, more challenges are faced in health care research. Thus E-Health is opportunity to enhance health or health service delivery by using modern information technology, electronic communication resources, Internet, interactive TV, wireless communications, voice response systems, CD-ROMs, DVD-ROMs, and remote monitoring.[3]

There are 10 E's in e-health which are described below:

• Efficiency - Improve the health care efficiency at low cost is the main motive behind the e-health which can be done by therapeutic interventions through enhanced communication possibilities between health care establishments and by involving patients.

• Enhanced healthcare quality - To increase efficiency, the quality must also to be improved by allowing comparisons among different providers, to direct patient streams to the best quality providers and consumers who are involved for quality assurance.

• Based on Evidence - Interventions in e-health must be evidence based so that their efficiency and effectiveness is proved by scientific evaluation.

• Empowerment of consumers and patients - E-health has opened the new doors for patient centered medicine, personal electronic records accessible to consumers.

• Encouragement of a new relationship between health professional and the patient where decisions are to be made in a shared manner.

• Education of both physicians & consumers through online sources. For physicians, it is by continuing medical education and by providing health education, tailored preventive information for consumers.

• Enabling the exchange of information as well as communication between health care establishments in a standardized way.

• Extending the health care scope beyond its conventional boundaries - It enables customers to obtain online health services from global providers easily.

• Ethics – In E-health, there is a new form of interaction between the patientphysician. This poses many new challenges and even threats to the various ethical issues such as informed consent, online professional practices, privacy and equity issues.

• Equity – E-health can be accessible in both urban and rural population.

2. Health TV

Health TV, which is also called as connected TV or hybrid TV, is a television set or set-top box which is integrated with Web 2.0 and Internet features. It is convergence of technology between television sets, PC's and set-top boxes. These devices can also provide on-demand streaming media, online interactive media, over-the-top content, Internet TV and home networking access along with its traditional functionalities. The set-top boxes, digital media players, game consoles and other interactive devices which are connected to the network can utilize display outputs like television, which allows the users to

find and play videos, movies, photos and other content from the Web on a satellite TV channel or cable TV channel, or on a local storage drive.

2.1 Health TV as a Platform for E-health Services:

E-health field aims at providing various services targeted to patients at increasing manner at low cost, better quality of services and efficiency, personalization and user-control. ICT industry focuses on the easy access of remote health services such as medication reminders, health monitoring and health coaching at home, independent-living style for patients like senior citizens, managing and accessing health services in a specific condition from home. The well-known consumer electronic device 'Health TV' is user friendly and can interface with different systems. Patient can anytime connect with their caregivers, submit measurements, take different surveys, get reminders about medication, tutorials of sample videos and video conference with caregivers.[5] People those who are not familiar with smartphone, computer, laptop or other portable devices, addresses the need, usability and productivity. The main motive is to create a unique interface between technology and human beings. For example the use of a cloud-based remote service for the consultation of health reports, collect data from biomedical devices(Arney, Venkatasubramanian, Sokolsky, & Lee, 2011) and present the data in graphical format to manage user reminder for medicines.

2.2 Technology Centred Research Agenda

There are different strategies to increase the speed as well as usefulness of e-health research among people, as it is required to increase awareness so that it will become approachable. Many interactive services and applications can be provided on Health TV platform. More sophisticated services are accessible through this structure. Hence human TV interaction responds higher degree of efficiencies. Along with this, it also maintains the efficiency and effectiveness of quality. Use of multimedia such as media conferencing, 3D-TV, remote live diagnostics (Brax & Jonsson, n.d.) in e-Health services and applications are emerging .This paved the way of using the terminals like Health TV sets, home-boxes, smartphones and tablets to deliver information to the end user. [6] There may be issues related to e-Health care and safety services provided for elderly and dependent patients. To overcome these issues, services are provided using different communication technologies depending on the requirement and different profiles of people situated in diffeent contexts, locations and places such as health institutions, home and city. Such devices, services or platform ideally should be accessible at any time from any place.

2.3 Overall Market Analysis

Significant transitions are observed in last one decade. The plasma TV and LCD TV replaces the CRT TV in the market. There is a demand for multi-functional services, TV network digitization and increasing internet penetration leads to the growth of Health TV. Indian Health TV market was valued at \$0.22 billion in 2011 but it is expected to reach approximately \$10.41 billion, with CAGR of 87.02% during the period 2012-2017. [7] According to the new market research report, "Global Health TV Market" is rapidly increasing. By 2016, the overall market for global Health TV is expected to grow \$265 billion, with CAGR of 17% and the unit shipment is expected around 153.2 million by 2016 from 64 million in 2011, with an estimated annual growth rate of 19%.[8]

2.4 Tools and Applications

SEMI is smart e-Health Monitoring on IPTV is an intelligent e-health monitoring tool. It help users to perform regular health monitoring or independently by using IPTV. It has following health monitoring features such as:

- Graphical format display
- Upload information using various health devices
- Keep track of health profile of patient by themselves
- Send health related information to the doctor directly from IPTV screen

SEMI Set-Up has relationship between IPTV, Set-up-box, e-Health server and various connected e-Health devices. Medical device registers the health data for user and uploader automatically uploads health data to a server. E-health server receives data and interacts with IPTV server to send this information. IPTV shows a graph of information sent. Also automatic Email is sent to the doctor. [9]

CASIS is service-oriented framework which allows family members and healthcare providers to monitor senior citizens anytime, anywhere. Using a wide variety of appliances interaction with elders for data gathering and information presentation is done. It tracks the location and specific activities of the elder in any environment through sensors, cameras, bio-sensors, such as pressure-sensitive floors and smart furniture (Nijholt, Stock, & Nishida, 2009). The arrangement for receiving multimedia messages or content through speakers, TV, as well as personal mobile devices can be done. The elder's health data and dietary information via a web device can be accessed by caregivers. Parameters such as convenience, comfort and safety are considered while integrating devices. CASIS senses the status of a person and accordingly, take necessary actions. For eg. when elder person is sleeping, CASIS(Pokrzywinski, Meads, McKenna, Glendenning, & Revicki, 2009) will automatically turn off the TV and keep telephone into voice mail mode. It plays back any incoming message when the elder wake up. [10]

2.5 Industrial Applications

Health TV provides usage information on real time basis, controls the status of connected electrical devices provided via remote basis. An alert is triggered on the TV whenever fall is detected. An alert is displayed in form of message. Recorded video footage of the event is captured and can be sent if programming done accordingly. Centralized database will maintain the appointment information and accordingly patient can decide a good time to visit or consult. Health TV will show the number of people at registration, consultation & pharmacy counters. Patient or user allows viewing, changing and deleting their appointments. These appointments can be synchronized with the user account (e.g. Google calendar).Gentle reminder of the selected appointment date via TV alert or SMS can be sent.

Recently Panasonic has entered in Tele-Health sector providing health and wellness solutions. They have implemented the Wi-Fi connected tablet to assist senior citizens especially those with cognitive impairment, to stay connected and manage daily activities. These devices have features like view photos, videos, gentle reminders, send and receive messages and calendar. Panasonic Tele-health platform uses home television and simplified controller to track queries and health of a patient.

Planet media has developed various multichannel technological solutions in the e-Health sector. They are specialized in development and coordination of the large projects on technological innovation in multichannel services and solutions. [11] The R&D Department is dedicated to the management and development of R&D projects and international level activities at Europe and Spain. The Department is specialized in the implementation of multichannel communication using mobile devices (smartphones, tablets) and Health TVs. The collaboration of e-Health with Health TV will serve as technological solution.

2.6 Tele-Care using Interactive TV

Tele-care medium(Miyazaki, 2009) can be used along with an Interactive TV [12], which will eliminate the technological barrier. Application development in this medium will help to monitor & track health condition. It educates and promotes healthy lifestyle in family and improves quality of life.

Tele-care caters to:

- Those who don't know how to use PC or elder person who don't have knowledge about technology
- People who stays at home for longer duration(more than 12 hours) or do office work from home
- Elder people of age 75 and more (They watch more TV than any other age group)
- Physically challenged people Tele-care Advantages:
- Cost of setup box is less compare to PC/Notebook
- Ease of maintenance
- Robust and easy to use

Systematic approach:

- Vital information including past records can be seen
- Option of sending email to doctor/caregiver will fasten the process
- Doctor can be selected from the list of doctors
- Signal is sent when the information is received by the doctor

Health TV is not widely deployed yet, but if implemented successfully, it will create awareness among different areas in large number of users. Daily activities of tracking, monitoring, sending and receiving message and booking appointment are evaluated in terms of efficiency, effectiveness and productivity. Also privacy and security will play important role while developing and providing solutions. This will definitely create more and more opportunities and challenges in emerging IoT landscape as well as E-health platform.

3. Smart Infusion Pumps

Smart infusion pumps are the latest technological device that has now been adopted by various doctors & medical practitioners for treating their patients more carefully and accurately.

It is, basically a smart device which collects data and then aggregates into the database which contains the records of the administration in central server. They are network devices which connects hospitals and clinics through wireless local area network. An Infusion device has a software which is programmed according to the various parameters of patient such as their weights, dosages given to them and category such as either adults or paediatric.[13] In addition to this, infusion device software uses different libraries for various patients records according to their sizes whether they are adults or kids and later on compare doses of drug to the library which has been selected according to the patient size. The smart infusion pump programmer is required to select the correct library in the first stage of set up so as to confirm the appropriate dose ranges are being used. In the drug library programming, the matching of a drug with appropriate infusion time is set within the infusion rate limits.

This pump automatically integrates with the health records of hospital through bar code medication administration (BCMA)(Poon *et al.*, 2010)(DeYoung, VanDerKooi, & Barletta, 2009) and computerized provider order entry (CPOE)(Aarts & Koppel, 2009) program. For ensuring more safety, infusion pumps can be provided to the clinicians for the medication through BCMA which verifies about the dose of drug that matches and which drug is in the active medication list of the patient. Along with this current drug infusion data is also been updated to the record from the infusion pump. [14]

3.1 Market Analysis

With the increasing number of diseases like diabetes, cancer and chronic pain all over the world, the market is expecting to witness the growth of smart infusion pump in near future. With this demand of systems from nations like US, Germany, Canada, France, Australia, Japan, UK and Singapore, it is going to provide an opportunity for leading players in the market. In India & China which has large population base & being a developing country are focused towards providing better health care facilities.

In 2012 smart infusion pump global market scenario was valued at USD 5.4 billion & expected the growth at 5.3% CAGR from 2013 to 2019. In 2019, it is estimated to reach the value of USD 7.8 billion. The 31.9% revenue of the global infusion pumps was shared by the clinical nutrition market in 2012. As diabetic patients are increasing mainly in affluent countries that would definitely drive the market of smart infusion pumps.

With the increasing incidences of cancer & diabetes, market of infusion pumps in Asia Pacific region is estimated to grow at faster rate in 2013-2019. As number of malnourished patients in this region is quite high which will create a need & arouse the demand of smart infusion pumps for clinical nutrition(Koletzko & Gruszfeld, n.d.). India & China is expected an increase in demand of these pumps in this region.

In recent years, there has been tremendous growth worldwide in smart infusion pump(Trbovich, Pinkney, Cafazzo, & Easty, 2009) with the increase in particular number of patients of diabetes, chronic pain and cancer. The market can be analysed considering three different perspectives that are product type, different applications and major geographies.

According to the product type, market is basically segmented into five categories that are large volume, disposable, syringe, ambulatory and infusion pumps that are implantable. Smart infusion pumps have been classified according to the pumping channel type, either a single channel or multiple channel infusion pump. The market is analyzed considering geographical distributions into four regions that are Asia- Pacific, North America, Europe and rest of the world. Major players of smart infusion pumps in market are Care Fusion Cooperation, Baxter International Inc. , Hospira, Fresenius kabi AG, Terumo Corporation ,B. Barun Melsungen AG, Smiths Medical Corporation, KD Scientific Inc. and Mdtronic Inc.[15, 16].

3.2 Market Scenario of India

In India, the market of infusion pumps in 2012 was estimated Rs.66.5 crore for 22,000 units. The rise in popularity of smart infusion pumps has reduce the medical errors as it is programmed. In some of the smart pumps there is barcode technology for allowing the verification of patient identity thus, prevents the delivery of wrong drugs or delivery to wrong patients.

A major drawback of smart pump is that when it is inappropriately programmed the alerts may hamper the care taking of patient and hold off of these alerts may lead to some errors. The DERS (Dose Error Reduction Systems) and BPoC (Bar code Point of care) are the methods which can prevent drug delivery to wrong patient. Safety compliance can be improved by programming prompts which further increases the usage & emphasize the safety culture within the organization. One more important feature of smart pump is that it

also has a data log which could be used for further identification of any programming errors so as to prevent adverse events.

The other limitation of smart pump is not considered as the best standalone devices. So as to make it more efficient, medication system can be integrated to it. This will further connects them to the better computerized provider order entry, BPoC and electronic medication administration records. Only the administration errors can be solved whereas medical errors during prescribing, dispensing, ordering, transcribing and monitoring of patient response may take place.

The companies like B.Barun, Fresenius Kabi, Plenum Tech and Akas lead the market. They share 55 percent of market in Syringe infusion pumps(ANDERSON, 2010) & 44 percent in volumetric infusion pumps(Lee, Thompson, & Thimbleby, 2012).

3.3 Future Outlook

All the programming and administration errors are not completely prevented by using smart infusion pumps. Therefore, clinicians use their professional judgement and adhere to established standards of operating procedures to ensure the safe medication administration and also for preventing the programming and administration errors (Danello, 2009). This device is not meant to replace the existing clinical practices, policies of institution but vigilant monitoring by building the drug libraries(Escoubas & King, n.d.). As there are various libraries for clinical settings therefore, proper user knowledge and understanding technology of the respective Pumps including drug libraries are important for safe-ty.[17]

4. Smart Monitoring

Owing to an increasing internet usage in the country, the e-commerce industry (Sharma & Mittal, n.d.) has grown exponentially during the past few years. The online travel market comprises of 80 per cent of the total e-commerce while retail market (online) counts at Rs 2,000 crore and is expanding at an annual rate of 35 per cent. The online retail industry is likely to be worth Rs.7000 crore by 2015, with Flipkart being the dominant player, says Prashant who is tapping healthcare for online gains. However, there is no issues in consumer products but online trade of prescription medicines(Leontiadis, Moore, & Christin, n.d.) are major concern. There are many issues that are involved in safety and authenticity as safety and legitimacy are the sides of products, hence it is the reason for law makers to make the proper guidelines.[18]

Most of the countries in Europe, Germany and the United States have started online sale of medicines. China joined recently the bandwagon by opening the online route for its pharmaceutical industry. Around 20 companies got license and are performing well. In India, barring a couple of companies that sell medicines online, most players are afraid of venturing into that zone because of the irregularity in the legal framework aspect. The lack of clarity in the Indian law on the subject dissuades e-healthcare stores from venturing in the direction.

"We are exploring the idea of prescription business, but do not want to be on the wrong side of the law or regulatory framework," he says. The company instead is focusing on its consumer healthcare segment, which is huge in itself, says Sameer Maheshwari, managing director and co-founder, Healthkart.com.

"The overall market for consumer healthcare products in India can be pegged at \$15-20 billion. Of this, personnel care and nutritional health products are primary," says Sameer. Recently, Healthkart.com raised capital from Sequoia Capital, Omidyar Network and Kae Capital, sells home health devices such as diabetes testers, elderly and disabled support devices, thermometers, eye care products, baby, fitness and sports equipment, beauty and sexual health products. The company, which claims a robust 50 per cent month on month growth, is less than a year old.

4.1 Specific Aims for E Health Monitoring

• Develop and refine a Web-based patient-centered decision support system for BP control using an iterative, user-centered design process so that it meets standards of acceptability and feasibility for patient attendants and participants. (Achieved)

• Determine the appropriate and acceptable patient motivators (i.e., engaging content, social media, and incentives) which leads the use of e-Health BP control program (BP device, PHR, Web portal, patient navigator). (Ongoing)

• Develop and start the field-test a patient navigator training program(PAASCHE-ORLOW & WOLF, 2010), a manual of procedures for the patient navigators, and a measure of patient navigator adherence to the training manual. (Achieved)

• Test the functionality, security, and fidelity of the secure data exchange between the HBPM device(Parati & Asmar, 2010), PHR(CHAN, WATTS, & GAN, 2010), Webbased portal, and EMR interface engine(Henricks, 2011) in both test and live (enterprise) environments. (Achieved)

• Determine the degree of adoption by participants in the four intervention components (HBPM, PHR, Web portal, patient navigator). (Ongoing)

• Estimate the effect sizes in the four-component program relative to the threecomponent program with regard to patient activation, self-care activities, medication adherence, reduced clinical inertia(Harris, Kapor, Lank, Willan, & Houston, 2010)(Bruggen, Gorter, Stolk, Klungel, & Rutten, 2009). Developmental Grant and e-Health Blood Pressure Control Program Exploratory improve the health care quality through health information technology with the help of improved blood pressure control and e-BP control program. (Upcoming).

4.2 Current Scenario and Market Forecasting

MARKET SIZE:

India (in 2014):-Number of Hypertension patients = 150 million Number of sugar patient = 110 million Number of hospitals = 4.5 million Number of Old age homes = 355 Payment basis old age homes = 95

Pune, Maharashtra (in 2014):-Number of Hypertension patients = 0.6 million Number of sugar patient = 0.25 million Number of hospitals = 25 Number of old age homes = 35 Prevailing Current Scenario

Integrated Disease Surveillance Prevalence Survey of 2011-12:

S.No	State	Rank	Population Suf-
			fering (In %)
1	Mizoram	1	58.5
2	Uttarakhand	2	48.5
3	Kerela	4	41.8
4	Maharasthra	3	46.2
5	Andhra Pradesh	-	40<
6	Tamil Nadu	-	40<

5. SPSS Analysis

5.1 People Rely on Internet and Technologies for Health Related Solutions

H0 <= 2

Alternate H0 >2

Here, test value is 2, because the value signifies that the people uses handheld devices for internet use

T-Test

One-Sample Statistics

	Ν	Mean	Std. Deviation	Std. Error Mean
I generally use internet in handheld devicesto get health information	108	2.5093	1.30774	.12584

One-Sample Test

		Test Value $= 2$					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confide Of the D	ence Interval	
			× ,		Lower	Upper	
I generally use inter- net in handheld devices to get health infor- mation	4.047	107	.000	.50926	.2598	.7587	

The statistics for the test are given above. The one sample t-test statistics indicated value of t is 4.047 and the p-value is .000 that is below 0.05 (the level of significance). This P -value shows the average value of the sampled observation which is statistically significantly different from test value 2.

T-Test

One-Sample Statistics

	Ν	Mean	Std. Deviation	Std. Error Mean
I may trust the solutions which are based on technol- ogy for patient	109	3.2018	4.24870	.40695

One-Sample Test

		Test Value $= 2$					
	t	df	Sig. (2- tailed)	Mean Differ-	95% Confid val of the I	lence Inter- Difference	
				ence	Lower	Upper	
I may trust the so- lutions which are based on technolo- gy for patient	2.953	108	.004	1.20183	.3952	2.0085	

The statistics for this test is shown above. The one sample t-test statistics shows that value of t is 2.953 and the p-value is .000 that is below 0.05 (the level of significance). This p-value shows the average value of the sampled observation is statistically significantly different from test value 2.

This signifies that people generally don't use handheld device for getting health information.

5.2 Person with Moderate or Higher Source of Income are Willing to Adopt e-Health Devices and Techniques for Health Issues

H0 >= 3

Alternate H0 < 3

Here, test value is 3, because the value signifies that the people having monthly income greater than 35000

T-Test

One-Sample Statistics

	Ν	Mean	Std. Deviation	Std. Error Mean
Monthly Income	103	3.41	1.556	.153

One-Sample Test

		Test Value $= 3$						
	t	df	Sig. (2-	Mean Dif-	95% Confidence	e Interval of the Differ-		
			tailed)	ference	ence			
					Lower	Upper		
Monthly Income	2.66 0	102	.009	.408	.10	.71		

The statistics for this is present above. The one sample t-test statistics indicated the value of t is 2.660 and the p-value is .000 that is below 0.05 (the level of significance). Such a p-value shows the average value of the sampled observation is statistically significantly different from test value 3.

T-Test H0 <=2 Alternate H0 = 2

One-Sample Statistics

	Ν	Mean	Std. Deviation	Std. Error Mean
I will prefer to use automated services in case of an emergency to get immediate alert	108	2.7500	2.21349	.21299

		Test Value $= 2$					
	t	df	Sig.	Mean	95% Confiden	ce Interval of	
			(2-tailed)	Difference	the	2	
					Differ	ence	
					Lower	Upper	
I will prefer to use automated services in case of an emergency to get immediate alert	3.521	107	.001	.75000	.3278	1.1722	

One-Sample Test

Here, test value is 2, because the value signifies that the people are interested in automated services for emergency alert for serious/suddenly occurred health issues

The one sample t-test statistics indicates the value of t is 3.521 and the p-value is .000 and that is below 0.05 (the level of significance). p-value shows the average value of the sampled observation which is statistically significantly different from test value 2. This signifies that person with moderate source of income are generally not interested in adopting e health devices and techniques for their health issues.

5.3 IoT based Automated Solutions for Health Check–up may Save the Time and Number of Visits to the Hospital

	-		
	Mean	Std. Deviation	Ν
Generally lot of time is spent on planning and implementing check ups?	2.98	1.275	108
I think automated solutions/ platform will help to reduce number of visits top doctor	2.61	1.139	109

Descriptive Statistics

Correla	ations	Generally lot of time is spent on planning and im- plementing checkups?	I think automated solu- tions/platform will help to reduce number of visits top doctor
	Pearson Correlation	1	.213*
Generally lot of time is	Sig. (2-tailed)		.027
spent on planning and implementing check-	Sum of Squares and Cross-products	173.963	33.222
ups?	Covariance	1.626	.310
	Ν	108	108
I think automated	Pearson Correlation	.213*	1
solutions/platform will	Sig. (2-tailed)	.027	

help to reduce number of visits top doctor	Sum of Squares and Cross-products	33.222	140.037
	Covariance	.310	1.297
	Ν	108	109
*			

Correlation is significant at the 0.05 level (2-tailed).

There is positive correlation exists between planning check-up's and automated solution on E-Health.For time spent on planning and implementation by an individual, the Pearson coefficient factor is 0.027 and for thought of automated results and monitor reduces visit to doctor for the check-up is 0.213, this signifies that with increase in one variable leads to increase in another variable also. Also since the coefficient value is near to 0. Thus, for time spent on planning and implementation by an individual is not related with the number of visit done by the individuals either with or without automated solutions availability.

5.4 People Having Regular Health Check-up also use Internet for Health Related Information. As the Positive Correlation Exists between both Variable

Descriptive Statistics					
		Mean		Std. Deviation	Ν
I frequently go for regular health checkup		2.34		1.201	108
I generally use internet in handheld devices to get health information		2.51		1.308	108
Correlations					
			I fi	requently go for regular health checkup	I generally use internet in handheld devices to get health information
	Pearson Correlation			1	.242*
I frequently go for regular health check- up	Sig. (2-tailed)				.012
	Sum of Squares and Cross-products			154.324	40.467
	Covariance			1.442	.382
			108	107	
generally use internet in handheld devices to get health infor- mation	Pearson Correlation			.242*	1
	Sig. (2-tailed)			.012	
	Sum of Squares and Cross-products			40.467	182.991
	Cov	Covariance		.382	1.710

Correlation is significant at the 0.05 level (2-tailed).

As the Pearson coefficient factor for frequently visit for regular health check-up by an individual is 0.012 and for use of internet in handheld devices to get health information is 0.242, this signifies that with increase in one variable leads to increase in another variable also. Since the coefficient value is near to 0. Thus, frequently visit by a person for regular health check-up is not related with the use of internet in handheld device to get health information.

6. Conclusion

IOT based e-Health solutions is an upcoming trend which will revolutionize the healthcare industry in near future. In reference with the response from various respondent during our survey conducted it can be said that Internet of Things is emerging as a solution enabler in health sector. Various technologies like Smart Infusion Pumps, Smart Monitoring, & Health TV will provide the edge over the existing methods used in healthcare sector. With reference to the observations taken especially in Pune (India), it can easily be concluded that people still prefer to use the old traditional methods. Some of them with high income prefer technology based solutions and readily up for new innovations. Most of them are not even aware about e-Health based solutions. In today's world where technology has rooted deep into the life of humans, Internet has become medium for survival without which life can't be imagined also. E-Commerce is emerging trend but very few of them uses internet for purchasing health products. Some of them think internet related health information is reliable and want to use E-health monitoring method for their regular health check-up. This IOT based e-Health monitoring method will help in reducing number of visit to doctor & even doctor can monitor his or her patient from anywhere. As this is technology not so feasible now but in upcoming years this technology will definitely add dimensions to the existing trend. Also the solution provided through IoT devices are more accurate and accountable.

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International Journal of Bio-Science and Bio-Technology Vol.7, No.2 (2015)