Impact of Internet of Things Technology on Healthcare Monitoring System for Afghanistan

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Abstract: Health is very important in human's life. Many people described health in many ways. Like, wellness is more than being free from illness. Even there are some sayings for it as well. Like, health is wealth, etc. Similarly, in today's world where the life has gone full of stress, people are facing many physical, physiological and psychological problems, they cannot make enough time to visit doctors again and again for treatment. Sometimes there is a very serious situation to look after the patient very quickly. Therefore, an efficient settlement is required to make a solution for this problem. There is a method called (Healthcare Monitoring System based on Internet of Things Technology) which is very simple, generic and understandable for all. So Internet of Things technology can also be used in healthcare monitoring. It can collect a big amount of data about an illness, which would take many years if it's taken manually. Tues, our initial aim in this research is to make the healthcare monitoring system smart and put the internet of things technology into use for healthcare. By doing that major advantages will come included: regular monitoring of patient, cost reduction, cutting down unnecessary hospital visits, better quality, error reduction, safety improvement, machine to machine connection etc.

Keywords: **Internet of things technology, Sensors and Healthcare**

I. INTRODUCTION

The internet is not just about computers anymore. Now all kinds of objects can connect to the internet, included cars, sporting equipment, refrigerators and even shoes. This is known as the internet of things. Now you may be wondering, why shoes need to connect to the internet? The answer is that; the shoes can collect data via IoT (Internet of Things). Like, how many steps do you take? Or how many calories have you burned.

In 2008 the IoT (Internet of things) was defined as "Those objects which can establish connection and exchanges data is called internet of things", nowadays though they define it as "Those objects which can establish connection through their smart technology and can understand a human is called IoT". The reason for changing this definition is that the concept of Internet of things goas broad as each day passes. Like, the population of the world was 6.3 billion in 2003 and only five million devices were connected to the internet which was 0.08 devices connected by each person. This rate increased to 3.47 devices connected by each person in 2015. In 2020 as population of the world increased to 7.6 billion, the connected devices to the internet are 50 billion which is 6.58 devices connected by each person all around the world. (Cave, 2014).

Figure 1: Devices connected to Internet of Things (IoT)

Furthermore, The Titanic an unsinkable ship hit an iceberg and sank on Apr 1912. Over 1500 people (almost 68% of the passenger) dead in that disaster (David A. Savage, 2011). Imagine, if there was an intelligent device which could estimate both time and distance of ship to the iceberg and could alarm and let the navigators to change their direction, the two lovers Jack and Rose would have survived.

While technology cannot stop the world population from ageing at once, at least it can manage the growth of chronic diseases. So Internet of Things technology can also be used in healthcare monitoring. The impact of this technology is very sensible in healthcare as well. Those who are suffering from heart problems, diabetes, blood pressure and other health issues must track them pules, blood pressure and other activities. A smart device can fulfill this task very easy and in quick manner using sensors.

Throughout the process, the patient remains home and never needs to go out to visit doctors. In addition, the patient never needs to wait hours and pay too much money to get their health pulse or signs. This medical condition is becoming very common all around the world among all kinds of healthcare monitoring system and this is thankfully made possible by IoT (Internet of Things technology).

SENSORS

Sensor is a type of detector which is able to measure physical quantity that is happening. Like pressure, force, light, etc. After the physical quality is detected, the sensors will then convert the measurement into desired output like electrical-readable signals. In other words, sensors are those devices which converts non-electrical quantity into electrical signals. Sensors work like ears, skin, eyes in electronics. They are doing a particular job at a given time. New findings show that human brain sensors are similar to human made computers and robots. Human made sensors are used in different applications, such as touchscreens, nightlights, microphones, medical ultrasound etc. Engineers designed robots with sensors like heart, liver etc. Which brought significant improvement in healthcare system. (Peng Lid and John Regehr, 2012).

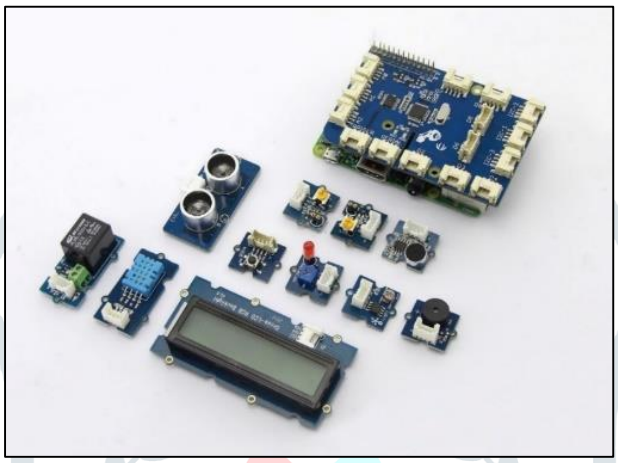

Figure 2: Sensors used in IoT Technologies

PROBLEM STATEMENT

During the recent decade as global population aged the rate of chronic diseases increased as well. Such as heart disease, blood sugar etc. According to a research, approximately 610000 people die of heart attack in USA which is almost 1 in every 4 deaths (Nhanes, 2011). Likewise, 15% of deaths in India were due to heart attack in 1990 where this percentage grow up to 34% in last 26 years (Elsevier, 2017). In addition, 32% deaths are all because of heart attack all around the world. Moreover, one of the surveys in 2010 showed that more than 35% of people die due to diseases in Afghanistan as well (Strong, Mathers and Bonita, 2007). So many people dead due to lack of a good health monitoring system.

Death percentage in Afghanistan is mentioned as below:

1.	Heart attacks:	Women 17.9 %	Men 14%.
2.	Cancer:	Women 8.3%	Men 7.3%.
3.	Blood sugar:	Women 2.7%	Men 3.7%.

So the patients with abnormal vital signs should be assessed in every 2 hours to reduce this percentage. To reach to that goal a good monitoring system is required to collect the data about heart rate, blood pressure, ECG (Electrocardiograms), EEG (Electroencephalograms) using wearable devices. The acquired data will be converted from analog to digital form and then will be sent to the server through some mobile devices such as smartphones or tablets and that is how everybody can access it from anywhere.

We want to implement IoT technology in healthcare system of Afghanistan because many people die due to very small health issues in those villages which are very far away from cities. For example, In Paktia province there are lack of hospitals in those towns which are very away from focus or in Badakhshan province most of deaths were due to lack of hospitals. Likewise, Bamyan province has more poor people, which have no enough money to go to other countries for their health monitoring. They can monitor their health at home with no charges.

Related Works

(Egon L.Van Den Broek, Ana Fred, Hugo Gamboa and Mario Vaz, 2017) A Real-time m-Health Monitoring System: An Integrated Solution Combining the Use of Several Wearable Sensors and Mobile devices: This writers have done health monitoring using Android. They believe that there is an efficient solution for a patient's monitoring is available. They also added that mobile devices like smartphones or tablets are the perfect devices and instruments to monitor the vital parameters of a patient. It's possible to collect data through wearable sensors and analyze it and then monitor it through mobile devices. Like heart rate, blood pressure

and body temperature. Likewise, they expressed that mobile health applications are able to measure vital signs like ECG, EEG, heartrate, blood pressure etc.

(K. Sundara Velrani and G. Geetha, 2016) Android Based Health Care Monitoring System: The purpose of this paper is to monitor the conditions. The patient's temperature, SPO2, Blood pressure, Heart rate, Body position and ECG will be monitored continuously. The writers in this paper will fulfill real time monitoring of health condition of person. Using Bluetooth, the signals reading is sent to the doctor's smart phone and SMS is sent using GSM modem. The signals of (ECG, Heart Beat Sensor etc.) are sent with modern medical sensors which are more intelligent, low power etc.

(Adiboye, Ademola, Azeez, Nureni, Adesina, Ademola Olusola, Agbele, Kehidne, 2011) Wearable Sensors for Remote Healthcare Monitoring: This paper is based on wireless Network. Sensors can collect data from patient and transmit it to intelligent personal digital assistant. A WBAN (Wireless Body Area Network) is a key technology that provides a real time monitoring and transmit data from central control unit to medical server through personal server.

(InG. Habil, Gegina Stoll, Med Habili, 2017) Wearable Devices in Medical Internet of Things: Scientific Research and Commercially Available Devices: In this paper according to some algorithms, data are sent to medical center. The same way some sensors were worn to patient and then after the signals taken, saved and sent to the server by internet. At first the sensors are stacked to the patient, first layer of the device called Arduino (which is in the bottom) is stacked to patient, the second layer communicates through Arduino Wi-Fi. That is how Arduino Wi-Fi allows the client to communicate with the server by using wireless Wi-Fi. And then health sensor shield is stacked on top of the device to collect the data for sending.

(Sumit Majumder, Tapas Mondal and M. Jamal Deen, 2017) Wearable Sensor for Remote Health Monitoring: In this paper the researchers declared that remote health monitoring systems are equipped with a variety of electronic sensors, wireless communication modules and signal processing units. So the sensors were connecting in wireless sensor network and transmit the data to a processing node (smartphone, computer etc.) using suitable communication protocol. Like Bluetooth, ZigBee, ANT etc. after data was uploaded to processing node, the data is transmitted to the healthcare personnel. So remote healthcare facilities are implemented.

Data and Research Methodology

The researcher can develop an effective researcher dissertation by selecting an accurate research philosophy. In this scenario, the researcher applied positivism research philosophy to measure the collected secondary information. Likewise, the researcher applied descriptive research design to assess this research project. By the assistance of descriptive research design, the researcher accommodates accurate information through secondary data collection process. Thus descriptive research design was suitable which characterizes the impact of IoT technology in healthcare. In addition, the research design in this paper was qualitative in descriptive design. The researcher collected reliable information from the survey by applying descriptive research design.

The researcher selected probability method for sampling technique to select people randomly. Likewise, sample size was taken from population size (35000000 people) and 600 questionnaire forms were distributed to the people. On the other hand, the data was analyzed through SPSS software. The questions of questionnaire were also tasted in SPSS software.

Analysis and Findings (Proposed Work)

This is the most important sections of research in every research. Our paper will prove that IoT technology is very important in healthcare and will decrease the rate of deaths if this method is implemented in Afghanistan. In this dissertation, the researcher prepared questionnaire for the survey. the researcher will go for survey to collect required data for analysis and find what is the impact of IoT technology if it is used in Afghanistan as well.

Furthermore, the researcher wanted to prove that internet of things technology is very effective and beneficial for healthcare, and it has a very superior impact on decreasing rate of deaths in cities and specifically in those villages which are far away from focus. That's why this questionnaire was distributed for 600 people to get data from various age categories and both genders. In part one the first question was divided into 5 parts included less than 18, 18-29, 30-45, 46-59 and 60 or above.

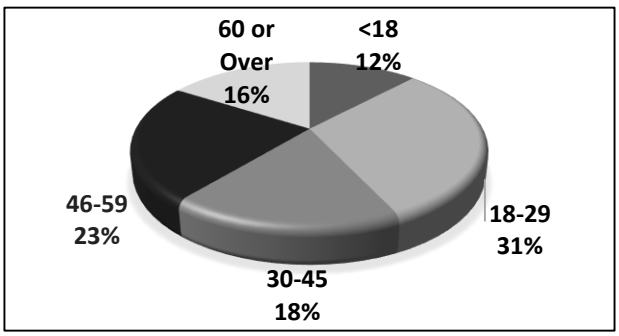

Figure 3: Age Category of Respondents

Gender is very important segment in survey. So the second question asked from respondents was about their gender. The percentage of male was 59% and female was 41% answered to this survey questionnaire.

The first part was not enough to get us to what we are looking for, therefore the researcher asked some main questions about healthcare and IoT technology. As it was important to find whether the respondent spent most of his life in Afghanistan or not. The first question was how many years have the respondents live in Afghanistan. Out of 600 people only 3% taken the first category (0-9), 21% people chosen second category (10-19), 22% people elected third category (20-29), fourth category (30-39) was picked up by 27% of people and the last category (40 or over) was opted by 23% of people. Here the researcher can say clearly that more than 50% of respondents lived for more than 30 years in Afghanistan.

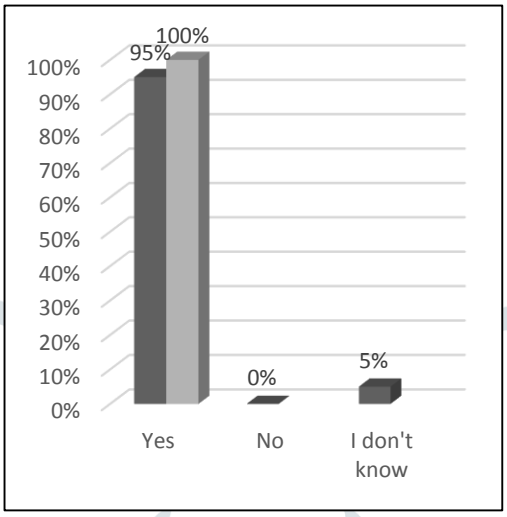

Figure 4: Sources used by patients

The researcher needed to find those people who were not just lived in cities but in far villages as well. Therefore, next question added to the questionnaire was whether they lived in those villages of Afghanistan which was out of focus or not. Yet again the result was acceptable, 52% of respondents answered yes, 48% answered no. Again, the researcher wanted to find if the treatment centers in respondent's area was good or not. The answer was wicked. Only 11% of people answered yes, the rest 89% answered no. In addition, the researcher asked the responders to rate their hospitals, again the result was very poor. Believe it or not, 38% picked Below Average, 29% chosen Very Poor and none ticked Excellent. The researcher wanted to know where are the people going for their treatment if they don't have good treatment centers in their area. 60% picked Pakistan, 35% picked India and 7% selected Iran. Likewise, the researcher felt the need of sources people select while they get sick. 85% selected hospitals, 18% selected pharmacies, 8% opted local doctors and more importantly 0% picked E-healthcare, which is called life-to-death point.

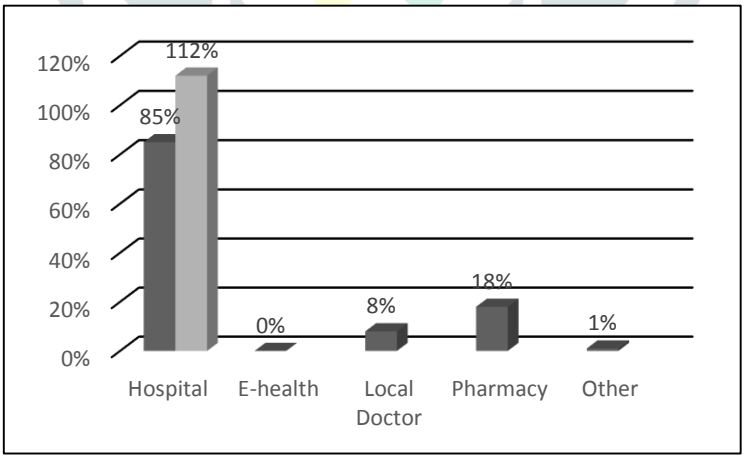

Figure 5: The Rate of People's Trust on Technology for healthcare

Further, another question asked was about health checkup. It was important to find how often people are going for a health checkup. 30% ticked Only When Needed, 14% picked Never Done, 23% answered After One Year, 16% chose After 3-6 Months and none picked 24 hours through IoT technology. Similarly, researcher needed to find whether people suffer from any hereditary diseases or not, 86% answered yes only 14% ticked no.

Next we wanted to find if people lost their family members caused by any diseases, the result yet again was very sad and regrettable. 90% answered yes, 7% picked no and 3 % picked I don't know option. On the other side, the researcher wanted to find that how is the rate of people's trusts on technology, to gain that aim the next question asked was, do you believe technology can

decrease the rate of deaths or not. Fortunately, 0% answered no, 5% answered I don't know and 95% picked yes. There is hope alive, because that mind blowing rate of people's trust anticipate us.

In order to earn if people faced modern equipment for their treatment in Afghanistan we added this section in our questionnaire as well, once again the result was very disgraceful. 10% opted yes, 9% no and 81% I don't know.

Here we come to the main question which can prove if people are aware of IoT technology and have they sent their vital pulse using these devices to doctors/hospitals or not. Amazingly, 96% people's response was negative and only 1% of answered yes, 3% picked I don't know.

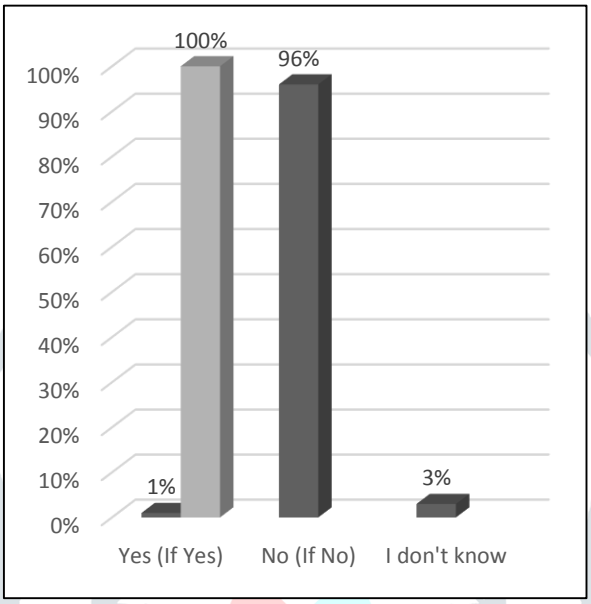

Figure 6: Rate of People Sent Their Pulses Through Internet

Last but not least, do they wish this method to be implemented all over Afghanistan was the last question, the percentage of its suiter will blow your mind. 96% wanted this method to be implemented all over Afghanistan, only 4 percent had no idea about it and 0% picked no.

Conclusion

Our research proved from our survey that 96% of people trust on this technology and have faith if this technology is implemented it will make very big impact in monitoring system. Likewise, usage of this technology in other countries decreased the rate of deaths.

Our survey data showed that everyone is recommending this method for healthcare monitoring system. The researcher also recommends this method to be implemented all around the country to reduce the rate of deaths.

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