

A FRAMEWORK FOR IMPLEMENTATION CHALLENGES IN BIGDATA ENABLED SMART HEALTH MONITORING SYSTEM-A STUDY FOCUSED IN NEPAL CONTEXT

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ABSTRACT

The technology and healthcare industries have been deeply intertwined for quite some time. New opportunities, however, are now arising as a result of fast-paced expansion in the areas of the IoT and BD. In addition, as people across the globe have begun to adopt wearable biosensors, new applications for individualized eHealth and mHealth technologies have emerged. The upsides of these technologies are clear: they are highly available, easily accessible, and simple to personalize; additionally, they make it easy for providers to deliver individualized content cost-effectively, at scale. At the same time, a number of hurdles currently stand in the way of truly reliable, adaptive, safe and efficient personal healthcare devices. Major technological milestones will need to be reached in order to address and overcome those hurdles; and that will require closer collaboration between hardware and software developers and medical personnel such as physicians, nurses, and healthcare workers. The present advancement and development in the field of IoT are giving an extraordinary potential in the course of the novel age of healthcare. The vision of the healthcare is expansively supported, as it propels the greatness of life and health of people, including a few health guidelines. The unending increment of the multifaceted IoT gadgets in health is comprehensively tried by difficulties, for example, fueling the IoT terminal nodes utilized for health monitoring, constant information handling and event management. An important part of our life, internet has enabled many machines and devices we use in everyday life to be monitored and controlled remotely through IoT technology. Thanks to IoT technology, smart health applications have become a rapidly growing sector. In this work, the researcher has tried to provide an overview of how big data and IoT can be incorporated which can solve the problem of smart health monitoring in a robust way. As both BD and IoT have been started using in healthcare long back based on their capabilities and wide usage pattern.

Keywords: IoT, healthcare, health monitoring, Big Data (BD), eHealth, mHealth, personal healthcare devices, monitoring & control.

1 Introduction

Healthcare BD alludes to the tremendous amounts of data that is currently accessible to social insurance suppliers. As a reaction to the digitization of healthcare data and the ascent of significant worth-based consideration, the industry has benefit of BD and examination to settle on key business choices (engpaper.com, 2019). Looked with the difficulties of healthcare information volume, velocity, variety, and veracity, health frameworks need to embrace innovation fit for gathering, putting away, and investigating this data to deliver noteworthy understanding (Evariant, 2019). BD in the healthcare industry is changing the manner in which patients and specialists handle care. The greater data included; the more effective healthcare can be (Collective, 2019).

Big data in healthcare alludes to electronic health data sets so substantial and complex that they are troublesome (or incomprehensible) to deal with customary software as well as equipment; nor would they be able to be effectively made do with conventional or normal data the executive's apparatuses and strategies. Big data in healthcare is overpowering a direct result of its volume as well as a result of the decent variety of data types and the speed at which it must be overseen (K, 2014).

The healthcare business has produced extensive measure of data created from record keeping, consistence and patient related data. In the present advanced world, it is compulsory that these data ought to be digitized. To improve the nature of healthcare by limiting the costs, it's fundamental that expansive volume of data produced ought to be dissected adequately to answer new difficulties (J.Archenaa, 2015).

The progressions that BD will convey to health sciences are a lot more noteworthy than the vast majority assessed. Take the shrewd gadget for instance. The health condition estimations from clients will be put away, broke down and partook in their cloud. The time course health estimation data with practically perpetual time focuses from a huge number of individuals will change the general health analysts from extensive number of attendants and specialists to PC researcher and couple of therapeutic specialists. It will likewise change the utilization of health science results. In pre-BD age, the health science result is typically a report and individuals will get its logical implications from Newspapers, TVs and internets. It could take years or decades to instruct the overall public and fabricate their health mindfulness. Be that as it may, in BD age, the logical recommendations are close to home and will be specifically pushed to their intelligent gadgets. The individual recommendations are valuable and thusly improve the consistence. The Information Push System ensures the message can be conveyed in a flash and precisely. Science report could be as viral as viral recordings (H. Tao, 2015).

Conventional health care can't oblige everybody's needs because of the colossal increment in populace. In spite of having an amazing foundation and front-line advances, restorative administrations are not agreeable or reasonable to everybody. One of the objectives of intelligent health care is to help clients by teaching them about their restorative status and keeping them health mindful. Shrewd health care engages clients to self-deal with some crisis circumstances. It gives an accentuation on improving the quality and experience of the client. Savvy health care helps in using accessible assets to their most extreme potential. It helps in remote monitoring of patients and in lessening the expense of the treatment for the client. It additionally encourages medicinal specialists to broaden their administrations with no topographical obstructions. With an expanding pattern toward intelligent urban areas, a viable keen health-care framework guarantees healthy living for its natives (S. Prabha, 2018).

The incorporation of EHR frameworks with the IoT can make wide customized healthcare arrangements which could empower the accompanying: Interface any wearable/portable gadget to the cloud, draw and break down gathered patient information progressively; Screen fundamental health markers gathered by portable gadgets; Graphs and chart perception dependent on gathered information; Screen patients at home with the assistance of live video and sound gushing; Clever crisis notices sent to a doctor or potentially family (Medium, 2019).

1.1 Background of the Study

In 2005 Roger Mougaldas from O'Reilly Media authored the term BD just because, just a year after they made the term Web 2.0. It alludes to an enormous arrangement of data that is practically difficult to oversee and process utilizing customary business insight instruments.

2005 is additionally the year that Hadoop was made by Yahoo! based over Google's MapReduce. Its objective was to list the whole World Wide Web and these days the open-source Hadoop is utilized by a ton of associations to smash through tremendous measures of data.

As an ever-increasing number of social organizations begin showing up and the Web 2.0 takes off, an ever-increasing number of information is made regularly. Creative new companies gradually begin to dive into this gigantic measure of information and furthermore governments begin taking a shot at BD ventures. This information is put away in the biggest biometric database on the planet. In 2010 Eric Schmidt talks at the Techonomy meeting in Lake Tahoe in California and he expresses that "there were 5 exabytes of data made by the whole world between the beginning of development and 2003. Since same sum is made each two days." In 2011 the McKinsey report on BD: The following boondocks for development, rivalry, and efficiency, expresses that in 2018 the USA alone will confront a deficiency of 140.000 –190.000 information researcher just as 1.5 million

information administrators (Datafloq, 2018).

1.2 Problem Statement

The segmented data sources extend past suppliers and all through the health care industry and data is put away in formats that are not perfect with all applications and technologies. This absence of data institutionalization makes bothers in exchange of that data. The protection concerns with respect to the utilization of BD investigation in health care given the establishment of Health Insurance Portability and Accountability Act (HIPAA) enactment. Over that serious issues are identified with data security. Interestingly, the data in health care suppliers, explicitly clinics, are frequently segmented or siloed.

Most of data in health care is unstructured, for example, from natural language processing. It is regularly fragmented, scattered, and seldom standardized. It's an obvious fact that the EHRs don't share well crosswise over authoritative lines, yet with unstructured data, even inside a similar association, unstructured data is hard to total and examine. This absence of data institutionalization additionally causes issues in exchange of that data. It entangles data obtaining and purging. data age is economical contrasted and the capacity and move of the equivalent. When data is produced, the expenses related with verifying and putting away them stay high. Expenses are likewise brought about with moving information starting with one spot then onto the next just as breaking down it. It is significant that health care laborers are likewise stayed up with the latest with the utilization of continually evolving innovation, methods, and an always moving standard of consideration. Because of the consistent advancement of innovation, there exist populaces of people lacking explicit abilities; thusly this is additionally a huge proceeding with obstruction to the usage of BD (Kruse, 2016).

1.3 Purpose of the Study

The main purpose of this research is to find the implementation level challenges in adopting the big data in health sectors and also the possible factors influencing the level of readiness of adopting the big data in health sector of Nepal. The next purpose is to analyze current usage patterns of smart health monitoring system in Nepal. Another purpose of this research is to propose a robust framework which can solve the smart health monitoring system with the help of big data analysis. Therefore, the purpose of this research is to provide the solution of the research questions so that the research objectives will be met properly and the big data can be successfully implemented in the hospital sectors of Nepal.

1.4 Objectives of the Study

The major objectives of this research are as follows:

- 1 To analyze current usage patterns of smart health monitoring system in Nepal.
- 2 To identify implementation level challenges for smart health monitoring system in Nepal context.
- 3 To propose a framework for effective implementation of big data enabled smart health monitoring system.

1.5 Research Questions

1. How effectively big data analysis can be used in terms of health care monitoring and management?
2. How data is stored in formats that are compatible with all applications and technologies?
3. What are the challenges faced during the big data analysis of smart health monitoring system?
4. What are the major components required to build a framework for effective implementation of big data enabled smart health monitoring system?

1.6 Scope and Limitation of the Study

The researcher only proposing a framework for SHM system but unless and until it is practically implemented its actual robustness can't be figured out. Testing of the proposed framework for data security, privacy and notification functions, as well as implementing a test trial with real-world patients and health professionals are needed.

1.7 Significance of the Research

The finding of the research study will definitely provide benefit to the society of Nepal. This research will be very significant for the hospital sector of Nepal as there are limited literature and information was done on these particular issues. This research will help to find implementation level challenges in adopting the big data in health sectors of Nepal. Similarly, it will analyze current usage patterns of smart health monitoring system in Nepal. The main significance of this research will be to propose a robust framework that will be implemented on the basis of different data collected from the primary research i.e. from survey and questionnaire and the secondary data i.e. from different journal papers collected in the literature review section which can solve the smart health monitoring system with the help of big data analysis in the hospital sectors of Nepal. The proposed framework will be significant for the other researchers and academicians to study and can improve it further.

2 Literature Review

2.1 Big Data in Healthcare

Big data examination in healthcare is advancing into a promising field for giving understanding from extremely vast data sets and improving results while diminishing expenses. Its potential is extraordinary; anyway, there remain difficulties to survive.

Big data examination can possibly change the manner in which healthcare suppliers utilize refined advances to pick up understanding from their clinical and other data stores and settle on educated choices. Later on, we'll see the fast, far reaching usage and utilization of big data investigation over the healthcare association and the healthcare business. With that in mind, the few difficulties must be tended to. As big data examination turns out to be more standard, issues, for example, ensuring protection, shielding security, setting up models and administration, and ceaselessly improving the devices and innovations will earn consideration. Big data investigation and applications in healthcare are at an early phase of improvement, yet quick advances in stages and devices can quicken their developing process (K. Priyanka, 2014).

Big data technologies advances are progressively utilized for biomedical and health care informatics inquire about. A lot of natural and clinical information have been produced and gathered at an extraordinary speed and scale. For instance, the new age of sequencing advancements empowers the handling of billions of DNA grouping data every day, and the use of electronic health records (EHRs) is archiving a lot of patient data. The expense of procuring and examining biomedical data is required to diminish drastically with the assistance of innovation redesigns, for example, the rise of new sequencing machines, the advancement of novel equipment and programming for parallel processing, and the broad development of EHRs. Big data application in bioinformatics is generally full grown, with refined stages and instruments as of now being used to help break down health data, for example, quality sequencing mapping apparatuses. Nonetheless, in other biomedical research fields, for example, clinical informatics, medicinal imaging informatics, and general health informatics, there is huge, undiscovered potential for big data applications (Luo, 2016).

2.2 Importance of Big Data in Healthcare

The healthcare systems are quickly embracing a lot of data, driven by record keeping, consistence and administrative prerequisites, and patient care. The advances in healthcare system will quickly augment the size of the health records that are open electronically. Simultaneously, quick advancement has been made in clinical examination. For instance, new procedures for breaking down enormous size of data also, gathering new business bits of knowledge from that examination

is a piece of what is known as big data. Big data additionally hold the guarantee of supporting a wide scope of therapeutic and healthcare capacities, including among others disease observation, clinical choice backing and populace wellbeing the board. Henceforth, powerful big data-based information the executive's system is required for observing of patients and distinguish the clinical choices to the doctor. This paper proposes a major big data-based learning the executive's system to build up the clinical choices. The proposed learning system is created dependent on assortment of databases, for example, Electronic Health Record (EHR), Medical Imaging Data, Unstructured Clinical Notes and Genetic Data. The proposed procedure no concurrently speaks with various data sources and delivers numerous elective choices to the doctor (Manogaran, 2017).

2.3 Challenges in SHM

BD investigation can possibly change the manner in which healthcare suppliers use cutting edge developments to carry understanding by its medical & remaining data archives & choose taught decisions. In the future, they'll see the brisk, far-reaching use & application of BD assessment over the healthcare affiliation & the healthcare business. Keeping attention, a couple of troubles featured above must be tended to. As BD examination ends up being increasingly ideal, problems, for example, guaranteeing insurance, protecting safety, developing benchmarks & management, & persistently refining the apparatuses & advances will accumulate thought. BD assessment & operations in healthcare are at a beginning period of progress, anyway quick progress in stages & instruments can fasten their creating system (Raghupathi, 2014).

2.4 BD & IoT in HealthCare

(Farahani, 2018) talked about the relevance of IoT in healthcare & medicine by showing a comprehensive model of IoT eHealth environment. Healthcare is finishing gradually hard to supervise because of deficient & low convincing healthcare managements to fulfill the growing needs of increasing budding demos through perpetual illnesses. They advise this needs progress through the facility motivated action to persistent motivated healthcare where every specialist, like, hospital, patient, & managements are perfectly linked with one another. A distinctive IoT eHealth framework comprises of four layers: (1) detecting layer, which coordinates with every extraordinary sort of equipment interface with the physical world & gathers data, (2) networking layer, it suggest systems networking backing & information moves in the wired & wireless networks, (3) service layer, it makes & deals with a wide range of administrations planning to fulfill client necessities. (4) interface layer, it suggests connection techniques to clients & different appliance. Lastly report the difficulties of IoT eHealth, for example, information administration, scalability, guidelines, interoperability, device-network-human interfaces, safety, & protection (Farahani, 2018).

3 RESEARCH DESIGN AND METHODOLOGY

3.1 Research Design

It is depicted as an arrangement of systems & methodology chosen by a researcher to combine different sections of study in a sensibly intelligible way with the target that the examination matter is gainfully managed. It gives bits of finding around "how" to direct research utilizing a specific method. Each academic has a once-over of research addresses which ought to be assessed – which ought to be possible with research design.

The design of a research subject is utilized to clarify the sort of research (experimental, survey, review, correlational, semi-experimental) & moreover its sub-type (experimental design, research problem, descriptive case-study). There are 3 rule regions of research structure: Information gathering, estimation, & examination (QuestionPro, 2019).

3.2 Research Methodology

A research method is a specific procedure for guiding research. Sociologists design on a mixture of both qualitative & quantitative research strategies, with analysis, survey, fellow opinion, &

secondary data. Quantitative methods mean to characterize highlights, analysis, & build statistical models to examine hypothesis & clarify opinion. qualitative techniques go for a total, itemized portrayal of observation, including the setting of occasions & conditions (Study.com, 2019).

Here the researcher has tried to show the methods that are selected for the research purpose.

3.3 Study area

The study area is some hospitals of Kathmandu valley such as Kathmandu Medical College, Civil Service Hospital, Kist Teaching Hospital as well as general users to take their opinion & some doctors for understanding the current scenario & their expectation from this kind of framework proposal.

3.4 Data Collection Method or Tool

Questionnaire: The data collection method is questionnaire both online & offline.

3.5 Research Approach

The area of healthcare obtained its impact by the effect of BD since the information sources associated with the healthcare associations are notable for their volume, heterogeneous unpredictability & high dynamism. In spite of the fact that the job of BD scientific procedures, stages, instruments are acknowledged among different areas, their effect on healthcare association for executing & conveying novel use-cases for potential healthcare applications shows promising exploration headings. With regards to BD, the achievement of healthcare applications exclusively relies upon the basic engineering & use of fitting instruments as confirm in spearheading exploration endeavors. Novel research works have been done for determining operation explicit healthcare systems which suggest differentiated information explanatory abilities for taking care of wellsprings of information extending from electronic wellbeing records to medicinal pictures. System based arrangements consistently take into account the far-reaching prerequisite of different partners engaged with the healthcare space. With the effect of BD, healthcare space was patched up & offer concentrated answers for taking care of broadened BD foundations which have sequence through patient health records to medicinal pictures. This examination checked on different research endeavors in setting up healthcare structures & abridges their huge results.

4 DATA ANALYSIS AND INTERPRETATION

4.1 Descriptive Analysis

Descriptive analysis is a significant initial step for leading statistical analyses. It gives you a thought of the circulation of your data, encourages you to recognize anomalies & grammatical errors, & empower you distinguish relationship among variables, in this manner setting you up for directing further statistical analyses.

In any case, with the accessibility of such a large number of sorts of graphical & outline draws near, agents get confounded about which way to deal with use for investigation of their data. They either wind up leading such a large number of sorts of analyses, along these lines burning through their time or totally avoid this essential advance of statistical analysis, hence expanding their odds of settling on incorrect choices.

There are some individual variables in the data collected from the questionnaire which describe quality or characteristics of variables. These variables are like gender, age, familiar with BD, positive impacts, negative impacts, expensiveness of BD, etc. Here descriptive analysis for each individual variable is carried out using the pie chart.

4.1.1 Frequency distribution of respondent on the basis of gender

4.1.2 Frequency distribution of familiarity with the BD

Table 1: Frequency distribution of respondent on the basis of familiarity with the BD

Familiar_With_Bigdata					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not familiar	14	13.7	13.7	13.7
	Fully familiar	36	35.3	35.3	49.0
	Familiar	52	51.0	51.0	100.0
	Total	102	100.0	100.0	

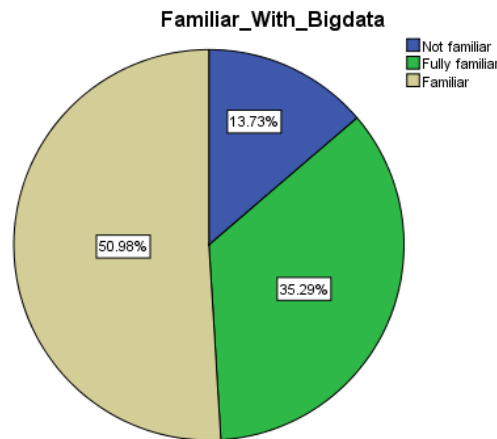


Figure 1: Pie chart of distribution of familiarity with the BD

It is seen from the above table, out of 102 respondent 52 is familiar with the BD, 36 is fully familiar & 14 are not familiar. Also, the above figure represents the pie chart of familiarity with BD. It is seen that proportion respondent who is familiar is 50.98%, fully familiar is 35.29% & the not familiar is 13.73%. So, it is seen from the above diagram is that the respondent is more familiar with BD. The above figure is the pie chart of familiarity with BD. It is seen that 50.98% participants are familiar & 35.29% are fully familiar whereas only 13.73% are not familiar.

4.1.3 Frequency distribution of types of positive impacts of BD

Table 2: Frequency distribution of respondent on the basis of types of positive impacts of the BD

Types_of_Positive_Impacts_of_Bigdata					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Greater innovation	10	9.8	9.8	9.8
	Reduce costs	13	12.7	12.7	22.5
	Increased productivity	18	17.6	17.6	40.2
	Improved customer service	21	20.6	20.6	60.8
	Better decision-making	40	39.2	39.2	100.0
	Total	102	100.0	100.0	

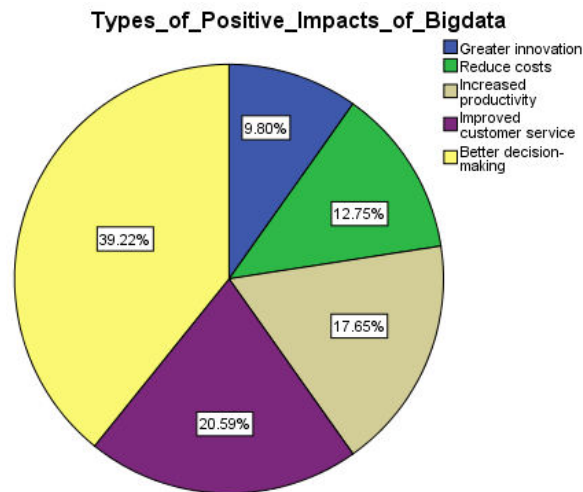


Figure 2: Pie chart of distribution of types of positive impacts of BD

It is seen from the above table, out of 102 respondents 40 respondents choose better decision making, 21 respondents choose improved customer service, 18 respondents choose increased productivity, 13 respondents choose to reduce costs & 10 respondents choose greater innovation among the positive impacts of BD.

Also, the above figure represents the pie chart of the positive impacts of BD on health care. It is seen that 39.22% participants choose(select) better decision making, 20.59% choose improved customer service, 17.65% choose increased productivity, 12.75% choose reduce cost & 9.80% choose greater innovation.

5 CONCLUSION AND RECOMMENDATIONS

5.1 Findings

5.1.1 Research Objective 1

To analyze current usage patterns of SHM system in Nepal.

5.1.1.1 Findings

The researcher has studied the use of BD implementation on the health sector of Nepal, but there is no such framework found i. e. SHM system is not yet implemented in Nepal. However, there was great scope found on the BD implementation of the health sectors of Nepal. The researcher had done research on how BD can be used in the health sectors in the world, this is done by reviewing different journal paper about the SHM system. For this the researcher had proposed a framework of SHM system for the health sectors of Nepal, which is very useful for the patients & doctors.

5.1.2 Research Objective 2

To explore & identify implementation level challenges for SHM system in Nepal context.

5.1.2.1 Findings

BD analytics in healthcare is progressing into an encouraging area for providing information from exceptionally substantial informational collections & improving results while decreasing expenses. BD analytics give advancements to store a lot of complex healthcare data. It is believed that there is a colossal chance to improve lives by applying BD in the healthcare industry. With the quick advancement of the IoT & cloud computing innovations, smart health is relied upon to essentially upgrade the nature of healthcare. The top possibilities uncovered were a quality improvement, populace the board & health, early discovery of illness, information quality, structure, & availability,

improved basic leadership, & cost decrease. Besides the various advantages of BD in health sectors there are various challenges associated with the SHM system in Nepal. The highest difficulties were problems of information construction, safety, information institutionalization, stockpiling & moves, & administrative abilities, for example, information administration. These challenges were found after the study of data collected using the survey & questionnaire from the different health sectors of Nepal.

5.1.3 Research Objective 3

To propose a framework for effective & efficient implementation of BD enabled SHM system.

5.1.3.1 Findings

The proposed system if made possible in the context of Nepal can help not only the doctors but will highly going to help the family of patients. The framework has been intended for health monitoring. One such application is in healthcare to screen the patient's health status IoT makes medicinal hardware increasingly productive by permitting ongoing observing of patient health. The data will be sent via wireless medium to the internet through the PDA & health gateway & getting stored in the medical server. The data stored in medical server is used to analyze for understanding patterns & to take healthcare advice & can be transmitted to emergency services or can be used for clinical decision making by knowledge mining from the medical server or can be used by doctors to make suggestions to patients.

5.1.4 Research Question 1

How effectively BD analysis can be used in terms of health care monitoring & management?

5.1.4.1 Findings

BD examination in healthcare is progressing into an encouraging area for providing understanding through extremely vast information sets & developing outcomes. BD technologies advances are progressively utilized for health care informatics inquire about. Many of normal & medical data have been formed & collected at an extraordinary speed & scale. Use of BD investigation in the investigation in healthcare has huge impact on refining the nature of consideration, diminishing misuse & fault, & diminishing the expense of consideration. The developments in healthcare structure will quickly augment the scope of the health accounts that are open through online. Simultaneously, quick advancement has been built in medical examination. BD additionally grasp the guarantee of encouraging a broad scope of therapeutic & healthcare capacities, with among the various disease observation, medical choice backing & populace wellbeing the board. Henceforth, powerful BD -based information the executive's system is required for observing patients & distinguish the clinical choices to the doctor.

5.1.5 Research Question 2

How data is stored in formats that are compatible with all applications & technologies?

5.1.5.1 Findings

The available BD found in the hospital sectors are in the different formats like structured, unstructured & semi-structured. These formats are the big challenges for the BD storage. The perfect BD stockpiling framework would permit stockpiling of a basically boundless measure of information, adapt both to high paces of irregular compose & read get to, adaptably & effectively manage a scope of various information models, bolster both organized & unstructured information. So, the data must be stored, accessed & processed in the form of fixed-format i.e. in a structured way. BD stockpiling advances are alluded to as capacity advances that somehow or another explicitly address the volume, speed, or assortment challenge & don't fall in the classification of social database frameworks. This does not imply that social database frameworks

don't address these difficulties, yet elective stockpiling innovations, for example, columnar stores & cunning blends of various stockpiling frameworks, for example utilizing the Hadoop Distributed File System (HDFS), are regularly increasingly productive. Hadoop-based arrangements offered by sellers, for example, Cloudera, Hortonworks, & MapR just as different NoSQL database merchants, specifically those that utilization in-memory & columnar stockpiling advances.

5.1.6 Research Question 3

What are the challenges faced during the BD analysis of SHM system?

5.1.6.1 Findings

There is quick, far-reaching implementation & application of BD examination over the healthcare connection & the healthcare business. Despite being various benefits of BD in healthcare there are several challenges associated with the BD in healthcare & that must be addressed. The top difficulties were issues of information structure, security, information institutionalization, stockpiling & moves, & administrative aptitudes, for example, information administration.

5.1.7 Research Question 4

What are the major components required to build a framework for effective implementation of BD enabled SHM system?

5.1.7.1 Findings

The major components required to build a framework for effective implementation of BD enabled SHM system are-

Smart Sensors- The uses of sensors in the computerized health space were recently restricted by their enormous size & front-end gadgets. Presently with little circuits, increasingly refined signal handling system, & less expensive assembling costs, sensors can be sent to evaluate, screen, analyze, & gamify our health.

Gateway- It gets information through various sub-systems, performs protocol transformation, & gives other higher-level administrations, for example, data aggregation, filtering & dimensionality contraction. Ordinarily, this has no immediate association with an embedded gadget or sensor. A smartphone or other individual information gadget is expected to empower to the gathering, preparing & transmission of information to doctors & medical staffs through the web.

Internet- It is an all-around related establish architecture which utilizations TCP/IP to transmit data from various sorts of media. The internet is a structure of the worldwide business – associating private, open, business, scholastic & government systems – connected by guided, remote & fiber-optic advances.

Data server- It is a product program/stage used to give database administrations like putting away, preparing & verifying the information. These database administrations are devoured by other programming projects or segments.

BD - BD is a word that describes the huge capacity of data – both planned & unstructured – that submerges a corporate on an everyday assumption. Be that as it may, it's not the measure of data that is important. It's what relations do with the data that problems. BD can be dissected for experiences that lead to improved selections & crucial corporate moves.

5.2 Recommendations

The proposed framework based on the research objectives, research questions, data collection & data analysis for SHM system will have parts like a smart gateway, a gathering of sensor nodes & remote correspondence interfaces that can ceaselessly obtain, process & transmit human essential signs to a remote medicinal server. Such a framework makes remote patient wellbeing status observing by specialists & medical caretakers a practical recommendation. Also, the huge volume of information gathered makes it feasible for scientists to grow new healthcare items & give successful wellbeing training to individuals through the web.

5.2.1 Proposed Framework

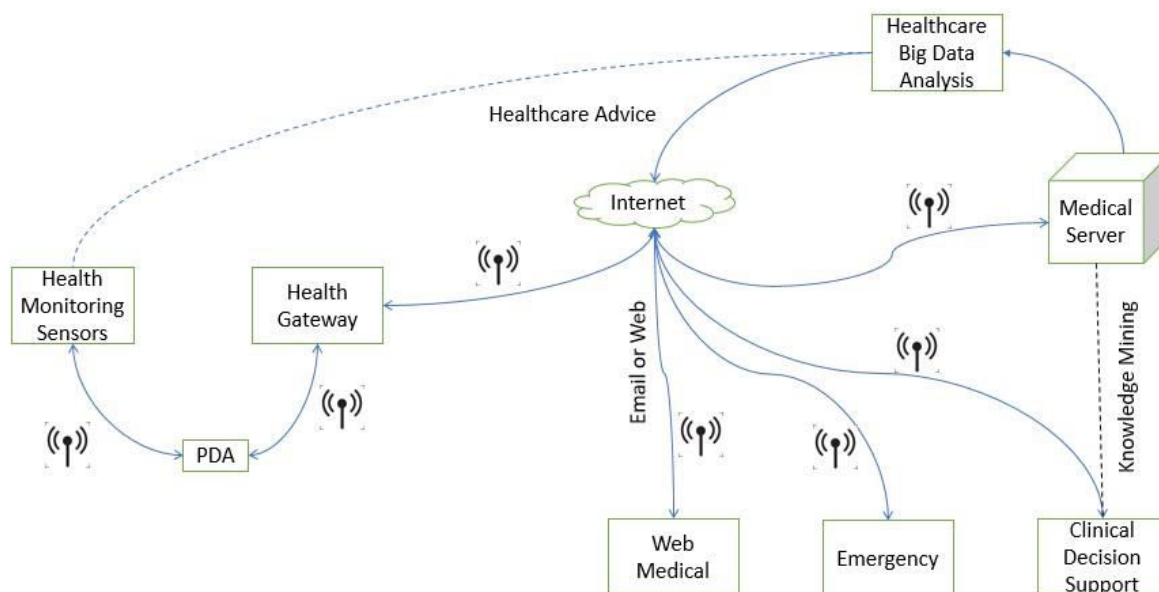


Figure 6: Proposed Framework

The SHM system covers short-run telemetry communication station as from in-body to on-body. The on-body gadget can likewise gather & transmit high information rate & constant medicinal information to specialists & attendants through a gateway. The health monitoring sensors can be of two kinds a natural good & miniaturized size embed gadget that is situated inside the human body, either in the tissue/organ region (profound region) or under the skin (close surface). An on-body (or wearable) gadget that can be situated on either surface or up to 20 mm away from skin.

Health Monitoring Sensors

The uses of sensors in the computerized health space were recently restricted by their enormous size & front-end gadgets. Presently with little circuits, increasingly refined signal handling system, & less expensive assembling costs, sensors can be sent to evaluate, screen, analyze, & gamify our health. The sensor upheaval is a piece of the purported IoT, which has been characterized as the network of gadgets or different things installed with the software, sensors, & network that empowers them to trade significant information precisely & rapidly to gather significant data & patterns. IoT is most encouraging in social healthcare, where it is as of now being connected to improve care quality, access, & expenses. The sensor transformation impacts the outpatient care too. Sensors guarantee indistinguishable operational advantages for centers from medical clinics appreciate. As the innovation for gathering, transmitting, & examining information keeps on advancing, we will unquestionably observe progressively inventive sensor-driven applications in healthcare crossing from hospital to clinic to the patient's home & office.

Personal Digital Assistant (PDA)

A PDA, otherwise called a handheld PC, is an assortment of the mobile device which capacities as an individual data administrator. PDAs have been for the most part dislodged by the boundless reception of exceptionally skilled smartphones, specifically those dependent on iOS & Android. Almost all cutting-edge PDAs can interface with the Internet. A PDA has an electronic visual showcase, giving it a chance to incorporate an internet browser. Most models likewise have sound abilities, permitting utilization as a portable media player, & furthermore empowering the greater part of them to be utilized as phones. Most PDAs can get to the Internet, intranets or extranets by means of Wi-Fi or Wireless Wide Area Networks. Now & again, rather than buttons, PDAs utilize touchscreen innovation. The innovation business has as of late reused the term individual

computerized help. The term is all the more generally utilized for software that distinguishes a client's voice to answer to the inquiries.

Health Gateway

The gateway, which supports diverse communication protocols, goes about as the contacting point between a sensor network & the nearby switch/Internet. It gets information through various sub-systems, performs protocol transformation, & gives other higher-level administrations, for example, data aggregation, filtering & dimensionality contraction. Ordinarily, this has no immediate association with an embedded gadget or sensor. A smartphone or other individual information gadget is expected to empower to the gathering, preparing & transmission of information to doctors & medical staffs through the web. The gateway is responsible for understanding whether the data it receives is for the emergency condition or for non-emergency condition.

The data will be sent via a wireless medium to the internet through the PDA & health gateway & getting stored in the medical server. The data stored in medical server is used to analyze for understanding patterns & to take healthcare advice & can be transmitted to emergency services or can be used for clinical decision making by knowledge mining from the medical server or can be used by doctors to make suggestions to patients.

Normally gateway has no immediate connection to any embedded gadget or sensors. Advanced mobile phone or other personal information gadget is expected to empower for the collection processing & transmission of information to specialists & medical attendants through the internet.

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