



IJIRCCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 12, Issue 9, September 2024

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.625



9940 572 462



6381 907 438



ijircce@gmail.com



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International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCCE)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

Harnessing Analytics to Revolutionise Healthcare in the United States: Uncovering Impacts and Benefits

Viswaprakash Yammanur

Architect, Tata Consultancy Services, USA

ABSTRACT: Harnessing analytics is the prevalent step in the healthcare industry of the US for alleviation of misdiagnosis or wrong medication. Analytics allow medical practitioners to evaluate a patient's medical history to get a better health outcome. Analytics integration assists healthcare practitioners to develop personalised and accurate results that reflect a strong relation with human aspects which could be effectively evaluated through “interpretivism philosophy”. Secondary data collection process was integrated for conducting the research in which thematic analysis supported to reach a sound conclusion. The integration of business analytics has changed the scenario of treatment and other operations in the healthcare sector. It helps the medical professionals in obtaining necessary information about patients within a moment during the treatment process. In another direction, the insurance company also evaluate the requirements of the patients and they can foster personalized healthcare plans for the consumers according to their requirements also. The data privacy concerns are quite significant for the healthcare organisations in this scenario as it is related to ethical considerations about the personal data of patients. Accumulation of high quality and complete data of patients can enhance the outcomes of business analytics in the US healthcare industry.

KEYWORDS: Healthcare sector, Data analytics, Big data, Blockchain, IoT

I. INTRODUCTION

1.1 Background

Patient’s medical history brings valuable insight within the healthcare industry in order to provide quality care to each patient. However, effective management of such data appears to be extremely challenging for healthcare practitioners for identification of trends and patterns for problem solving.

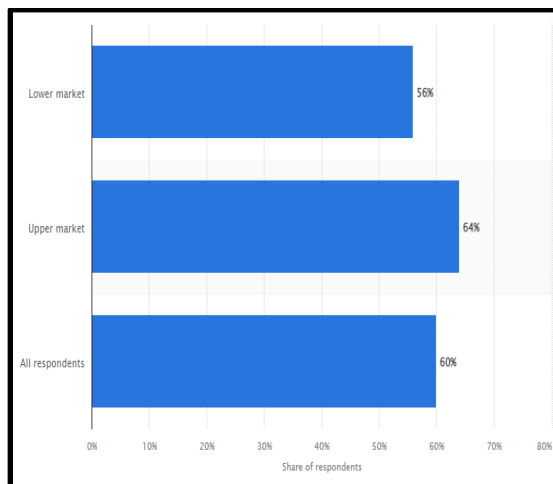


Figure 1: survey on C-suite executives regarding advanced analytics integration in their healthcare organisation
(Source: [1])



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A survey on the United State revealed that 60% of C-Suite executives deployed advanced analytics in their healthcare organisation [1]. Harnessing advanced analytics like predictive analytics, machine learning, and healthcare practitioners could anticipate patient requirements, optimise resource allocation and personalised treatment plans [2]. Therefore, harnessing analytics eases the process of examining hidden data patterns, complex datasets, and correlations to provide quality care to patients.

1.2 Rationale

Diagnosis errors are considered to be a major cause of death that raises concern worldwide across clinical settings. The US National Academy of Medicine demonstrated that most people will experience at least one diagnostic error in their lifetime. It is estimated that almost 795,000 Americans die or are permanently disabled due to misdiagnosis [3]. Following the context, lack of information on patients' medical history could lead healthcare practitioners to make wrong decision that bring harmful consequences on patients.

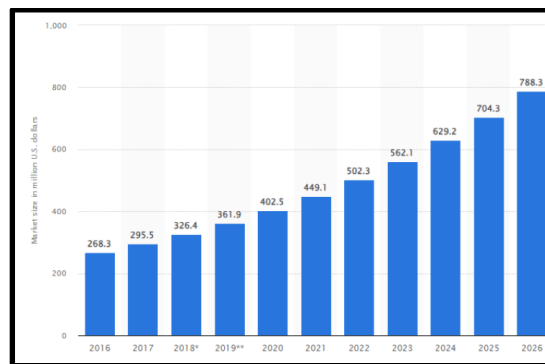


Figure 2: global medication error reporting market revenue
(Source: [4])

Medication error is another significant aspect of medical system of US that leads to death of patients. Figure 2 highlighted that the “global medication error reporting market” continuously increased over the period of 2016 to 2026. For instance, almost 44,000 to 98,000 US people die annually due to medication error, which is the eighth leading cause of death in US [4]. In this regard, analytics supports healthcare practitioners to design the most effective medication that decreases the mortality rate of patients. Considering this, harnessing advanced analytics is becoming prevalent within the medical sector of US to improve diagnosing, medication that will enhance care quality. Therefore, the study will explore impacts of harnessing analytics within healthcare sectors of US by considering its impacts and benefits.

1.3 Aim, research objective and research question

Aim: The aim of this paper is to explore the way harnessing analytics revolutionise healthcare in the United State by considering its impacts and benefits.

Research Objectives

- To evaluates the impacts of harnessing analytics within healthcare of United states
- To analyse the benefits of harnessing analytics within healthcare’s of United States
- To investigate contemporary challenges associated with harnessing analytics within healthcare of United States
- To assess strategies for successfully harnessing analytics within healthcare of United States

Research questions

RQ1: How does harnessing analytics impact healthcare practice in the United States?

RQ2: What are the benefits of harnessing analytics within healthcare of United States?

RQ3: What contemporary challenges are associated with harnessing analytics within healthcare of United States?

RQ4: What strategies could be implemented for successfully harnessing analytics within healthcare of United States?



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1.4 Scope of the paper

The scope of this paper is to explore application of analytics within healthcare that encompass dimensions like predictive modelling, patient's safety, personalised medicine, operational efficiency. Hence, the paper would illustrate the reason behind the prevalence of harnessing data analytics that revolutionised healthcare in the US.

II. LITERATURE REVIEW

2.1 Impact of harnessing analytics within healthcare practice

Utilisation of analytics is becoming a prevalent step within the healthcare industry in order to enhance patient outcome, resource optimization while attending patients. For instance, **predictive analytics** supports identification of risk factors for a given patient and that patient could make changes in their lifestyle which in turn improve health outcomes [5]. In this regard, harnessing analytics bring dramatic changes in terms of **health outcome** by eliminating the threat of negligence by leveraging predictive analytics. On the other hand, ML-enable predictive analytics supports for pattern, trend identification which might human analysts overlook that streamline process for **early disease detection** [6]. Therefore, harnessing analytics positively impacts health outcomes and early disease detection in the healthcare sector.

2.2 Benefits of harnessing analytics within healthcare system

Harnessing analytics is extremely important for improving patient safety, decision making by navigating through a large amount of dataset. For example, **"Big data analytics"** assists healthcare practitioners in enhancing decision making by undertaking evidenced based practice from the stored dataset [7]. Medical practitioners could leverage these data sets from cloud storage during decision making to generate better outcomes. In contrast, data analytics streamline the process of healthcare providers to **uncover interesting patterns** which are previously unknown. For instance, remote monitoring devices assist in evaluation of patients' health and specific symptoms [8]. Therefore, analytics integration benefited the healthcare industry by facilitating decision making process, patient safety and discovering interesting patterns from vast datasets.

2.3 Contemporary challenges associated with harnessing analytics within healthcare

Harnessing analytics fully depends upon sensitive information of patients that makes it vulnerable to security breach. In this regard, Privacy concern is majorly associated with big data analytics that restrict perceived usefulness of "Electronic Health Record" (EHR) [9]. EHR holds a vast amount of datasets that creates security challenges and restrict medical practitioners to use data analytics effectively. On the other hand, lack of managerial competency restricts future transformation of healthcare sectors in terms of new technology integration [10]. Therefore, lack of practitioner's competency and privacy concern are major challenges for harnessing analytics within healthcare.

2.4 Recommended strategies for successful harnessing analytics within healthcare

Training for medical practitioners on advanced technology like big data analytics, predictive analytics are extremely necessary for successfully harnessing analytics within healthcare. Referring to this, "AI-based training" within medical education is regarded as a complement to enrich the current curriculum [11]. On the other hand, healthcare organisations could utilise Blockchain for protection of patients' data which address privacy concerns. For example, Blockchain technology used "smart contract" for improvising security for sensitive data across dataset within healthcare [12]. Therefore, training for medical practitioners and robust security integration are recommended ways for successfully harnessing analytics within healthcare.



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2.5 Theoretical perspective

Technology Acceptance Model (TAM)

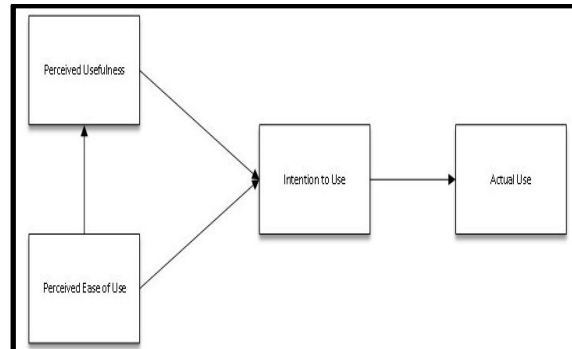


Figure 3: Technology Acceptance Model

(Source: influenced by [13])

TAM is regarded as information theory that elucidates the way users are encouraged to utilise or accept a technology. TAM encompasses concepts of “perceived usefulness” and “perceived ease of use” that change the intention of the user to accept a technology [13]. In this regard, the application of TAM is associated with identifying factors of acceptance. For instance, medical practitioners could effectively diagnose disease, planning for medication by leveraging technology like big data analytics as per TAM. Therefore, practitioners now need to put less effort to achieve greater results that act as perceived usefulness for acceptance of analytics within healthcare settings.

III. METHODOLOGY

The Methodology section eases the procedure for researchers to design methods that are dependable, accurate, for addressing research questions. In this regard, research philosophy, approach, strategy, data collection and analysis process were followed to design methodology for this study. Research philosophy refers to belief about the way data needs to be collected regarding a phenomenon. “**Interpretivism philosophy**” was followed in order to capture subjective information related to perception of patients and healthcare practitioners in response to harnessing analytics within healthcare. “Interpretivism philosophy” emphasises human factors to create in depth meaning regarding a phenomenon [14]. Apart from this, “**Inductive approach**” was utilised for comprehending cause and effect phenomena behind analytics integration and treatment quality within healthcare. Researchers collect empirical data to develop a concept based upon that previously collected data [15]. Empirical data was evaluated in this research in order to comprehend impacts of harnessing analytics within healthcare settings to develop concepts on its benefits through the lens of “Inductive approach” through evaluating specific information on analytics like big data analytics. Therefore, “Inductive approach” and “interpretivism philosophy” were followed to capture the perception of medical practitioners on utilisation of analytics for designing treatment plans.

“**Qualitative strategy**” was followed for in-depth exploration of each aspect like treatment effectiveness, mortality rate accomplished through harnessing analytics within healthcare of UK. On the other hand, “**secondary data collection**” method was followed due to its cost effectiveness for collecting relevant information that addresses research objectives. Secondary data is cheaper and easier to obtain compared to primary data [16]. “Google Scholar” is used as the main secondary database for collecting relevant information from peer-reviewed journal articles. Apart from this, **thematic analysis** was incorporated in order to interpret meaningful conclusions in the form of themes by analysing collected information of analytics within healthcare. Themes were generated from research objectives inductively through identification of patterns across the dataset. Therefore, the study incorporated “secondary data collection”, “Thematic analysis” for addressing research questions.



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IV. IMPACT AND IMPLICATION

Theme 1: Definition and components business analytics in US healthcare sector

Business analytics is involved with systematic usage of relevant data, statistical analysis along with modelling for obtaining suitable insights to establish informed decisions. It has been observed that business analytics surrounds several business techniques to enhance operational efficacy, patient outcomes and optimisation of financial management in the healthcare industry [17]. The healthcare sector generates a huge amount of data obtained from different healthcare organisations that includes hospitals, insurance companies, healthcare service providers in the United States. In addition to that, the pharmaceutical business in the US has started utilising Big data to mitigate the challenges as well as the significant changes in terms of healthcare services for better treatment and reducing fraud claims [18].

Theme 2: Application of business analytics in United States healthcare industry

It has been observed that the National Health Expenditure Accounts (NHEA) depicts that the United States has spent \$3.3 trillion in the healthcare aspect in 2016 and it has increased 4.3% in recent era [18]. In addition to that, data related to healthcare claims that it can reveal a lot regarding medical services as well as prescribed drugs also. In this digital era, almost 95% doctors in US utilise Electronic Health Record (EHR) systems to accumulate, store and also analyse significant data related to their patients [18]. Big data, IoT and Blockchain in healthcare would help the healthcare sector in accessing billing data and clinical outcomes of the patients periodically. It would help the physicians and other healthcare providers in proper diagnosis of the patient's diseases and in providing better treatment also.

Theme 3: Benefits of technological advancements in US health sector

Health Big data, the term refers to the significant amount of health data of the patients in healthcare system of recent times helps the healthcare professionals in United States in drawing out numerous insightful conclusions. It can help in enhancing patient care, boosting patient safety and also enabling the insurance providers in offering personalised plans for the consumers as per their need [19]. The **remote monitoring devices** help in detecting essential symptoms of patient health and the specific data can be sent to the insurance providers for medical evaluation. It basically helps in reducing the readmission rates, self-monitoring by the patients themselves and decreased travel time to the hospitals also in United States.

The **Glucose sensor** helps out the diabetes patients through monitoring the glucose level in interstitial fluids continuously. Apart from that, the **blood pressure sensor** helps the patients in preventing strokes and heart attacks by providing them alert about critical symptoms immediately [19]. The **sweat sensors** are often utilised by the athletes and patients in United States for tracking levels of body fluid by offering them data on sodium chloride, amino acids, glucose and potassium to help them in prior detection of harmful diseases like cystic fibrosis. The **sensor enabled ambulance** is helpful in delivering necessary treatments until the patient admits to the hospital. The ambulance telemetry plays a crucial role in implementing wireless transmission of vital patient information and measurements to the medical professionals while the patient is in transit [19]. The IoT applications in the US healthcare industry helps people in obtaining basic healthcare services that reduce the risks related to chronic diseases. Fitbit, the sensor-based medication, helps the patients in reducing the number of hospital visits even for routine check-up also.

Theme 4: Challenges and limitation in integrating business analytics in US health sector

The primary challenge related to data analytics in the healthcare sector is highly sensitive data of the patients that contains personal health information. High quality data is extremely required for proper application of machine learning algorithms. Lack of sufficient high quality patient data results in degraded outcomes through EHR system. The healthcare data in United States mainly suffers from inconsistency, incompleteness and inaccuracies also. The diverse range of sources, medical imaging of same patients from different laboratories disrupts the common format of data collection in this scenario.

The challenges related to technical and organisational makes further complication in the aspect of business analytics in healthcare system. The resistance to wards change in healthcare system affects the implementation of business analytics in this sector in United states. Apart from that, lack of technical knowledge of the medical professionals also disrupts the efficacy of business analytics in the healthcare sector in US. Another significant limitation is data privacy and



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security of the patient data. Lack of advanced cyber security measures results in data leakage and the private data of patients gets disclosed. It can be considered as the significant loophole of business analytics in the healthcare industry in US.

V. CONCLUSION

The integration of business analytics in healthcare sector help the medical professionals in handling huge amount of patient data in an easier manner. Instead of handling huge previous history of patients, the necessary part of data can be fetched by the medical professionals within a moment during providing treatment. The integration of Big data, IoT applications, machine learning algorithms and blockchain technology has helped the healthcare service providers in obtaining suitable insights for better diagnosis and treatment of the patient disease. The wireless transmission of necessary patient data to medical professionals has helped in reducing the life risks of the patient as basic helps can be gained by patient parties before reaching to the hospitals. The sensor enabled machineries have helped in continuous monitoring of patient health data and also provide alerts immediately after observing the critical symptoms. It helps in initiating a quick treatment process for the patients and overall monitored data helps the doctors in making data driven decisions for the relevant patients also. In Spite of such facilities, the integration of business analytics in healthcare sector also possesses some security loopholes regarding data privacy. The lack of innovative cyber security measures often discloses the patient data and it can be considered as ethical concerns for the healthcare sectors in US.

VI. FUTURE DIRECTION

The future research could emphasise specific dimensions of analytics like predictive analytics to enrich information on certain aspects like diagnosis of healthcare settings. For instance, future research could be conducted upon impact of predictive analytic scalability of AI in response to diagnosis accuracy. On the other hand, researchers can also focus on personalised treatment strategies by leveraging big data analytics for minimising adverse effects on patients in future research. Lastly, the importance of harnessing analytics within developing countries like India, Pakistan could be conducted to gain vivid knowledge on treatment quality.

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