Big Data and Analytics – Technology Transforming Health Care

Meenakshi Nadimpalli*

Global Information Technology Executive, 2412 Amherst Rd, Middleton, WI – 53562, USA

Abstract: The paper provides Big Data and Analytics potential benefits and its impact in the world. The importance of big data analytics technology in transforming health care industry. How the big data analytics is evolving in healthcare into a promising field for improving outcomes and reducing costs. There is a discussion on data security challenges and recommendations to overcome those challenges.

Keywords: Big data; Analytics; Healthcare; Data security; Industry performance; Clinical problems; Public health; Data privacy; Methodology; Framework.

I. INTRODUCTION

Industries are continuing to adopt large-scale data mining techniques to enhance their productivity levels and better their competitive advantage [1-7]. Apparently, various sectors including healthcare, insurance, and retailing are shifting to the big data analytics technology at an unprecedented pace because of its benefits. The experiences that the many industries have had through the adoption of the strategies articulate the potential of the big data analytics technology. Among the first businesses to welcome the mechanism include Amazon.com, John Hopkins Hospital, and Netflix. While this new concept of business may prove to be effective in most paradigms, it is equally marred by a series of security challenges. Since its inception, CEOs and data experts have been struggling to identify the avenues for privacy issues to guarantee the efficiency of the big data analytics technology [6]. The paper focuses on the potential of the big data analytics and its relevance in healthcare, the possible challenges faced by adopters, and the ways to overcome such issues. To begin with, it is important to note that many organizations tend to contemplate the applicability of the big data and analytics strategies after realizing the urgent need to map an industry's profit pools. In this view, the potential of the new technological framework arises from a business's ability to use the big data as a strategy for enhancing market share. Typical adopters are generally those sectors that have concluded that the tools are there to allow them study consumer behaviourism to perceive what elements tend to influence their decisions [4]. Achieving in this scope necessitates firms to understand the simultaneous information shared by clients over the internet. Correspondingly, the ease of tracing the degree by which a disease spreads is amongst the greatest goals of health care practitioners. Physicians believe that the obtained information may simplify the process of preparation against further outbreaks. Prompt detection of epidemics facilitates mitigation against increased spread. Fortunately, through the big data and analytics strategies, the process of disease detection and mitigation has become a reality. The information obtained from the various sources is applied in improving healthcare and saving lives. Experts are now shifting from mere reaction to outbreaks to ways of curbing future incidences of diseases [4]. Furthermore, the big data and analytics tools are perceived to have a potential of boosting intelligence in manufacturing; a factor that guarantees an increase in the rate of production. It can be overwhelming for a company to perform in the current market if the management fails to acknowledge the potential of the big data. Besides, researchers agree that many businesses are still far from full realization of what the big data analytics has to offer because they have not completely exhausted the facets of these new tools. It is a fact that firms still lack proper communication channels, clear visions, and actual plans to facilitate the execution of technological provisions [6]. As a result, the failure of these companies to incorporate the evidently novel mechanisms prompts the core of this study; to explore the potential of the big data and analytics strategies.

II.   METHODOLOGY

To explore the aim of the study, there was the application of an exploratory research design. The approach was essential in scrutinizing the possible benefits presented by the big data analytics technology in various sectors including health industry. The exploratory research design also helped as the hypothetical basis for the existing studies. In addition, there were systematic literature reviews and major focus was on the current researches. Through this, it was possible to guarantee that the study topic was concerned with the development of the former projects. The exploratory research design and systematic reviews were suitable in examining the correlation between the big data analytics technology and overall industrial performance.

III.   HYPOTHESIS

1. The big data and analytics strategies have led to increased confidence on technological tools and made it possible for industrial sectors to realize increased production.
2. The big data is marred with major security challenges but these issues can be solved through a strong emphasis on education and resource allocation.

IV.   KEY FINDINGS

From the research, it was deduced that the greatest potential presented by the big data analytics technology lies in its ability to help firms gain better insights and create highly effective industrial intelligence. The result is that firms can make valid and well-informed decisions regarding their operations and how to reduce resource wastage [7]. Through the big data analytics technology, both small and corporate level companies stand a chance to easily predict the possibilities of downtimes. The big data analytics in combination with the Internet of Things can help in predicting the magnitude of future workloads, hence the need for prompt overhauls and maintenance.

It was also evident that a vast number of company executives perceive the big data and analytics as essentials for increased profits and reinforced competitive advantage. The use of Internet of Things in capturing industrial information and inferring data has the potential to lower the rate of equipment failure and curb spontaneous interruptions [6]. Because of its close relationship with the overall effectiveness of equipment, the big data analytics technology can highly modernize manufacturing.

Another finding was that the big data analytics comes with strategies that can assist producers to be highly well-organized in resource management. The improved industrial intelligence can equally help in ensuring that operations remain uninterrupted and safe. Various studies led to the conclusion that the technology is vital for the existing and imminent industrial activities. Any company that adopts the big data and its strategies tend to be confident with regard to its ability to achieve [4].

A closer look at the relationship between the big data analytics technology and healthcare revealed that these novel tools can be highly beneficial at this moment when the world is faced with disease outbreaks. It was found that innovations related to data mining techniques can assist in tracking ailments such as Ebola. Through this, it becomes easy to determine the various modes of response to worldwide epidemics. Ideally, the big data analytics technology has led to increased obtainability of the knowledge regarding diseases and how they spread [4]. The amount of available information regarding diseases influences the level of success realized after resources have been mobilized towards mitigation.

From a technical perspective, the health sector already has everything needed to apply the big data in the development of serums against infections like Zika. The numerous eruptions of diseases have prompted experts to look into strategies that can help in assessing viral behaviors and methods that can be used to isolate and eliminate infections [6]. This form of prognostic analysis has been possible because of the data mining techniques. Therefore, the success of the big data in this scope has proven its potential in developing solutions for major outbreaks.

V. DISCUSSION

With the aid of dedicated software, the big data and analytics strategies can be an avenue for multiple industry gains. For example, it can facilitate the identification of income opportunities, more effective promotional techniques, and approaches to competitive advantage. The various applications used for the big data analytics are effective in enabling information experts to scrutinize all the transaction data that sometimes pass uncaptured by the standard business intelligence software [5].

On a broader scope, big data and analytics tools offer a framework for examining information to allow companies make more informed decisions. Apart from their relationship with productivity, the big data and analytics strategies are equally composed of statistical algorithms and extrapolative systems [5]. The implication is that they are highly beneficial in ensuring that the rate of disease prevalence diminishes with time.

In an ideal medicine, Evidence-Based Practice is a factor of modernity that can only be realized if there is a combination of numerous data sets. Luckily, the big data and the analytics strategies have the potential to ensure that the available clinical data match health services with outcomes. The correlation is important when there is a need to predict the possibility of future risks [6]. Therefore, hospitals have the information needed to control recurrent readmissions at their disposal.

The effective use of the big data and general digitization can allow physicians to realize significant benefits of modern technology in various aspects. The potential gains presented by the analytics tools range from early detection of diseases to effective alleviation of occurrences. However, the detection and relief depend on the ability of hospital staffs to use data mining for information purposes [6].

In addition, the big data analytics technology can help in addressing various clinical problems. For example, data mining can assist in cutting down on the costs of medical operations and help to determine more therapeutically appropriate approaches to diagnose and handle patients [7]. The statistical algorithms are useful in examining patterns of outbreak and tracking viral transmissions. Through this, it becomes possible to inspect public health and speed up relevant responses. The information can equally be useful in the creation of more appropriate vaccines. More importantly, the large volumes of data can be applied in identifying public health needs.

VI. DATA SECURITY CHALLENGES

While the big data and analytics tools come with several benefits, they are equally flawed with a number of potential security concerns. First, there is no dedicated safety platform against possible risks. The implication is that the big data is a platform that lacks proper encryption, procedures, or any reliable inbuilt security features. Most organizations are forced to work on an individual basis towards safeguarding their systems. Similarly, there is the issue of anonymity where clients tend to be uncomfortable when they realize that companies may be collecting their information without getting approval from them [6]. The lack of anonymity can be an avenue for increased security challenges, both on the clients and the business.

Moreover, there is high insecurity involved with the big data owing to its complexity. The highly complicated data sets are characterized by greater difficulties during any attempt to protect information. For example, there are normally large volumes of email files and after a long period of time, it can be impossible to institute independently-functioning measures to remotely eradicate attacks. There is even increased security challenge as a result of the rampant data breaches. Cyber criminals now consider the large data sets as profitable components; hence firms with huge volumes are more vulnerable [6].

Even with the increased level of cyber-attacks, security-related outlays are still insignificant. From the perspective of experts, around 9-11% of an industry's technology budgets need to be used on data safety. Nonetheless, most firms still keep their spending in this area at below the 9th percentage mark. Minus the mandatory data resources, businesses are yet to encounter challenges in their attempts to safeguard their data [6].

The other factor that poses as security challenge is the concept of data brokers. An organization can deem itself successful in terms of data security, but this may be reversed immediately they do business with a third party. Unfortunately, the existing policies are ineffective and cannot resolve matters related to brokered data, and this complicates the problem further. There are only a few rules to ascertain that data brokers can be answerable in any case data is exchanged between numerous parties [6].Therefore, there are constant challenges in guaranteeing the safety of the big data.

VII.   RECOMMENDATIONS TO OVERCOMING THE SECURITY CHALLENGES

On account of the security concerns, many companies tend to be anxious regarding the efficacy of the big data analytics technology. However, with skilled personnel, sufficient resources, an analytics framework, and a focus on privacy, it becomes possible to settle most of these challenges [7]. To attain success, experts can think of packaging the big data to make it more transparent and operator-friendly [7]. Instant big data analytics also needs to be considered as a precondition in the health sector. In other words, it is important to address any issue that causes delays between data gathering and dispensation. The impacts of a data theft can be more overwhelming than the outcomes of most security concerns because they are normally detrimental to both the target and its partner organizations. The result is that a business stands a chance of losing its reputation. Therefore, firms must ensure that they are at an equilibrium point between their ways of utilizing the data and methods of protecting it. Some of the approaches that can assist in this include encryption, a guarantee of anonymity, and controlled access [4]. It is vital to anonymize data before storing it so that risky privacy issues are managed. All the same, this may not act as a warranty that the information will remain in its unspecified state continuously. This means that the anonymized data can also become a subject of security. As a result, it is always important to get rid of any form of sensitive information from the data sets before storage begins [4].

VIII.   CONCLUSION

In conclusion, amongst the various potentials presented by the big data analytics includes its capacity to enhance the way various industries, including healthcare sector, utilize large volumes of information for intelligence purposes. Through the new insights, it becomes possible for organizations to make informed decisions regarding their operations. Nonetheless, as big data analytics grow in demand, matters related to security equally become unbearable. As a result, it is the role of organizations to work inclusively to ensure that they maintain their systems and sustain their reputations.

IX.   REFERENCES

1. M Vincenzo, Big data and analytics. Strategic and organizational impacts 2015.
2. KH Mu, S Tony, et al. Health big data analytics: current perspectives, challenges and potential solutions. International Journal of Big Data Intelligence 2014; 1: 114-126.
3. Y Shen, K Okyay, Big data for modern industry: challenges and trends. Proceedings of the IEEE 2015; 103: 143-146.
4. K Avita, W Mohammad, et al. Big data: issues, challenges, tools and good practices. Contemporary Computing Conference IEEE 2013: 404-409.
5. S Onur, S Yalin, et al. Tactical big data analytics: challenges, use cases, and solutions. ACM Sigmetrics Performance Evaluation Review 2014; 41: 86-89.
6. K Stephen, A Frank, et al. Big data: Issues and challenges moving forward. Hawaii International Conference on System Sciences (HICSS) IEEE 2013: 995-1004.
7. FD Mark, HV Jagadish, et al. Big data challenges and opportunities in financial stability monitoring. Financial Stability Review 2016: 129-142.