A Survey on Healthcare Services Integrated for Business Intelligence

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Abstract— Quality of service in health care has been a related issue and is directly related to organizations' growth on the profit side and market share. Health care requires quality improvement in the services provided to maximize patients' satisfaction. The healthcare system has been developed and hospitals in Egypt are looking for quality improvement techniques to attract patients' electronic health records and meet their expectations in providing a distinctive service. There is no research or knowledge available to us to understand and evaluate the behaviour of healthcare professionals. Many developing countries face a lack of health care services. Lack of health-care services in developing countries; Lack of insurance coverage. We discussed previously in this article that many health consumers cannot afford the high cost of primary care due to the unavailability of some insurance services. This paper aims to focus on the impact of quality of service on patients' satisfaction in hospitals to ensure maximum patient satisfaction. The proposed framework was first designed to implement (BI) models to improve quality in the healthcare sector, healthcare services, patient awareness, and the functioning of integrated networks to provide healthcare services in Egypt, as well as to assess professional behaviour and health care services within the framework of healthcare in Egypt. In this research, the performance of quality standards in healthcare services has been improved based on healthcare methodology.

keywords— healthcare services, healthcare professionals, improve quality, Quality of service, Business intelligence (BI), Internet Communication Technology (ICT).

1 INTRODUCTION

Nowadays, healthcare services structures face difficult situations due to demographic changes, technological advances in medicine and limited opportunities for health funding growth, requiring a more intensive view of the effectiveness of systems [1].This situation is influenced by several factors: high costs of medical services, rapid development of medical technologies, increasing ageing of Europe's population, changing disease patterns, higher expectations and benefits for patients, widespread inadequacies in health care, pressure to increase access to health care services, greater diversity of medical services, changes in the approach to financing and managing health care and the growing importance of information technology in this sector [2]. Healthcare insurers are able to establish fraud and abuse cases, health directors are able to create higher choices particularly in managing their customers, and aid practitioners are able to deliver better services and treatments. the massive amounts of information generated by healthcare transactions are too advanced and voluminous to be processed and analyzed by ancient ways [3]. The current rapidly growing international of business has witnessed several superior breakthroughs in Information and Communication Technology (ICT). Business intelligence (BI), information analytics, and big data have turn out to be significant fields of studies nowadays [4]. The effectiveness and quality of records evaluations and selections have become an increasing essential for all stages of business [5]. Hence, information is a strategic organizational resource [6]. Large organizations manage their information using BI systems [7]. BI is a comprehensive series of technologies, applications, and tech-

niques that organizations use to transform their massive raw records into beneficial knowledge [8]. BI systems enable enterprises to achieve business success and develop shareholder value and sustainability [9]. BI structures are conceptualized as layered structures which have an information layer that represents the structures that store information [10].

2 OVERVIEWS OF BI

These days, organizations are involved in commercial enterprise activities and hence, collect and generate massive volumes of complicated information [11]. Since raw records is an organization's maximum valued resource, a proficient data system together with BI is critical to advantage most benefit from the complicated information, thus making sure business success [12]. Thus, investment institutions ensure less complex and faster access to the right knowledge on time to make appropriate decisions, thereby determining stakeholders' costs and sustainability [13]. Organizations of different industries and sectors use BI systems in those days, and BI has received great popularity since the 2000s [14]. It is critical to recognize BI inintensity to examine the diverse stages of BI growth; namely, BI 1.0, 2.0, and 3.0 [15]. BI 1.0 is The first stage of BI, which became from the 1970s and 1980s and is linked to Operational Information Systems (EIS), Decision Support Systems (DSS) and Management Information Systems (MIS) [15]. BI 2.0 is the second stage of the evolution of BI, which changed between the 1990s and 2005 and is associated with the increase of web and internet technology, data mining, Online Analytical Processing (OLAP) techniques, and data warehouses [15]. BI 3.0 is the third stage of ICT development, linked to smart business applications and networks [15]. Cloud computing, enhanced analysis and big data are becoming increasingly important today [16].

BI has been defined in a variety of ways in the literature. Table 1 shows a few definitions of BI from the existing literature. BI is a broad umbrella term for intelligence that encompasses IT and business technologies, applications, and tools for gathering, integrating, automating, and evaluating data from various data sources for better decision-making [17]. BI is an architecture that is always evolving and offers quick access to corporate data, enabling the organization to make educated and strategic decisions that will lead to business success [18].

Table 1: summary of the BI definitions.

Author	Year	Definitions
Mazreati and Radfar	2017	"A business intelligence system is a comprehensive combination of tools, technologies, and solutions designed to collect, coordinate, analyze, and make data available." [19].
Olbrich, Poppelbuß and Niehaves	2012	"BI is concerned with the effective deployment of organizational practices, procedures, and technology to develop an organizational knowledge base."[20].
Presthus et al.	2012	"Business intelligence (BI) is a broad category of applications and technology for acquiring, storing, analyzing, sharing, and providing access to data in order to assist organizational users in making better decisions."[21].
Jamaludin and Mansor	2011	BI is defined as "a continually evolving strategy, vision, and architecture that seeks to connect an organization's activities and direction with its strategic business goals"[22].
Ranjan	2008	"BI is the informed and systematic translation of data from any and all data sources into new formats to provide business-oriented information." It will often include a combination of tools, databases and service providers to deliver infrastructure that will not only provide the original solution, but also integrate the ability to change with the current business and market. "[23].
Lonnqvist and Pirttimaki	2006	"BI refers to a managerial concept and a tool used to assist organizations in managing and refining business information in order to make more efficient business deci-

		sions."[24].
Moss and Atre	**2003**	**A business intelligence system is defined as "an architecture and a collection of linked operational and decision-support applications and databases that offer the business community with quick access to company data"[25].**

3 ADVANTAGES OF BI

BI makes data available for better, more insightful, and strategic business decisions, as well as for meaningful reporting to maximize business success. BI transforms a data-reactive corporate environment into a proactive one [23]. Therefore, an intelligent BI system enables users and businesses to speed up response times, identify possibilities and risks, and cut expenses [21]. Thus, the structures of health insurance institutions promote the improvement of the Organization's business opportunities, practices, performance and transparency [4]. Furthermore, BI structures make sure longstanding stability, aggressive marketplace advantage, and the success of commercial enterprise goals [26]. The implementation of the BI system promotes profitability and productivity with the help of non-duplication of processes and increased efficiency [27].

4 ARCHITECTURE OF BI

BI system implementation boosts profitability and productiveness with the aid of using stopping technique duplication and growing the performance of processes [28]. Generally, BI frameworks include a structure which incorporates three levels; namely, data layer, logic layer, and the presentation layer [29]. The records layer stores each unstructured and established records derived from operational systems, whereas the common sense layer executes various opinions at the data [29]. The get admission to layer or the presentation layer allows BI customers to without difficulty get admission to the superior information that they require [29].

5 ELECTRONIC HEALTH RECORD

An electronic medical record (EMR) is a real-time patient health record that clinicians use to make decisions. Healthcare practitioners use EMR to document, monitor, and manage healthcare delivery care [30]. EMRs improve clinicians' or administrators' workflow by ensuring that all clinical information is communicated, preventing potentially dangerous delays in response and gaps in care [30]. The EMR also facilitates data collection for billing, quality management, disease surveillance, and reporting [30].

An electronic health record (EHR) is a database containing information on a patient's health status in an electronic format [31]. It's an electronic record of a patient's health information that's shared among many care delivery organizations in a community, region, or state across time [31]. The EHR is a subset of the EMR from each care-delivery organization, containing summary information about the health-record standard specifications produced cooperatively by healthcare organizations [31]. This underscores the importance of the EHR in ensuring patient continuity of care. Patient demographics, medical history, prescriptions, vaccines, laboratory test results, vital signs, issues, and notes are all included in the EHR [31].

6 HEALTHCARE PROVIDERS AND EHR

proposed architecture aimed at supporting the medical personnel in monitoring and moderating patients of participating to HSN platform. In particular, they focused on a PaPAS architecture that implements the AI logic by means of a combination of stemming, lemmatization and Machine Learning (ML) algorithms among others [32]. Specifically, the aim of such a system is to enhance the well-being of patients participating to the HSN platform. [32] Basically, PaPAS analyses patients' posts in order to detect possible critical issues considering three levels of seriousness that are: normal, warning, and critical. If the content of a post crosses the threshold of criticality, the clinical personnel may promptly intervene. [32] Although

our work is in a preliminary state, some experiments have been carried out that demonstrate effectiveness of the considered algorithms considered A one. In particular, it was demonstrated that the adopted ML algorithm (Naïve Bayes Classifier) is fast and reliable enough to allow real-time applications as in critical environment [32].

Performed a study found artificial neural networks can be applied across all levels of health care organizational decision-making. Influenced by advancements in the field, decision-makers are taking advantage of hybrid models of neural networks in efforts to tailor solutions to a given problem. The researcher had found ANN-based solutions applied on the meso- and macro-level of decision-making suggesting the promise of its use in contexts involving complex, unstructured or limited information. Successful implementation and adoption may require an improved understanding of the ethical, societal, and economic implications of applying ANN in health care organizational decision-making [33].

Presented proved that Dynamic health environments are dependent on speedy access to real-time health information and high interoperability among different providers with various skills. These requirements make the use of eHealth and information management system imperative for achieving high performance healthcare delivery [34].

Showed the variety of artificial intelligent systems using in eHealth for knowledge management. The information dashboard is a chance for healthcare executives for effective decision supporting. Combination of mentioned tools could give extraordinarily effects in performance, quality and profitability of healthcare. Integrating this systems and technology cooperation became one of the most important issues nowadays and performance dashboards visualize data and integrate data sources for making decision faster and more accurate [35].

Discussed the involvement of multiple factors in healthcare systems including diverse professionals and embedded devices have made IT-based healthcare systems expensive, competitive and complex. Internet technology makes it possible to interconnect independent devices and systems in an efficient and economical way in order to develop dynamic, flexible, distributed and cost-effective applications, service-oriented computing, which relies on services, can be used web services handle the complexity and heterogeneity with the help of ontologies [36].

Contributes improvements to home healthcare systems particularly for critical-care patients that require continuous medical monitoring by a collaborating group of medical specialists [37]. A framework based on software agents that proxy for participants in a healthcare environment was proposed. Neural networks were used to make the patient agent capable of intelligent decision support by being able to recognize symptom patterns that characterize certain chronic conditions. In this manner, they made the healthcare system capable of sending alerts and providing relevant medical data to the appropriate specialist responsible for the medical care of a specific chronic condition. Our simulation result indicates that ANN can recognize chronic conditions with very high accuracy. The implication is that future home healthcare systems can be enhanced with intelligent decision support in situations that require constant evaluation of the health status of a patient in critical care and the task of identifying the chronic condition from the symptoms of pattern can be safely delegated to a software agent. Using such systems, medical specialists can service more patients over a greater geographical area and be able to collaborate with colleagues from a broader spectrum of medical expertise [37].

Showed the burden of healthcare costs will continue to grow unless and until the efficiency and efficacy of healthcare systems will be accomplished [38]. It is critical that policymakers take action to restrain the rising costs of healthcare today, they have to bear in mind that the general aim is a continued public health improvement that will also help eliminate health gaps, as the relative position of vulnerable population groups gets better, AI-based analyses can be adopted to improve the effectiveness of health governance systems in ways that also lead to better quality of care [38].

Proposed Novel computational tools derived from AI are like-

ly to transform radiological practice. The greatest challenge at this time and also the most exciting opportunity—lies in determining which particular clinical tasks in radiology are the most and least likely to benefit from AI algorithms, given the power but also the limitations of such algorithms at the same time, regardless of the technology used, it is important to keep in mind that proper clinical hypotheses remain primordial, and an appropriate validation of AI-based methods against actual clinical outcome measures of patient wellbeing remains the most important measure of success[39].

Described defined healthcare is one of the fastest growing sectors in today's economy; more people require care, and it is becoming more and more expensive government spending on healthcare has reached an all-time high while the inherent need for enhanced patient-physician connection becomes readily apparent technologies like big data and machine learning have the potential to help both patents and providers in terms of better care and lower costs number of companies and organization have already taken the first step in this industry and have helped facilitate the transition to patient and evidence-orientated care. The data is there; the research just have to figure out how to interpret it companies like the ones mentioned above are just a small number of the entities taking us one step closer to that vision [40].

Developed an overview of the current deep learning models for EHR data Results from the reviewed articles have shown that as compared to other machine learning approaches, deep learning models excel in modeling raw data, minimizing the need for preprocessing and feature engineering, and significantly improving performance in many analytical tasks It is noteworthy that deep learning models are ideal tools for recognizing diseases or predicting clinical events or outcomes (eg., mortality or treatment response) given time series data such as EEG or bio signals from ICU or imaging data. However, although deep learning techniques have shown promising results in performing many analytics tasks, several open challenges remain [41].

Showed the accelerating creation of vast amounts of health care data will fundamentally change the nature of medical care [42]. The researchers firmly believe that the patient–doctor relationship will be the cornerstone of the delivery of care to many patients and that the relationship will be enriched by additional insights from machine learning [42]. They expect a handful of early models and peer-reviewed publications of their results to appear in the next few years, which along with the development of regulatory frameworks and economic incentives for value-based care are reasons to be cautiously optimistic about machine learning in health care. The researchers look forward to the hopefully not-too-distant future when all medically relevant data used by millions of clinicians to make decisions in caring for billions of patients are analyzed by machine-learning models to assist with the delivery of the best possible care to all patients [42].

Developed data-driven predictive model is predicting readmission rates in heart failure patients. Cases and controls were compiled based on 30-day readmission evidence to the same location. Compared to the existing repertoire of predictive models to assess readmission, our model shows better accuracy using one year of readmission data from a single site. However, the model needs to be updated and calibrated using multiple years of datasets from different sites across the nation. Feature selection provides insights into several novel factors that could help to delineate readmission rates associated with HF. Implementing data-driven methods that EMR-wide variables in a hypothesis-free approach could help us to find new features underlying clinical outcomes. Designing predictive and prescriptive models would help to accelerate stratification of patients at risk for improved care. Such findings and predictive assessments have significant implications for the quality of healthcare delivery and impact on patient outcomes [43].

Presented an identified subject with and without T2DM is the first step to enable subsequent analysis such as GWAS and Prewash [44]. In that work, the researchers propose an accurate and efficient framework as a pilot study to identify subjects with and without T2DM from EHR data. Our framework leverages machine learning to automatically

extract patterns of T2DM [44]. And they further boost its predictive power by overcoming the wide separation rage of cases and controls in expert algorithms [44]. Our feature engineering framework considers a diverse set of data features spanning diabetic diagnosis codes, diagnosis notes, complications, self-reports, medications (both standard and traditional Chinese medicine), and laboratory tests to represent diabetes related patients. Based on engineered features, they train classification models [44]. They collected 160 T2DM cases and 61 controls and use 4-fold cross validation strategy to evaluate performances of classification models. The experimental results show that our framework can identify subjects with and without T2DM at an average AUC of around 0.98, significantly outperforming the state-of-threat at an AUC of 0.71[44].

Proposed a brief overview of current deep learning research as it pertains to EHR analysis. This is an emerging area as evidenced by the fact that most of the papers they have surveyed were published in the past two years [45]. Tracing back the deep learning-based advances in image and natural language processing, they see a clear chronological similarity to the progression of current EHR-driven deep learning research. Namely, a majority of studies in this survey are concerned with the idea of representation learning, i.e., how best to represent the vast amounts of raw patient data that has suddenly become available in the past decade. Fundamental image processing research is concerned with increasingly complex and hierarchical representations of images composed of individual pixels. Likewise, NLP is focused on word, sentence, and document-level representations of language composed of individual words or characters. In a similar fashion, they are seeing the exploration of various schemes of representing patient health data from individual medical codes, demographics, and vital signs. The parallels are strong, and these recent studies represent a critical launching off point for future deep clinical research [45]. Table 2 shows some of the recent published research in the health care services.

Table2: Shows some of the recent published research in the health care services

Author	country	Techniques	Objectives	Scope of services
L. Cervantes, L .Yong-Seokee,& Y. Hyunho, 2007.	South Korea	Neural networks	Create an intelligent decision support system for a group of medical specialists collaborating in the pervasive management of healthcare for chronic patients.	High costs of healthcare.
N.Mohammadzadeh, &R.Safdari, 2012	Iran	Data Mining	Improving quality of health care, reducing costs and facilitating health.	High costs of healthcare. Need for real-time access to health information for fast diagnosis and treat-
F. Zeshan,& R.Mohamad,2012	Malaysia	Medical Ontology	Improves the response time in emergencies and supports quick and effective decision-making	Limited knowledge of the conditions and ineffective communication systems. limited space and resources without knowing the full medical history of the patient
P. Ziuziański, M. Furmankiewicz,& A. Sołtysik-	Poland	data mining	The information dashboard is a chance for healthcare executives for effective decision supporting. Combination of mentioned tools could give extraordinarily effects in performance, quality and profitability of healthcare. Integrating this systems and technology cooperation	each agent disposes not complete information that is why agent is not capable to solve entire problem on its own, only combined agents can solve problem,
K. SHAMEER, W.JOHNSON, &Y.ALEXANDRE,201	USA	MACHINE LEARNING Techniques	Improving the outcomes and decreasing the cost of healthcare delivery in the United States. Patient readmission rates are relatively high for conditions like heart failure (HF) despite the implementation of high-	High costs of healthcare. Limited space and resources in healthcare.
K.BRETT BEAULIEU-JONES,& H.JASON MOORE,2016.	USA	DEEPLY LEARNED AUTOENCODERS	To evaluate performance, we examined imputation accuracy for known values simulated to be either missing completely at random or missing not at random. We also compared ALS disease progression prediction across dif-	Real-time access to health information for fast diagnosis and treatment.
T. Zheng, W. Xie Liling Xu Xiaoying ,&G.Yang You Chen,2016.	USA	Machine Learning	The goal of this work is to develop a semi-automated framework based on machine learning as a pilot study to liberalize Filtering criteria to improve recall rate with a keeping of low false positive rate.	Limited due to their high missing rates on identification of cases and controls.
Y. Cheng, et alm2016.	USA	Deep Learning Techniques	Deep learning approach for model is validated on a real world EHR data warehouse under the specific scenario of predictive modeling of chronic diseases.	High costs of healthcare.
R. Bhardwaj, R. Ankita Nambiar,& D.Debojyoti,2017.	USA	Machine Learning Techniques	These innovations range from swallow able microchips that alert doctors when medication has been taken to large scale data analysis to determine which medications are most effective. However, recently, machine learning has been identified as having major technological application in the healthcare realm. While such technologies will probably never completely replace physicians, they can transform the healthcare sector, benefiting both patients and providers.	The cost of healthcare and the financial burden on consumers
T. Pham, et al, 2017.	Australia	deep learning Techniques	Answering prognostic inquiries necessitates modeling patient level temporal healthcare processes. Effective modeling must address four open challenges: Long-term dependencies in healthcare: the future illness and care	Nursing illness trajectory model was popularized by Strauss and Corbin, but the model is qualitative and imprecise in time.
G.Fiumara, et al, 2018.	UK	Machine Learning Techniques	The aim of such a system is to enhance the well-being of Patients participating to the HSN platform.	Present potential risks for patients due to the possible distribution of poor-quality or wrong
C. Xiao, C .Edward,& S. Jimeng,2018.	USA	deep learning Techniques	Significantly improving performance in many analytical tasks. It is noteworthy that deep learning models are ideal tools for recognizing diseases or predicting clinical events or outcomes treatment response	Predictive power and Electronic medical records is limited.
B. Shickel, et al, 2018.	USA	Deep Learning Techniques	Applying deep learning to clinical tasks based on HER data, where we find a variety of deep learning techniques and frameworks being applied to several types of clinical applications including information extraction, representation learning, outcome prediction, phenol typing, and de-identification.	doctors want to promote the exchange of information among patients
P. Savadjiev, et al, 2018.	UK	Machine learning Techniques	Strengths and limitations of more classical methods as well as of the more recent deep learning techniques. We discuss the unique characteristics of medical data and medical science that set medicine apart from other technological domains in order to highlight not only the potential of AI in radiology but also the very real and often overlooked constraints that may limit the applicability of certain AI methods. Finally, we provide a comprehensive perspective on the potential impact of AI on radiology and on how to evaluate it not only from a technical point of view but also from a clinical one, so that patients can ultimately benefit from it.	Healthcare systems with limited human resources.
N. Shahid, T. Rappon,& W. Berta,2019.	Canada	neural networks	improving integration of processes in care delivery for patient-centered chronic disease management	in scope and generally focus on a specific disease

There were several studies used machine learning and other techniques to solve the problems of patent's data entry and changing service in healthcare stored in the EHR system and used for analyzing and processing to improve health care services. [33,36,39,42,45] As examples of these researches are:

The previous researches attempted to solve the changing in services healthcare. According to these studies the service doesn't which will be led to save the services time and interact efficiently with the patient. However, these studies contain some limitations that differ from one technique to another. The common limitations of the previous solutions are:

- Some of the previous studies According to some circumstances, an individual could feel pain and is not able to see a doctor so there is an urgent need for taking temporary effective treatment or performing some medical tests. [33, 36,39,42]
- Some of these studies didn't use Again, due to the absence of the doctor some people may advise a patient feeling certain symptoms with improper medicine leading to mistreatment and complicated medical problems. [36, 39,42]
- Some of the previous studied didn't use in the remote places there is a huge problem which is the rarity of the pharmacies or the hospitals and suddenly a patient may need to healthcare services. [42, 45]

7 Conclusion

The articles reviewed indicate that data analyses improve decision-making, planning and forecasting compared to decision support systems in the traditional environment. Based on this systematic review of the literature reviewed, there is sufficient evidence to suggest that data analyses can bring significant benefits to healthcare organizations. Analysis of the data helps institutions to be more efficient and help them save the costs of various healthcare processes due to enhanced decision-making. However, challenges must be assessed - including the confidentiality and privacy of patients' data mainly due to strict regulations governing the healthcare industry. However, these risks can be mitigated to reap the benefits provided by data analyses

8 References

[1] J. P. Glaser, C. Salzberg, The Strategic Application of Information Technology in Helath Care Organizations, San Francisco: JosseyBass, 2011.
[2] G Karasiewicz.: Ochrona zdrowia. Wizerunek, marketing, rynek, IPiS, Warszawa 2006.
[3] U. Fayyad, G. Piatetsky-Shapiro, and P. Smyth, "From data mining to knowledge discovery in databases," AI Mag., vol. 17, no. 3, p. 37, 1996.
[4] Magaireah, A. I. (2019). Identifying the Most Critical Factors to Business Intelligence Implementation Success in the Public Sector Organizations. *The Journal of Social Sciences Research, 5*(2), 450-462.
[5] Alabaddi, Z. A., Rahahleh, A. H., Alali, H., Muflih, M. A., & Sana'a, N. A. N. (2020). The relative importance of the critical success factors of business intelligence (BI) systems implementation in Jordanian pharmaceutical companies. *Journal of Theoretical and Applied Information Technology, 98*(12).
[6] Nasab, S. S., Selamat, H., & Masrom, M. (2015). A delphi study of the important factors for BI system implementation in the public sector organizations. *Jurnal Teknologi, 77*(19).
[7] Mazreati, H., & Radfar, R. (2017). Determining the factors affecting the evaluation of Business Intelligence systems with an emphasis on the integrity of Organizational resources. *Journal of Industrial Strategic Management, 2*(3), 64-82.
[8] Adjie Eryadi, R., & Nizar Hidayanto, A. (2020). Critical Success Factors for Business Intelligence Implementation in an Enterprise Resource Planning System Environment Using DEMATEL: A Case Study at a Cement Manufacture C
[9] Dawson, L., & Van Belle, J. P. (2013). Critical success factors for business intelligence in the South African financial services sector. *South African Journal of Information Management, 15*(1), 1-12.
[10] Juan-Verdejo, A., Surajbali, B., Baars, H., & Kemper, H. G. (2014). Moving business intelligence to cloud environments.
[11] Nasab, S. S., Selamat, H., & Masrom, M. (2015). A delphi study of the important factors for BI system implementation in the public sector organizations. *Jurnal Teknologi, 77*(19).

[12] Mazreati, H., & Radfar, R. (2017). Determining the factors affecting the evaluation of Business Intelligence systems with an emphasis on the integrity of Organizational resources. *Journal of Industrial Strategic Management, 2*(3), 64-82.

[13] Dawson, L., & Van Belle, J. P. (2013). Critical success factors for business intelligence in the South African financial services sector. *South African Journal of Information Management, 15*(1), 1-12

[14] Harison, E. (2012). Critical Success Factors of Business Intelligence System Implementations: Evidence from the Energy Sector. *International Journal of Enterprise Information Systems, 8*(2), 1.

[15] Olszak, C. M. (2016). Toward better understanding and use of Business Intelligence in organizations. *Information Systems Management, 33*(2), 105-123.

[16] Huttunen, J., Jauhiainen, J., Lehti, L., Nylund, A., Martikainen, M., & Lehner, O. M. (2019). Big Data, Cloud Computing and Data Science Applications in Finance and Accounting. *ACRN Oxford Journal of Finance & Risk Perspectives, 8*, 16-30.

[17] Lönnqvist, A., & Pirttimäki, V. (2006). The measurement of business intelligence. *Information Systems Management, 23*(1), 32.

[18] Jamaludin, I. A., & Mansor, Z. (2011). The Review of Business Intelligence (BI) Success Determinants in Project Implementation. *International Journal of Computer Applications, 33*(8), 24-27.

[19] Mazreati, H., & Radfar, R. (2017). Determining the factors affecting the evaluation of Business Intelligence systems with an emphasis on the integrity of Organizational resources. *Journal of Industrial Strategic Management, 2*(3), 64-82.

[20] Olbrich, S., Poppelbuß, J., & Niehaves, B. (2012). Critical contextual success factors for business intelligence: A Delphi study on their relevance, variability, and controllability. In *2012 45th Hawaii International Conference on System Sciences* (pp. 4148-4157). IEEE.

[21] Presthus, W., Ghinea, G., & Utvik, K. R. (2012). The More, the Merrier? The Interaction of Critical Success Factors in Business Intelligence Implementations. *International Journal of Business Intelligence Research, 3*(2), 34.

[22] Jamaludin, I. A., & Mansor, Z. (2011). The Review of Business Intelligence (BI) Success Determinants in Project Implementation. *International Journal of Computer Applications, 33*(8), 24-27.

[23] Ranjan, J. (2008). Business justification with business intelligence. *VINE, 38*(4), 461-475. https://doi.org/10.1108/03055720810917714

[24] Lönnqvist, A., & Pirttimäki, V. (2006). The measurement of business intelligence. *Information Systems Management, 23*(1), 32.

[25] Moss, L. T., & Atre, S. (2003). *Business intelligence roadmap: the complete project lifecycle for decision-support applications*. Addison-Wesley Professional.

[26] Pham, Q. T., Mai, T. K., Misra, S., Crawford, B., & Soto, R. (2016). Critical Success Factors for Implementing Business Intelligence System: Empirical Study in Vietnam. *Computational Science & Its Applications -- ICCSA 2016 (9783319420912)*, 567.

[27] Adjie Eryadi, R., & Nizar Hidayanto, A. (2020). Critical Success Factors for Business Intelligence Implementation in an Enterprise Resource Planning System Environment Using DEMATEL: A Case Study at a Cement Manufacture Company in Indonesia. *Journal of Information Technology Management, 12*(1), 67-85.

[28] Sangar, A. B., & Iahad, N. B. A. (2013). Critical factors that affect the success of business intelligence systems (BIS) implementation in an organization. *intelligence, 12*(2), 14-16.

[29] Juan-Verdejo, A., Surajbali, B., Baars, H., & Kemper, H. G. (2014). Moving business intelligence to cloud environments.

[30] Aceto, Persico, & Pescapé, 2018; Dang et al., 2019; Islam et al., 2018; Li et al., 2019; Saheb & Izadi, 2019.

[31] Aceto, Persico, & Pescapé, 2018; Bhuiyan et al., 2019; Dang et al., 2019; Dinov, 2016; Galetsi et al., 2020; Islam et al., 2018; Lismont et al., 2016; Mahmud et al., 2016; Ng, 2018; Raghupahti & Raghupathi, 2014; Visconti et al., 2019; Wang et al., 2018.

[32] Fiumara G., Celesti A., Galletta A., Carnevale L. , Villari M., "Applying Artificial Intelligence in Healthcare Social Networks to Identity Critical Issues in Patients' Posts," in International Joint Conference on Biomedical Engineering Systems and Technologies, 2018.

[33] Shahid N, Rappon T, Berta W, "Applications of artificial neural networks in health care organizational decision-making: A scoping review," journals.plos.org, 2019.

[34] Niloofar Mohammadzadeh, Reza Safdari, "Artificial Intelligence Tools in Health Information Management," International Journal of Hospital Research, pp. 71-76, 2012.

[35] P. Ziuziański, M. Furmankiewicz, A. Sołtysik-Piorunkiewicz, "E-health artificial intelligence system implementation: case study of knowledge management dashboard of epidemiological data in Poland," INTERNATIONAL JOURNAL OF BIOLOGY AND BIOMEDICAL ENGINEERING, vol. 8, no. 1998-4510, 2014.

[36] Furkh Zeshan, Radziah Mohamad, "Medical Ontology in the Dynamic Healthcare Environment," in *The 3rd International Conference on Ambient Systems, Networks and Technologies (ANT)* , 2012.

[37] Louie Cervantes, Yong-Seok Lee, Hyunho Yang,, "Agent-Based Intelligent Decision Support for the Home Healthcare Environment," School of Electronic and Information Engineering, Kunsan National University, ,South Korea.

[38] Alessandro Capone, Americo Cicchetti,Francesco S. Mennini,Andrea Marcellusi,Gianluca Baio, Giampiero Favato, "Health Data Entanglement and artificial intelligence-based analysis: a brand new methodology to improve the effectiveness of healthcare services," Institute for Leadership and Management in Health, Kingston University London.

[39] Peter Savadjiev,Jaron Chong,Anthony Dohan,Maria Vakalopoulou,Caroline Reinhold,Nikos Paragios, Benoit Gallix, "Demystification of AI-driven medical image interpretation: past,present and future," *Springer*, 2018.

[40] Rohan Bhardwaj,Ankita R. Nambiar,Debojyoti Dutta, " A Study of Machine Learning in Healthcare," *IEEE 41st Annual Computer Software and Applications Conference*, 2017.

[41] Cao Xiao,Edward Choi,Jimeng Sun, "Opportunities and challenges in developing deep learning models using electronic health records data:a systematic review," *Journal of the American Medical Informatics Association*, 2018.

[42] Alvin Rajkomar, Jeffrey Dean, Isaac Kohane, "Machine Learning in Medicine," *The new england journal o f medicine*, 2019.

[43] KHADER SHAMEER, KIPP W JOHNSON,ALEXANDRE YAHI, "PREDICTIVE MODELING OF HOSPITAL READMISSION RATES USING ELECTRONIC MEDICAL RECORD-WIDE MACHINE LEARNING: A CASE-STUDY USING MOUNT SINAI HEART FAILURE COHORT," Pacific Symposium on Biocomputing, 2016.

[44] Tao Zheng Wei Xie Liling Xu Xiaoying He Ya Zhang Mingrong You Gong Yang You Chen, ": A Machine Learning-based Framework to Identify Type 2 Diabetes through Electronic Health Records," *International Journal of Medical Informatics*, 2016.

[45] Benjamin Shickel, Patrick J. Tighe, Azra Bihorac,Parisa Rashidi, "Deep EHR: A Survey of Recent Advances in Deep Learning Techniques for Electronic Health Record (EHR) Analysis," *IEEE Journal of Biomedical and Health Informatics,* pp. 1509-1604, 2018.