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Assessing the Extent to Which AI is Revolutionizing UK and USA Healthcare Sector

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Abstract

Artificial intelligence (AI) has been revolutionizing various sectors. The healthcare sector is not left out. This study assesses the extent to which AI has been revolutionizing the healthcare sector. It relied on online questionnaire data from 400 respondents and library and internet materials. Survey design and multistage method with the suitable associated techniques were employed. The results show the extent to be high amidst some challenges, with healthcare services getting improved significantly. The study concludes that AI has been revolutionizing the healthcare sector at a significant extent, as it rapidly transforms, automates and optimizes traditional practices, activities and procedures that lead to the realization of technological innovations, efficiency, safety, resilience, worthwhile professionalism, best practices, regulatory compliance and patient satisfaction. To harness more benefits of AI in the healthcare sector, stakeholders have to increase the integration of AI models into healthcare services; work collaboratively to address the constraints posed by stakeholders to AI adoption in the sector; and Government with its agents and private sector partners should fund personnel training and the adequate provision of AI-driven resources and procedures in the sector.

Keywords: AI, Revolutionizing, Healthcare Sector, Extent, Assessment

Introduction

Artificial intelligence (AI) is traced to John McCarthy, who championed the idea of human-based AI in the 1950s (Lukovich, 2023; Chaillou, 2019). Oliver Selfridge advanced the idea to the non-human AI in the 1960s, being autonomous software agents capable of performing tasks undertaken by human beings (Lukovich, 2023; Hoar et al., 2017). There are growing numbers of studies on the impact of AI on the healthcare sector (Famous, 2023; Rane et al., 2023; Pasupuleti, 2022; Pasupuleti & Inyang, 2022; Thuraka, 2021), as in other sectors too (Akinloye & Shawana, 2023; Oguntona, 2023; Oluwamayomikun & Oparaku, 2022; Shawana, 2022). However, none of the empirical and literature-based studies specifically assesses the extent to which AI has been revolutionizing the healthcare sector. The current study focuses the extent to which AI has been revolutionizing the healthcare sectors in the UK and the US.

Larnyo et al. (2018) note that governments of different nations continually face the challenges of attaining and sustaining improvement, performance, efficiency, quality, and digitalization in the public sector. The integration of AI into the healthcare sector advances human medical efforts, service delivery and operations, including the extent to which medical data are managed and secured. Healthcare data are sensitive and have to be secured from threats (Alghanim et al., 2017). As such, AI techniques have to be leveraged for effective management and security of medical resources, patient data and diagnostic records, and ensure cybersecurity in the healthcare sector. Thuraka (2022) states that USA, UK, Canada, Australia, France, Germany, and many other developed countries are increasingly integrating AI and other new technologies into their healthcare systems. As such, AI and other innovative technologies are revolutionizing the sector at a significant extent. In view of the foregoing, this study seeks to determine the extent to which AI has been revolutionizing the healthcare sector in UK and US.

Problem Statement

The factors constraining large extent of AI integration into the healthcare sector can be addressed significantly, once there is the political will to do so. Regrettably, there is lack of political will and support for high-level integration of AI into the healthcare sector across many nations. The unwillingness causes little or no support for AI integration into the healthcare sector. Financial constraints, lack of resources, poor personnel training and attitudinal factors. Attitudinal factors include resistance to technological to modern innovations, preferring traditional systems and practices, and unwillingness to migrate from traditional to modern digitalized systems and practices.

Aim and Objectives

The aim of this study is to assess the extent to which AI has been revolutionizing the healthcare sector in contemporary times. Its specific objectives are to:

i. Assess the impact of AI on the healthcare.
ii. Determine the extent to which AI has been revolutionizing the healthcare sector.
iii. Explore how AI has been revolutionizing the healthcare sector.
iv. Establish the extent to which AI has been revolutionizing UK and the US healthcare sectors.

Research Hypotheses

The following alternative hypotheses are designed to guide the study:

i. AI has been exerting significant positive impact on the healthcare.
ii. AI has been significantly revolutionizing the healthcare sector at a large extent.
iii. AI has been revolutionizing the healthcare sector by automating, optimizing, innovating, improving and developing the sector.
iv. AI has been revolutionizing UK and the US healthcare sectors at a high extent.

Theoretical Framework

The study is anchored on Venkatesh's et al. (2003) Unified Theory of Acceptance and Use of Technology (UTAUT), which explains how technology gets accepted and used in society. UTAUT captures the following theories of computation, information, technology and communication sciences, and innovation adoption:

i. Diffusion of Innovations Theory (DOIT),
ii. Theory of Reasoned Action (TRA),
iii. Technology Acceptance Model (TAM),
iv. Theory of Planned Behavior (TPB),
v. Combined TAM and TPB (C-TAM-TPB),
vi. Motivational Model (MM),
vii. Model of PC Utilization (MPCU), and
viii. Social Cognitive Theory (SCT).

UTAUT has four pillars, which are performance expectancy, effort expectancy, social influence, and facilitating conditions (Venkatesh et al., 2003). Users of technologies, such as AI, expect performance to reach certain for adoption. The expected and attested performance determines the number of users and their interest in the given technologies. The performance influences the extent of adoption and use of the technologies. The extent to which technologies perform determines the extent to which the given technologies impact on users, the society and other societal systems. Since

AI models and algorithms are digital, they are bound to perform much more than human beings could do. Since humans are not computers, they cannot perform as much as computers do. So, the performance speed or extent of AI and other cutting edge technologies motivates their adoption as well as the advocacy for their adoption.

The implication of the foregoing is that expectations are the drive of technology adoption. Beyond performance expectations, efforts are expected too (Oluwamayomikun & Oparaku, 2023). The extent to which efforts are required also determines users' interest in technologies. Prospective users weigh or preempt the efforts to be put into the innovations they are to adopt. That is, when the required efforts are much more than the expected results, prospective users are likely to be discouraged. This means that the expected efforts, like the expected performance, motivate individuals to the adoption of AI and other technological innovations. Further, social factors are some other pillars of UTAUT, which motivate users to adopt technologies and other innovations. Thus, social factors influence or determine the adoption of AI. The factors include social contexts and impact, worldviews, interests, attitude, perception, peer influence, worldviews, and social status.

The facilitating conditions, noted by Venkatesh et al. (2003), are the enablers of technology adoption. The conditions, which facilitate the adoption of innovations are the motivating factors, encourage the adoption of technological innovations like AI innovations. On the whole, as AI offers optimization, automation, reformation, improved and satisfactory services, modernization, efficacy, innovations, safety, personalized experiences, and quality, it continuous gain attention. These offers are what ground the four pillars of UTAUT. AI is a worthwhile technological innovation that meets users' expectancies; exerts huge influence and gains influence among individuals; and there are motivating conditions for its adoption. Thus, UTAUT aptly suits and grounds the present study, because its postulations and pillars apply to and obtain in AI adoption in the healthcare sector.

Related Studies

Studies, such as Thuraka (2022 & 2021), Pasupuleti (2022), Pasupuleti and Inyang (2022), Islam (2021), and Litwin (2020), demonstrate that AI and other cutting edge technologies have been exerting significant impact on the healthcare sector in USA as well as other nations, which include the UK. The study by Hossain et al. (2016) emphasizes that researchers should deploy newer and better approaches to measuring the integration of technologies into various traditional systems and activities in order to increase the realization of innovations. Podemska-Mikluch (2018) and Thuraka (2022) explain the critical role played by Medicare and Medicaid in the integration of technological innovations into the healthcare systems of the US. The studies prove the extent of their role to be at a significant extent. They lend credence to the present study.

As Yigit et al. (2018) confirm, the factors behind the low integration of AI technologies into the healthcare sector include AI privacy invasion, causing loss of jobs for humans, safety and fairness concerns about AI, violating ethics and human rights, and posing threats to data security. Lukovich (2023) and Cudzik and Radziszewskí (2018) observe that since AI requires voluminous data for high results, its adoption is constrained by data volume. This is because the higher the data, the better the results generated by AI. Studies, such as Mohammadzadeh et al. (2023), Hutchings (2020), British Medical Association (2019), Castle-Clarke (2018), and Barmier (2018), identify the following constraints to the adoption of AI into the health systems:

- Ethical issues of data security and privacy
- Low training and support to personnel
- Financial or funding constraints alongside poor budgeting
- Resistance to innovations by healthcare professionals
- Shortage of resources or resources
- Stakeholder differences, lack of collaboration, and inadequate communication
- Regulation complexities
- Poor monitoring and evaluation
- Organizational structure and internal leadership lapses aggravated by external factors.

NHS (2021) and Romanelli (2016) confirm that many governments and their agencies in-charge of healthcare systems are revolutionizing the healthcare sector by ensuring significant integration of AI and other new technologies. They do so by making concerted efforts to automate, optimize, develop, improve, and transform their healthcare systems in line with their national values and interests. In the same vein, Thuraka (2022) states that since healthcare systems are critical to all nations, governments of various nations consistently make efforts to improve their healthcare systems and thereby integrate technological innovations into the healthcare sector. The innovations include big data, precision medicine, artificial pancreas, smart inhaler, medicines for rheumatoid arthritis, and cancer medicines. These are represented in the following diagram:

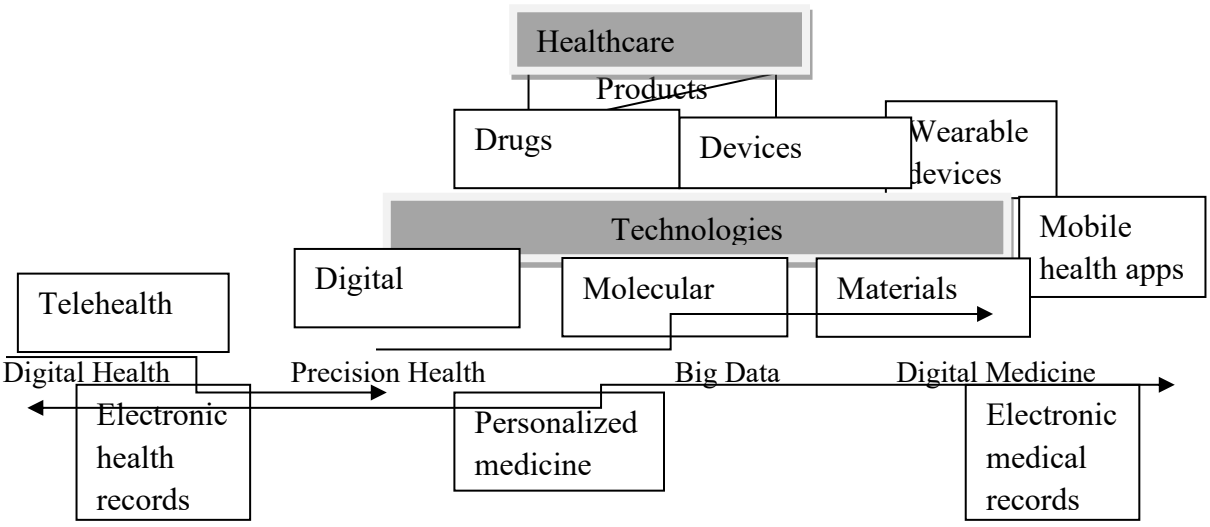


Fig. 1: Healthcare Services and Technologies
Source: Thuraka (2022)

Heart and Kalderon (2017) are of the view that integrating technologies into the healthcare sector can help address issues of high costs of healthcare services and resources. Similarly, Windrum et al. (2016) prove that the integration of technologies into the NHS UK has led to the attainment of technological innovations, reformations, improved and quality healthcare services, and seamless access to healthcare services and resources. Again, Thuraka (2022) symbolically presents the following benefits of technology integration into the healthcare sector:

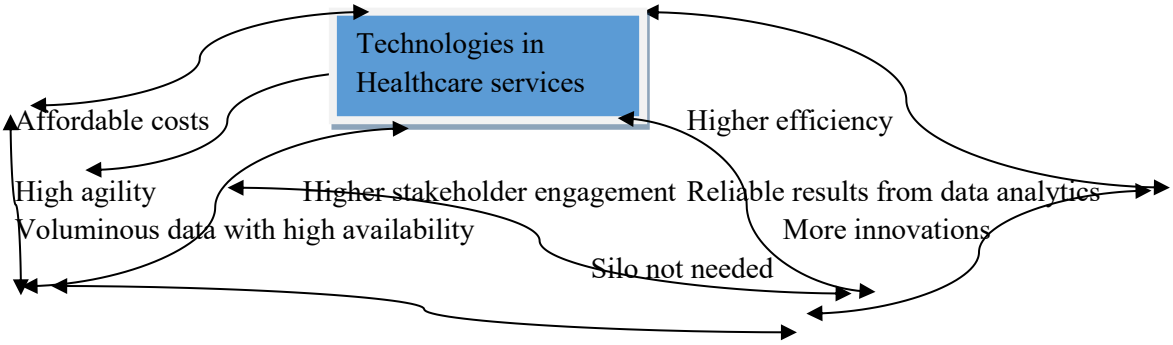


Fig. 2: Core impacts of technological innovations on the healthcare Sector
Source: Thuraka (2022)

Furthermore, Bhuiyan et al. (2021) examines Internet of Things in healthcare security, showing that this subfield or technique of AI is capable of ensuring maximum security in the healthcare sector. Similarly, there are many other studies that confirm the capacity of IoT to revolutionize healthcare systems. These include Ullah et al. (2021), Farahani et al. (2020), Sharma and Tripathi (2020), Selvaraj and Sundaravaradhan (2019), Yang et al. (2019), Chacko and Havajneh (2018), Khan (2017), and Al Alkeem et al. (2015). Accordingly, Ullah et al. (2021) explore healthcare data secure aggregation and transmission through IoT. Their study examines fog computing based architectures and secure transmission strategies, proving them to be AI techniques capable of securing medical data from unwanted access. Sharma and Tripathi's (2020) study shows that IoT is effective in securing data in the healthcare sector, as its techniques detect, predict and resist threats to the data.

Also, Selvaraj and Sundaravaradhan's (2019) study shows that IoT has more advantages than disadvantages, and can effectively secure large data in the healthcare sector through stringent encryption. This means that IoT can ensure data privacy in the sector. The study by Yang et al. (2019) proves that IoT proffers high level of security and protection to data in the healthcare sector. Thus, data management can be automated, optimized and perfected by IoT, a subfield of AI. In the same vein, Chacko and Havajneh's (2018) study demonstrates that IoT plays a critical role in the healthcare sector in terms of the extent to which its devices provide security to healthcare data and resources. The role borders on high level of security, improved and efficient services. Khan (2017) demonstrates that IoT has the capacity to safeguard and monitor healthcare systems using radio frequency identification, guaranteeing highly reliable performance in the healthcare sector.

Furthermore, Al Alkeem et al. (2015) have proven the extent to which IoT devices can ensure safety in the healthcare sector to be of high extent, thereby increasing efficiency in the sector. The study by Xu et al. (2021) reveals that blockchain technology has the capacity of securing, optimizing and managing data in the healthcare sector. Farahani et al. (2020) show that healthcare smart wearable devices of IoT are viable mechanisms for addressing cybersecurity threats to healthcare systems and for improving human services in the sector. Kiruba and Vijayalakshmi (2018) also show that symmetric algorithms, including Blowfish, DES, 3DES, and AES, are viable means of ensuring as well as attaining advanced encryption standards (AES) and tackling the effects of IoT-based healthcare applications. Finally, for Alghanim's et al. (2017) study, smart city health services can obtain at a significant extent with the use of IoT devices. The result-oriented and problem-solving capacity of IoT, affirmed by the foregoing studies and many others, is a pointer to the capacity of AI to produce high-level results and solutions to pressing problems and medical procedures in the healthcare sector.

Methodology

Survey design and multistage method were employed. Online questionnaire was used to obtain the primary data, whereas library and internet print resources were relied on for secondary data. The questionnaire was administered on 2 large WhatsApp groups having different nationals, with those living in US and UK dominating other members in terms of population. When posted on the groups, the researcher made a follow-up post requesting that only members living in the US and the UK should help fill the questionnaire electronically and anonymously.

Upon reaching 200 in each of the 2 groups, members were informed to no longer fill the questionnaire, if anyone still intended to do so. Another request was posted on the groups for volunteered and anonymous experts in Measurement and Evaluation, English Language and Linguistics, and Research. In other words, from the 2 Whatspp groups, 2 experts in Measurement and Evaluation unknown to the researcher evaluated and validated the techniques, thereby confirming the reliability of the instruments. Also, 2 independent researchers were given the draft to critically assess it so as to prove ethical considerations or otherwise.

These include subjecting the draft to plagiarism tests, copyright checks, and cross-checking and validating references and structural inadequacies. Lastly, editorial checks for language blemishes were done by 2 volunteered experts in English Language and Linguistics. Finally, the 400 responses were subjected to a critical analysis. Content, thematic, descriptive and statistical analyses were employed. The techniques employed include simple random and representative sampling, Likert five-scale coding, figures, tables, percentage, interpretive devices, objectivity and criticality. These build the quality of the work.

Data Presentation and Analysis

Table 1: AI has been exerting significant positive impact on the healthcare.

Variables	Freq.	%
Strongly Disagreed	35	8.8
Disagreed	48	12
Neutral	26	6.5
Agreed	96	24
Strongly Agreed	195	48.7
Total	**400**	**100**

Source: Author's Field Survey, 2023

Clearly, the data in Table 1 validate the hypothesis 1 "AI has been exerting significant positive impact on the healthcare" to be true. The affirmation, given by 96 (24%) and 195 (48.7%) respondents for Agreed and Strongly Agreed, implies that majority of the

respondents confirmed that AI has been revolutionizing the healthcare sectors of the US and the UK positively. The other sets of responses are statistically small and insignificant.

Table 2: AI has been significantly revolutionizing the healthcare sector at a large extent.

Variables	Freq.	%
Strongly Disagreed	51	12.8
Disagreed	82	20.5
Neutral	-	-
Agreed	141	35.2
Strongly Agreed	126	31.5
Total	**400**	**100**

Source: Author's Field Survey, 2023

The hypothesis 2 was validated by 267 (66.7%) respondents. Out of the 267 (66.7%), 141 (35.2%) chose 'Agreed', while 126 (31.5%) indicated 'Strongly Agreed'. Their two opposite variables recorded 51 (12.8%) and 82 (20.5%), which are statistically inconsequential. Therefore, the gathered that AI has been significantly revolutionizing the healthcare sector in US and UK at a large extent.

Table 3: AI has been revolutionizing the healthcare sector by automating, optimizing, innovating, improving and developing the sector.

Variables	Freq.	%
Strongly Disagreed	-	-
Disagreed	55	13.7
Neutral	31	7.8
Agreed	142	35.5
Strongly Agreed	172	43
Total	**400**	**100**

Source: Author's Field Survey, 2023

As evident in the Table 3, AI is confirmed to have been revolutionizing the healthcare sector of US and UK by automating, optimizing, innovating, improving and developing the sector. This finding applies to the application of AI to the healthcare sector of any other nations of the world. These ways, in which AI has been revolutionizing the healthcare sector, are the core functions and beneficial impacts of AI on the sector. The finding is established from the responses of 314 (78.5%) for

'Agreed' and 'Strongly Agreed', as against 86 (21.5%) responses for 'Disagreed' and 'Strongly Disagreed'.

Table 4: AI has been revolutionizing UK and the US healthcare sectors at a high extent.

Variables	Freq.	%
Strongly Disagreed	15	3.8
Disagreed	65	16.2
Neutral	86	21.5
Agreed	87	21.8
Strongly Agreed	147	36.7
Total	**400**	**100**

Source: Author's Field Survey, 2023

Given the data in Table 4, it is established that AI has been revolutionizing UK and the US healthcare sectors at a high extent. The finding is obtained from 234 (58.5%) respondents, as against 166 (41.5%). The decision rule is based on the statistical prominence of the 234 (58.5%) over the 166 (41.5%) contrary responses.

Conclusion

This study has explored and determined the extent to which AI has been revolutionizing the healthcare sector in general, and UK and US healthcare sector in particular. It has shown that AI has been revolutionizing the healthcare sector at a significant extent. Its beneficial functions in the sector include automation, optimization, innovation, improvement and development of traditional practices, activities and procedures as well as the sector as a whole in various regards.

Sequel to the critical role played by AI in the healthcare sector, technological innovations, efficiency, safety, resilience, worthwhile professionalism, best practices, regulatory compliance and patient satisfaction are realized at an appreciable extent. Therefore, to harness more benefits of AI in the healthcare sector, stakeholders have to increase the integration of AI models into healthcare services; work collaboratively to address the constraints posed by stakeholders' unfavorable attitudes and clashing interests to AI adoption in the sector; and Government and its agents and private sector partners should fund personnel training and adequate provision of AI-driven resources and procedures in the sector.

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