

# The Impact of AI in the UK Healthcare Industry: a Socio-Technical System Theory Perspective

Molly Holdsworth<sup>1</sup>, Fatema Zaghoul<sup>1</sup>

<sup>1</sup> University of Southampton, Southampton Business School, UK

## Abstract

Artificial Intelligence (AI) and similar technologies are becoming more and more common in business and society, and they are starting to be used in healthcare. Many facets of patient care, as well as administrative procedures, could be changed by the adoption of these technologies. Drawing on the socio-technical system theory, we explore the impact of AI in healthcare in the UK, through conducting qualitative research combining virtual semi-structured interviews and internal document analysis with healthcare companies who have developed their own AI-based applications. The study sought to explore an under-researched area of work and unearth the benefits and challenges of AI in healthcare organizations, as well as the impact on healthcare professionals' work.

## Keywords

Artificial Intelligence, healthcare, socio-technical system theory, health IT

## 1. Introduction

This paper presents research-in-progress exploring the impact of Artificial Intelligence (AI) in the UK healthcare industry, via a socio-technical system (STS) theory lens.

Advancements in AI have created new possibilities for addressing a variety of healthcare-related problems [1]. In 2020, a Deloitte report [2] claimed that the integration of AI into European healthcare systems has the potential to save up to 212.4 billion euros in annual healthcare expenses while also saving up to 403,000 lives. In this context, AI has the potential to play a significant role in addressing significant challenges in this context, such as resource shortages, increasing demand, and workload issues.

The UK National Health Service (NHS) have been focusing on adopting AI in order to reduce waiting time and increase efficiency [3]. Clinical data can be used by AI systems to improve diagnostic precision, enabling healthcare professionals (i.e. doctors) to provide patient-centered medical treatment and eliminate variations across the country. In April 2019, the UK government funded a new support system for the NHS, called NHSX [4], which specializes in the digital transformation of the NHS. Recently, they received funded to create the NHS AI Lab, to utilize existing AI technology and implement it into hospitals, to enhance the overall performance of the organization and delivery of care [5]. The significance of AI has been stressed, particularly in light of the pressure Covid-19 placed on the healthcare sector.

Despite the continually growing interest in, and research on, AI in healthcare, there is a significant gap in our knowledge in terms of the impact of AI on healthcare-related work, how to address implementation challenges, and how to increase the likelihood of sustainable adoption and acceptance in practice [6]. The majority of research on AI in healthcare have concentrated on testing proof-of-concepts, ethical and legal challenges, and algorithm development. Furthermore, recent AI systems have fallen short of their proposed objectives as they are generally created from a technical standpoint,

---

8th International Workshop on Socio-Technical Perspective in IS development (STPIS 2022), 19-21 August, 2022, Reykjavik, Iceland

EMAIL: mollyaholdsworth@gmail.com (Molly Holdsworth); fatema.zaghoul@soton.ac.uk (Fatema Zaghoul)

ORCID: 0000-0002-8626-807X (F Zaghoul)



© 2022 Copyright for this paper by its authors.

Use permitted under Creative Commons License Attribution 4.0 International (CC BY 4.0).

CEUR Workshop Proceedings (CEUR-WS.org)

with consideration of how they provide value, and fit into organizational practices and the system workflow/ healthcare delivery (where technological and social elements are intertwined), being a secondary concern [7].

This study aims to better understand the impact of AI and the interactions between people and AI systems in a complex and high-stress organizational environment [6]. We address the gap in the information systems (IS) literature calling for a better understanding of innovative configurations of human-machine work in organizational contexts [8]. These revelations, experienced by relevant stakeholders, can aid in creating cooperative environments for intelligent and human agents, as well as move our understanding of the impact of AI beyond the realm of conjecture.

We, therefore, aim to answer the following research questions: *How does AI impact healthcare professionals' work?* And, *What are the perceived benefits and challenges caused by AI within the healthcare industry?*

The remainder of this paper is structured as follows: the next section presents the background and related literature, followed by a description of the theoretical framing and methodology. Next, the preliminary findings are presented and discussed. Finally, we provide a brief conclusion and outline the future plan for the study.

## 2. Background

This section commences with a short overview of AI. The impact of AI in the healthcare industry, as well as the challenges, are discussed.

### 2.1 Artificial Intelligence

Charniak [9] identified three basic elements of AI, including the '*Human Element*' which is the link between human and machine; '*Knowledge Base*', the phenomenon of 'the more data entered into the machine, the more exact the outcome will be'; and finally, the '*Algorithm Set*', which is required in order to send instructions to the AI interface.

According to Haenlein and Kaplan [10: 5], AI refers to a "*system's ability to interpret external data correctly, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation*". This definition does not emphasize a specific technology, but rather takes an integrative approach to the fundamental elements that characterize the AI phenomenon, consistent with the definition proposed by Mikalef and Gupta [11: 3]: "*the ability of a system to identify, interpret, make inferences, and learn from data to achieve predetermined organizational and societal goals*".

In the healthcare context, AI can employ complex algorithms to 'learn' and gain insights from a large volume of healthcare data, and then apply them to improve and assist clinical practice. Some AI healthcare devices can perform a role that generally involves human decision-making and interpretation.

### 2.2 Impact of AI within the Healthcare Industry

The significance of AI in healthcare, particularly in medical informatics, was emphasized by many scholars [e.g. 1, 6, 7]. Emerging technologies that recognize the complexity of hospital operations and deliver the required patient care and addresses resource constraints are becoming more and more critical. It is argued that AI has the ability to enhance patient care and diagnoses, as well as interpret medical imaging effectively in fields like radiology. Furthermore, AI has the potential to enhance the accuracy and effectiveness of screening for breast cancer and other related conditions [1]. Although these studies highlight the positive impact in the healthcare industry, we still do not fully understand the boundaries of reliance on AI, and the impact on healthcare professionals' work.

#### *Impact on Healthcare Professionals*

The limited current empirical studies conducted on AI in the public sector has concentrated on how technology can change the workforce [6]. Four categories have been used to group the impact of AI

adoption and use. These are: *augmenting*, where AI increases the productivity of employees by enhancing their skills; *replacing*, where AI completes a job that was previously done by a person in its entirety; *splitting up*, where AI assists in dividing a task into smaller tasks and carries out as many of these as possible, while a human completes the remaining tasks; and *relieving*, where AI carries out mundane tasks, relieving healthcare professionals for more important responsibilities.

Reviewing the literature shows that AI can have both a positive and negative impact on healthcare professionals' work. For instance, a study designed to obtain doctors' views regarding AI revealed that some doctors believed the AI system saved them time that was usually spent on repetitive or mundane tasks, whereas other doctors felt their knowledge and skills were undermined [12]. For this subsection, the issues of disruptive technology and productivity will be discussed to understand the impact AI has on healthcare professionals.

#### *AI as a Disruptive Technology*

Grewal et al. [13] suggest that there is a dark side to AI implementation; AI may raise concerns among numerous stakeholders. For instance, the use of AI within Neuro-Oncology has revolutionized the accuracy of MRI scans by using machine learning (ML), whereby non-invasive tools replace the orthodox methods for tumor classification. Suggestively, AI can be more beneficial in comparison to a neurosurgeon or radiologist [1], hence, creating a disruption for experienced healthcare professionals.

Furthermore, AI has also been implemented into the field of nursing, causing challenges for current practicing nurses in terms of AI being able to deliver personalized patient care for a lower cost. However, some studies suggest that nurses should support AI adoption in the workplace since it can broaden their knowledge and improve their ability to deliver compassionate care. Suggestively, AI may not be as disruptive to all healthcare professionals since there is the potential to enhance knowledge and improve care delivery. Nevertheless, this relies on our understanding of human-AI interaction and how that could be enhanced, along with how AI could support existing ways of working and performance (how both AI and human intelligence can co-exist) [14], where there is currently limited research.

#### *Productivity*

The growth of AI has provided the opportunity of using aggregated healthcare data to create advanced models that can enable a precise approach to medicine and automate diagnosis in a dynamic and timely manner. AI has the potential to ease the pressure of increasing demand by providing operational, analytical, or machine-led diagnostic capacity which can enable healthcare professionals to prioritise workloads.

From an organizational management perspective, the implementation of AI in healthcare can be valuable in terms of facilitating information sharing within and across healthcare organizations, given the necessary technological infrastructure [11] and ethical/ legal considerations are in place [6]. Studies have revealed that AI applications and algorithms can improve back-office functions, enhancing patient experience and care, while saving resources by reducing inefficiency. There is a consensus that AI can reduce the workload of healthcare professionals, potentially improving the HR crisis within the UK healthcare industry, but further research is needed to understand the 'shift' or 'elimination' of work tasks that occurs as a result of the implementation [15].

### **2.3 Challenges to AI implementation in the Healthcare Industry**

Many organizations have failed to realize the anticipated value despite the prospects provided by medical AI systems, including automation, augmenting human intelligence via analytics capability, process efficiency, and forecasting clinical demands during the pandemic. In the public healthcare context, Sun and Medaglia [6] identified seven dimensions of perceived challenges, from the perspective of IT firm managers providing the AI-based solution, government policy-makers, and hospital doctors/managers. These include ethical challenges, economic challenges, political, legal, and policy-related challenges, organizational and managerial challenges, social challenges, technological challenges, and data challenges.

Similarly, Dwivedi et al. [1] assert that a variety of organizational and managerial challenges are caused by the move towards embracing AI technologies. For example, it can be challenging for

organizations to integrate AI-based applications with their current workforce and day-to-day operations. Having said that, the best ways to establish collaborative intelligence capabilities are not well understood nor are they commonly known [14].

Furthermore, some studies revealed that one of the main barriers associated with the diffusion of AI technologies in the healthcare industry is related to the threat it creates to healthcare professionals. Human employees have a limited awareness of how AI systems may affect their professions, which is a result of a lack of trust [16] as well as poor AI knowledge, competence, and skills. Consequently, employees may feel uncertain and have negative perceptions, which will affect their performance [6, 14].

Consideration also needs to be made to the gathering, storing, and sharing of large volumes of healthcare datasets generated by AI technology as it can create ethical challenges related to data ownership, governance, algorithmic transparency, standards, quality, and safety [17].

### 3. Socio-Technical System (STS) Perspective

The socio-technical approach implies that the technical and social subsystems of work cannot be decoupled and are inter-related; the compatibility and interaction between the two sub-systems determine the effectiveness of a work system. The technical subsystem is concerned with “*the processes, tasks, and technology needed to transform inputs to outputs,*” and the social subsystem is concerned with “*the attributes of people (e.g. attitude, skills, values), the relationships among people, reward systems, and authority structures*” [18: 17]. Here, we view the technology (i.e. AI) as a component of the ‘work system’ (Figure 1).

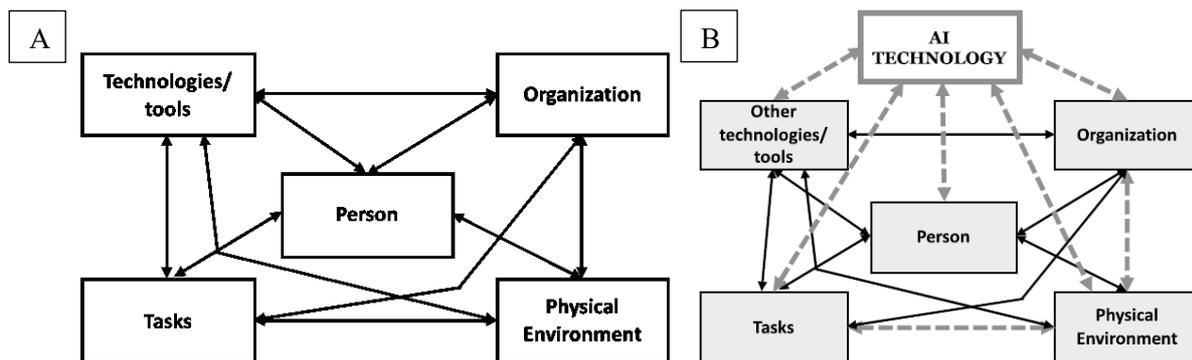


Figure 1. (a) Model of the work system; (b) AI implementation into the work system (adapted from Salwei et al. [19])

Any technological change (i.e. implementation of AI) has an impact on the overall work system (negative or positive) which ultimately affects the individual (i.e. in this case, the healthcare professional) [20] and workflow integration. Positive outcomes (e.g. use and acceptance) are more likely to occur when the technology is integrated in the workflow, while a lack of integration could lead to negative outcomes (e.g. increased workload, frustration). It is argued that AI must be designed in such a way that is integrated with the system elements to support employee workflow rather than impede it. This requires systemic evaluations and considerations of system elements, including their interactivity, as well as taking into account numerous layers and dimensions of workflow integration [19].

Existing AI research focuses primarily on the development of the AI technology while paying little attention to other components of the work system or the environment/ context of use; which has resulted in multiple challenges when such technologies are implemented [6,7,19].

## 4. Methodology

### *Approach*

After reviewing the literature and identifying the gaps, a qualitative research approach based on semi-structured interviews and document analysis, was deemed most appropriate. Qualitative research methods involve the study of subjects in their natural settings in order to interpret phenomena and the meanings individuals attribute to them. The fundamental goal “*is to understand those being studied from their perspective*” [21: 23].

A total of five semi-structured interviews were conducted with participants from three different organizations. Interviews lasted on average 45 minutes and each interview was recorded, transcribed and annotated. Participants were selected based on the AI application developed and deployed at one or more NHS sites in the UK, their role, knowledgeability for the study topic, and experience in using and/or designing the AI system.

Due to current circumstances of Covid-19, interviews were conducted via Google Meet and Zoom. Table 1 highlights the background of the participants.

**Table 1**  
Participant Background

Organization	Job Title	Experience in using AI solution(s)/ Years	Participant Code
A	Clinical Fellow (1)	2	P1
A	Clinical Fellow (2)	2	P5
B	Chief Operating Officer	>7	P2
B	Chief Scientist	>7	P3
C	Managing Director	4	P4

### *Data Analysis*

Guided by the research questions and theoretical lens (i.e. STS), a set of initial codes were applied to the data. We also created additional codes, derived from open coding, that added to an understanding of the impact of AI on healthcare professionals’ work, challenges, and benefits, as framed by participants (in an inductive manner). This was followed by performing axial coding, where we categorized and organized the codes into interpretive concepts. Finally, we performed selective coding by aggregating the second-order codes into overarching theoretical constructs.

During data collection and analysis, the research team met often to review the emerging themes and ensure trustworthiness and rigor, in addition to developing a contextually specific understanding.

### *Background of AI Applications from Interviews*

For this research, two of the companies who participated in the interviews have developed their own AI-based applications. Table 2 provides a brief description of the AI applications.

**Table 2**  
Description of AI Applications

Company	AI Application	Description
<b>Organization A</b>	Dora	Dora is the first UKCA marked automated AI led clinical conversational agent that can conduct routine conversations with patients. This utilizes a combination of AI-enabled speech-to-text, natural language processing (NLP), conversation engine and text-to-speech systems. Dora is currently implemented in five NHS trusts in the UK: Oxford (cataract), Imperial (cataract), Buckinghamshire (cataract), St Georges London (Head and Neck), and University Hospitals Leicester (wait list, long Covid, spine).
<b>Organization B</b>	Symptom Checker	This company developed an AI-based application that is a self-care platform. It utilizes the form of a chatbot on a mobile phone and allows individuals to indicate their symptoms. Based on the symptoms, the app will suggest what the possible causes are and recommend next steps (e.g. seeing a doctor).

## 5. Preliminary Findings & Discussion

This section presents and discusses the findings obtained so far. Generally, participants believed that AI can have both a significant positive and negative impact on the healthcare industry and their work. However, the overall perception was generally positive. The interviews revealed the importance of having technological advancement, such as AI, since there are numerous underlying health information management issues within the UK healthcare industry which AI would have the potential to improve.

Our analysis, so far, revealed four key themes in relation to the research questions: (1) human intelligence vs. AI, (2) pull-factors for AI, (3) the potential to improve the healthcare industry with AI, and (4) the challenges and barriers of AI.

### Human Intelligence vs. AI

When asked if AI could improve the diagnosis for patients, the prominent theme that kept arising was the challenge of AI being able to perform at the same standard as healthcare professionals.

P3 stated that:

*“We're not there yet. But over time, we'll certainly be as good. We're certainly, at the moment, not as good as a doctor when it comes to telling you what your next step should be based on your symptoms”.*

Participants revealed that AI is not of the standard of qualified doctors and nurses. In conjunction, AI has been primarily implemented as “*assisted intelligence*” or “*augmented intelligence*” whereby the AI technology assists healthcare professionals. “*Automated intelligence*” and “*autonomous intelligence*”, where no human intervention is required, is far less observed in the UK context.

Having said that, in some circumstances, there is the potential to create advanced algorithms that allow AI to conduct tasks if not better than healthcare professionals. For example, a study investigated the implementation of robots within the healthcare industry to deliver (or support) surgical procedures, care, and therapy, and found that robots are able to complete surgeries with 90% accuracy and increase operative time in comparison to trained surgeons, resulting in a lower mortality rate [22]. Arguably, this study only represents a small sample, and one ‘type’ of AI solution, questioning the generalizability of the findings. Nevertheless, these arguments are consistent with other studies that have indicated that not only do robots improve the success rate of surgeries, but they also create a better experience for the patient, since robotic surgeries are less invasive. Accordingly, reducing the risk of trauma and recovery time, as well as making post-operative care easier [23].

Opposingly, P1 contradicted P3’s statement and mentioned that AI is currently able to perform better than healthcare professionals in some respect.

*“The difficulty at one of the hospital sites was that the patient numbers were increasing, and it was becoming increasingly difficult to ensure that all patients got that telephone review at three weeks, which is when they're meant to get their review. AI obviously or the automated Dora means it doesn't have any capacity concerns”.*

Having said that, this may be possible because the ‘type’ of medical service offered can benefit from AI automation:

*“...because it's quite a low-risk procedure [those who underwent cataract surgery] and it's kind of very standardized and amenable to kind of automation because it's kind of quite repetitive” (P5)*

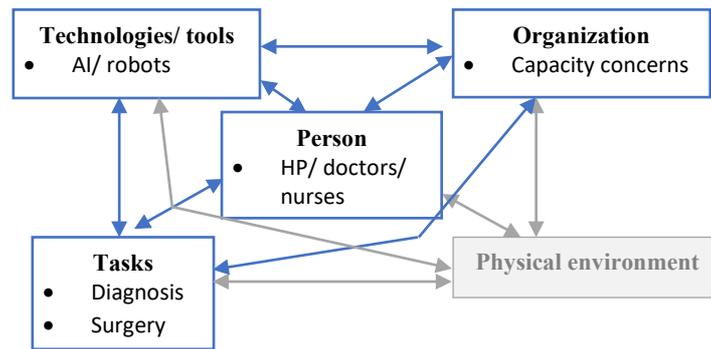
The interviews also revealed that AI can resolve/ address some of the (*sometimes unintentional*) performance issues (e.g. fatigue, prejudice) created by healthcare professionals.

Furthermore, AI can enhance the efficiency of the healthcare industry by reducing time spent on certain tasks, as well as, reducing costs. For example, the symptom checker app uses NLP and ML in order to identify the potential condition in which patients’ symptoms relate to. This is particularly interesting finding since P2 said;

*“It became very apparent that doctors are very inefficient at putting information into their computers, and it then became apparent that doctors don't actually diagnose... they take a risk assessment”.*

In relation to the above point, AI has the potential to be just as useful within the healthcare industry. Studies have found that AI powered diagnostic systems (i.e. Organization B), are able to diagnose patient accurately and more safely in comparison to a doctor. However, other scholars argue that although AI may be less biased and more reliable, doctors provide empathy in consultations which might be crucial for some patients, especially those who are being diagnosed with a life-threatening condition.

The human intelligence vs AI discussion demonstrates the interactions between *tools/technologies*, *tasks*, *person*, and *organization*; these system elements are illustrated in Figure 2.



**Figure 2.** Human Intelligence vs. AI Interaction within the Healthcare Industry

Pull-factors for AI in the healthcare industry

Some scholars have agreed that AI has the ability to improve performance in healthcare, since it is not limited to managing a small amount of data, instead it can process and transfer information quickly and effectively, leading to a more accurate diagnosis for patients. Consistent with this, P2 states:

*“AI just makes everything more efficient; it means that designing programs just makes things more efficient, making things more efficient for the user”.*

The healthcare industry is suffering from a HR crisis due to the fact that the ratio of patients to doctors can be as unbalanced as 5:1. Suggestively, the above quotation highlights the importance of enhancing productivity, as this could reduce the number of staff, or time, required for one patient, while not compromising the level of care provided.

*“I think there will always be a certain proportion of clinical tasks that will need a human, there may be 80% that could be done by AI, which means that what was done by 5 humans, only needs to be done by 1”.* (P5)

Although this could be seen as a pull-factor, it may also be recognized as a challenge to the adoption of AI in certain healthcare professions where it could lead to unemployment [6,13,14].

Additionally, participants raised that a significant pull-factor within the healthcare industry is the ability to reduce the existing pressure on healthcare professionals since AI will allow them to reduce time spent on each task and ensure the quality of primary care.

*“In healthcare, people understand that capacity is a massive issue, we can see that there is not enough staff to deal with what is an ever-increasing workload”* (P1)

*“CT scans or MRI scans of people’s bowels takes a very skilled radiographer to be able to understand whether the disease is stably progressing... it takes about 14 minutes per patient... the AI program can do it in 30 seconds with a higher degree of accuracy than any clinician” (P4)*

There is also the argument that implementing AI in the healthcare industry can create new jobs. For instance, P3, who aided developing a symptom checker app said;

*“Without AI, we wouldn't be doing what we're doing”.*

Contrastingly, Davenport and Kalakota [24] suggest that 35% of UK jobs could be automated by AI in the next 10-20 years. P1 and P4, respectfully, mentioned this adverse impact on the healthcare industry (to a certain degree) in their responses;

*“Diabetic retinopathy...whereby every diabetic patient is offered a photograph of their retina... this is looked at by not necessarily doctors but people who have had some training but there have been many kinds of AI algorithms that have been designed to read these photographs... the screeners feel they may lose their jobs or be replaced by AI” (P1)*

*“An alternative to surgery in benign prostate disease and there was some discussion among surgeons that it would be threatening to the jobs but that is always a minority” (P4)*

The development and implementation of AI is causing anxiety to healthcare professionals since many of the mundane jobs are becoming automated [6, 13] and, therefore, there is the risk that AI could displace over 75 million jobs this year alone. It could be argued, however, that although this might seem threatening, healthcare professionals’ jobs will most likely not be fully replaced on a large-scale since their skills and sense of empathy is still required within healthcare due to the sensitivity of patients’ illnesses and the need for a strong support system.

#### *The potential to improve the healthcare industry with AI*

Participants emphasized that AI has the potential to improve many elements within the healthcare industry through its unique attributes and abilities.

One way in which AI is able to improve the healthcare industry is by making diagnosis more efficient. P2 states;

*“So, one of the things we do is we can create a report saying all these all the things that the patient has, these are all the things patient doesn't have and that would certainly make consultations more efficient and make diagnosis more efficient”*

Scholars have highlighted that AI based computer aided detection software used in radiology and imaging has been found to detect 56%-70% of lung lesions which were originally missed by doctors. Moreover, consistent with this finding, other scholars have stated that using AI and traditional medical software cooperatively, can significantly improve the diagnostic process and the overall accuracy of the diagnosis. Additionally, deep learning (DL) algorithms used in cancer diagnosis have been found to be more efficient in comparison to cancer specialist dermatologists. These findings are consistent with the insights revealed in our research.

All participants believed that AI can eliminate bias in healthcare. For example;

*“What AI and patient databases allow to happen is the AI bots go into the data without prejudice or without any understanding, and they find the patterns” (P4)*

*“Doctors have bad days, AI won't have bad days, and AI won't be prejudicial” (P2)*

Unearthed through the lens of STS, it was evident from the interviews that there is the potential to improve management and efficiency-related aspects in this context. P1 states:

*“It will mean that hospitals will work more regionally, so at the moment they work just as their one, but you can see how AI would do a task rapidly across a whole region”*

Accordingly, AI could improve the way in which the healthcare infrastructure, such as hospitals and GP clinics, can transfer data to ensure that the delivery of care is more efficient. AI, as advanced algorithms, can be in the form of smart watches, whereby healthcare professionals could insert health data which can then be transferred and tracked. Ultimately, this improves the consistency across wards and other hospitals by allowing healthcare professionals to access data immediately, improving safety when providing medication and lastly, improving patients’ knowledge of their care.

With respect to technology adoption in healthcare, the three main inter-relating elements impacting the way in which hospitals operate appear to be *automation*, *value*, and *empathy*. For instance, there is the possibility AI technology could add value, however, simultaneously reducing the element of empathy.

Moreover, P2 suggested that AI has the ability to improve the efficiency and quality of training in healthcare.

*“Clinicians will start to use AI to train themselves... where doctors are tested with symptom checkers”*

It is argued that AI could potentially increase the learning capacity for healthcare professionals and can aid decision-making. Some observed the benefits of AI in medical training. For instance, AI supported technologies have been developed to allow clinicians to practice their surgical skills in a simulated environment. This method of training is practical for this field of work since there is a high-risk when conducting surgery. Therefore, surgeons can build their skills in a safe setting and enhance their quality of care. However, it could be argued that AI cannot fully replace traditional training methods since it is critical for clinicians to interact with human patients to practice certain skills.

### Challenges and barriers to AI

Challenges identified are not limited to ethical and legal concerns and include privacy, integration, reliability and security. Accordingly, with respect to Organization A, participants mentioned that one of the biggest challenges of Dora is related to integration across different NHS trusts:

*“That is quite delaying. You have to go through a lot of technical approval”* (P1)

*“I think the difficulty across the NHS is integrating into pathways. Even if it’s the same conversations, the IT is different, the people are different, the pathways of how these things happen or problems that are reviewed are different”* (P5)

Suggestively, the integration of AI in healthcare is time-consuming and a complex process, thus, raising technical challenges. For instance, there is the requirement to collect large volumes of high-quality data and parameters in order to create a successful algorithm [17]. However, with this requirement comes the risk of obtaining high levels of bias, since different healthcare environments (such as various NHS facilities) have their unique way of operating, gathering, storing, and recording data. Each healthcare organization has developed its own data infrastructure to meet its unique requirements. Consequently, the capacity to provide services to patients across a care continuum inside one organization or across organizational boundaries may be challenging.

Another external challenge that was mentioned includes the concern of costs and lack of funding. Participants revealed how challenging costs are and how they have impacted the adoption of AI in the UK healthcare industry.

*“One of the biggest challenges here is you have got a lot of costs”* (P2)

*“The price of entry is very high... and the cost of doctors is very high”* (P4)

*“The amount of money we spend on that is huge” (P5)*

Below shows P3’s opinion on AI’s barriers to entry in the healthcare industry related to policy and rules/ regulations:

*“I think the pace of change in healthcare can be quite slow... there is lots of red tape and bureaucracy around everything”*

The interviews also indicated a number of internal challenges to AI in the healthcare industry. For instance, implementation challenges related to the lack of necessary technological infrastructure and innovation currently available to support technological innovations or transformations. P2 stated:

*“Most technology in healthcare is substitute, it’s not transformative...It is just a very hard area to innovate in”*

This challenge could be due to the lack of funding healthcare organizations receive within the UK. Furthermore, it was noted that AI in the healthcare industry is still, in some cases, in the developmental stage. If it has been implemented, then it was challenging to set up, required a lot of data and collaboration in order to make it run successfully:

*“The first version of the symptom checker was done on a spreadsheet, just to prove it was possible” (P3)*

## **6. Conclusion and Future Work**

This research-in-progress sheds light onto the current landscape of AI in the UK healthcare industry, highlights the impact of AI on healthcare professionals’ work and the challenges associated with AI implementation. This research contributes by laying the foundations for future work on exploring the impact of AI in healthcare via the lens of STS theory.

So far, the study revealed that AI-based applications are able to understand and transfer data collected from CT or MRI scans and ensure that the diagnosis is accurate and cheaper compared to a healthcare professional. Patterns in the data were identified with AI algorithms, which in turn led to patients being put on the correct course of treatment and care package. This creates a positive impact on the healthcare industry, since it enables a better quality of care and can lead to greater funding for future technological developments, which will then transform the way in which healthcare organizations operate and manage data. Additionally, by adopting AI technology, the NHS would be able to improve health information management by being able to transfer data between numerous Trusts, thus, improving operational performance and organizational management.

Furthermore, the research found that, generally, healthcare professionals embrace various technologies that could reduce their workload. AI can accurately complete routine tasks, saving clinician time and reducing the number of clinicians needed for a specific task. For example, prior to the implementation of Dora (Organization A), there were capacity concerns since only one healthcare professional could call one patient at a time, whereas now Dora is able to call up to 1000 people simultaneously.

Despite the benefits, our findings show that the integration of AI within healthcare may trigger a sense of uncertainty and concern regarding job security. However, it is important to mention that this concern was only found with respect to those who practice repetitive tasks, such as screening programmes and administrative tasks.

The next steps are to validate and further explore the emerging themes through additional semi-structured interviews, particularly with healthcare professionals (e.g. clinicians, nurses) who have been directly and indirectly affected by the AI-based applications.

## 7. References

- [1] Dwivedi, Y. K., Hughes, L., Ismagilova, E., Aarts, G., Coombs, C., Crick, T., ... & Williams, M. D. (2021). Artificial Intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. *International Journal of Information Management*, 57
- [2] Biundo, E., Pease, A., Segers, K., de Groote, M., d'Argent, T., and Schaetzen, E. (2020). *The Socio-Economic Impact of AI in Healthcare*, Deloitte. [Available from: [https://www.medtecheurope.org/wp-content/uploads/2020/10/mte-ai\\_impact-in-healthcare\\_oct2020\\_report.pdf](https://www.medtecheurope.org/wp-content/uploads/2020/10/mte-ai_impact-in-healthcare_oct2020_report.pdf)]
- [3] Rajput, F.A., 2008. Lean thinking and UK Healthcare industry, pp.1-5.
- [4] Coyle, D., Dreesbeimdieck, K. and Manley, A., (2021). Productivity in UK Healthcare During and After the Covid-19 Pandemic. *National Institute Economic Review*, 258(1), pp.90-116
- [5] Kerstein, R., (2020). *NHS X-plained. The Bulletin of the Royal College of Surgeons of England*, 102(1), pp.48-49.
- [6] Sun, T. Q., & Medaglia, R. (2019). Mapping the challenges of Artificial Intelligence in the public sector: Evidence from public healthcare. *Government Information Quarterly*, 36(2), 368-383.
- [7] Reddy, S., Rogers, W., Makinen, V. P., Coiera, E., Brown, P., Wenzel, M., ... & Kelly, B. (2021). Evaluation framework to guide implementation of AI systems into healthcare settings. *BMJ health & care informatics*, 28(1).
- [8] Faraj, S., Pachidi, S., & Sayegh, K. (2018). Working and organizing in the age of the learning algorithm. *Information and Organization*, 28(1), 62-70.
- [9] Charniak, E. (1985). *Introduction to artificial intelligence*. Pearson Education India, pp. 105-108
- [10] Haenlein, M., & Kaplan, A. (2019). A brief history of artificial intelligence: On the past, present, and future of artificial intelligence. *California management review*, 61(4), 5-14.
- [11] Mikalef, P., & Gupta, M. (2021). Artificial intelligence capability: Conceptualization, measurement calibration, and empirical study on its impact on organizational creativity and firm performance. *Information & Management*, 58(3), 103434.
- [12] Martinho, A., Kroesen, M. and Chorus, C., (2021). A Healthy Debate: Exploring the Views of Medical Doctors on the Ethics of Artificial Intelligence. *Artificial Intelligence in Medicine*, 121, pp. 1-10.
- [13] Grewal, D., Guha, A., Satornino, C.B. and Schweiger, E.B., 2021. Artificial Intelligence: The Light and The Darkness. *Journal of Business Research*, 136, pp.229-236.
- [14] Chowdhury, S., Budhwar, P., Dey, P. K., Joel-Edgar, S., & Abadie, A. (2022). AI-employee collaboration and business performance: Integrating knowledge-based view, socio-technical systems and organisational socialisation framework. *Journal of Business Research*, 144, 31-49.
- [15] Bednar, P. M., & Welch, C. (2020). Socio-technical perspectives on smart working: Creating meaningful and sustainable systems. *Information Systems Frontiers*, 22(2), 281-298.
- [16] Andras, P., Esterle, L., Guckert, M., Han, T. A., Lewis, P. R., Milanovic, K., ... & Wells, S. (2018). Trusting intelligent machines: Deepening trust within socio-technical systems. *IEEE Technology and Society Magazine*, 37(4), 76-83.
- [17] Yu, X., Xu, S., & Ashton, M. (2022). Antecedents and outcomes of artificial intelligence adoption and application in the workplace: the socio-technical system theory perspective. *Information Technology & People*.
- [18] Bostrom, R. P., & Heinen, J. S. (1977). MIS problems and failures: A socio-technical perspective. Part I: The causes. *MIS quarterly*, 17-32.
- [19] Salwei, M. E., & Carayon, P. (2022). A Sociotechnical Systems Framework for the Application of Artificial Intelligence in Health Care Delivery. *Journal of Cognitive Engineering and Decision Making*.
- [20] Carayon, P. (2009). The balance theory and the work system model... Twenty years later. *Intl. Journal of Human-Computer Interaction*, 25(5), 313-327.
- [21] Gorman, G. E., and Clayton, P., (1997). *Qualitative research for the information professional: A practical handbook*. London: Facet Publishing

- [22] Reddy, S., Fox, J. and Purohit, M.P., 2019. Artificial Intelligence-Enabled Healthcare Delivery. *Journal of the Royal Society of Medicine*, 112(1), pp.22-28.
- [23] Zhou, X.Y., Guo, Y., Shen, M. and Yang, G.Z., (2019). Artificial Intelligence in Surgery. *Frontiers of Medicine*, pp. 1-28.
- [24] Davenport, T. and Kalakota, R., (2019). The Potential for Artificial Intelligence in Healthcare. *Future Healthcare Journal*, 6(2), pp.94-98.