ADDIS ABABA UNIVERSITY

COLLEGE OF BUSINESS AND ECONOMICS

SCHOOL OF COMMERCE

PROJECT MANAGEMENT GRADUATE PROGRAM

ROLE OF ARTIFICIAL INTELLIGENCE IN CHANGING ORGANIZATIONAL BEHAVIOR OF HEALTH SERVICES: PERCEPTIONS OF PHYSICIANS ON POTENTIAL AND CHALLENGES

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By

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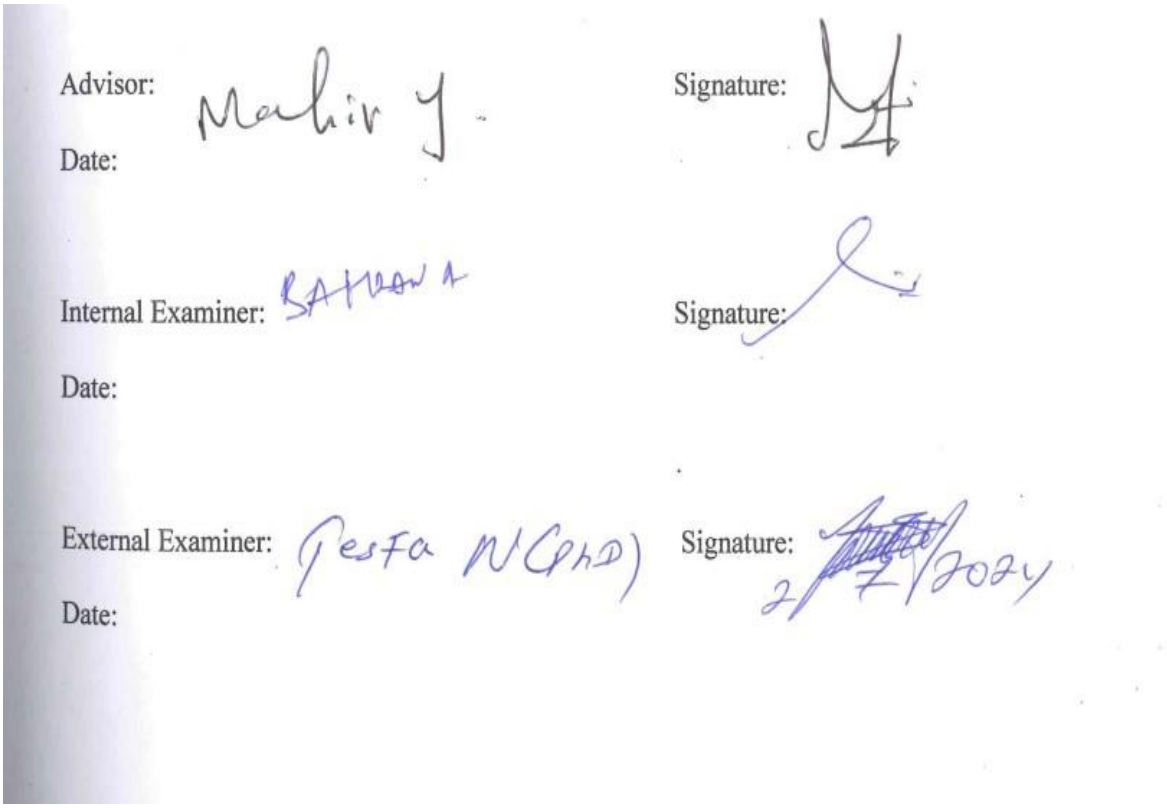
LETTER OF CERTIFICATE

This is to confirm that Aklile Habtemariam's final project work, "ROLE OF ARTIFICIAL INTELLIGENCE IN CHANGING ORGANIZATIONAL BEHAVIOR OF HEALTH SERVICES: PERCEPTIONS OF PHYSICIANS ON POTENTIAL AND CHALLENGES" had been completed and presented to in partial fulfillment of the Master of Arts in Project Management degree requirement in conformity with university requirement and fulfills acceptable criteria in terms of originality and quality.

Signed by the Examining Committee:



LETTER OF DECLARATION

I, Aklile Habtemariam Kassa, certify that this thesis is my original work, which I completed under the supervision of Dr Mahir Jibril. All sources of information utilized in the thesis have been properly credited. I further affirm that the thesis has not been submitted to any other higher learning institution, in part or in whole, with the intention of acquiring a degree.

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Acronyms

AI – Artificial Intelligence

CNN - Convolutional Neural Network

DL – Deep Learning

DHT – Digital Health Technologies

EHR – Electronic Health Records

EAII - Ethiopian Artificial Intelligence Institute

ICT - Information and Communication Technologies

IT – Information Technology

LMIC – Low- Middle-Income Countries

ML – Machine Learning

MPH – Master of Public Health

NLP- Natural Language Processing

RPA – Robotic Process Automation

Abstract

The rapid expansion of artificial intelligence technologies in health care is increasingly evident and are employed for monitoring, detecting and assessing disease risks as well as aiding in diagnosis and treatment decision making. Although countries like Ethiopia could highly benefit from AI, there remains limited understanding among Ethiopian physicians regarding AI, its benefits and associated challenges within the healthcare system. This study with its exploratory study design aimed to fill this knowledge gap by surveying 132 physicians with various background.

Results indicate that 65.2% of physicians are either slightly familiar or unfamiliar with AI in healthcare, with familiarity was found to be significantly linked to age (P=0.03). Only 35.6% of respondents report to have used AI in their work. Use was found to be associated with having educational status of subspeciality and of having surgical specialty background at P=0.02 and P=0.045 respectively. Respondents recognize AI's potential benefits such as enhancing healthcare delivery (79%), improving clinical decision making (72%) and reducing physician workload (87.9%). Concerns include job displacement (42.7%), and reducing professional roles (69.7%). Challenges identified include inadequate regulations on patient data access (59.8%) and high infrastructure costs (48.5%).

Training initiatives are recommended to familiarize physicians with AI and its applications, especially targeting those in their early stages of their career. Moreover, investments in healthcare organizations AI capabilities are proposed to enhance diagnostic accuracy, patient care and operational efficiency. Future research should broaden its focus beyond physicians to encompass other healthcare professionals in Ethiopia, to understand and address fears of professionals.

Keywords: Artificial Intelligence, healthcare, perceptions, physicians

Chapter One: Introduction

1.1 Introduction

Following the industrial revolution, advances were made in technologies that led to the substitution of labor-intensive manual jobs with machines that enable man to produce more and advanced human development. One major recent development with future potential of changing the way activities are planned and implemented is Artificial Intelligence (AI). Oxford dictionary defines AI as field of study that is concerned with the capacity of computers or other machines to exhibit or stimulate intelligent behavior. It also states that later use of the word also meant software used to perform tasks or produce output previously thought to require human intelligence especially by using machine learning to extrapolate from large collection of data[1]. The use of AI cuts across many industries, transforming banking, transportation, healthcare, and other fields. In addition to providing labor support AI is replacing labor in several of these areas (Ali, 2023).

Advances made over the last few decades has paved the way for plethora of innovations that have been continuously revolutionizing healthcare and medicine. Subsequent to Covid 19 outbreak, digital changes occurring in health industry have altered the essential pillars of medical treatment. The pandemic pressurized stakeholders in healthcare to adopt and implement digital innovations and technology including virtual healthcare systems. Among technologies revolutionizing the sector Digital Health Technologies (DHT), Machine Learning (ML), Robotics, and AI can be named as some of the examples. These technologies are used to monitor, detect, and assess risks and benefits and even be used in making decisions to treat patients (Ali, 2023; Al Kuwaiti et al., 2023; Ciecierski-holmes et al., 2021).

AI technologies used in healthcare and medicine include surgical robots, natural language processing (NLP), rule-based expert systems, knowledge engineering, machine learning, and image and signal processing. The fields of radiology, dermatology, and ophthalmology have benefited greatly from the new techniques and methodological approaches brought about by these

[1] https://www.oed.com/dictionary/artificial-intelligence_n?tl=true

technological advancements, as have medical education, healthcare delivery, and clinical practice (Alami et al., 2021; Ciecierski-holmes et al., 2021).

Implications of AI is not restricted to advancements in scientific fields. Studies have shown that AI has benefits to professionals and organizations as well. Benefits to professionals include access to automated decision making, improved patient monitoring, early diagnosis, and simplified procedures. Contributions to organizations originate from its vast potential for producing automatic inference with little to no human participation. This has proven a real-world way to reduce the time and effort required to make judgments about diagnosis and treatment. This results in quicker diagnosis time, cost reduction, fraud detection, performance improvement, and workflow support, large data set and sharing capabilities for the organization (Ali, 2023).

In regard to AI implementation within health originations, numerous challenges have been identified. These constraints include issues with data availability, data digitalization and consolidation, data regulations relating to privacy, law and governance. Privacy concerns include access to as well as editing and sharing of patient data. With increased access also comes data security ethical concerns (Ali, 2023; Fatima et al., 2023)

Changes in work environment and management and subsequent potential conflicts have impacts on the success of AI integrations into health care systems. Similar to other technologies that threaten the legitimacy of professional expertise, learning algorithms are likely to be resisted by occupational members (Faraj et al., 2018). One of the major challenges organizations will be facing is to manage the potentially divergent views and interests around the benefits and disadvantages of AI by their staff members (Alami et al., 2021). A recent review indicated that healthcare professionals often mistrust or poorly understand AI grounded clinical decision support system due to unidentified risks (Al Kuwaiti et al., 2023). This type mistrust has also been reported as finding of a scoping review where user trust was identified as concern (Ciecierski-holmes et al., 2021). Employees may not only mistrust AI, they may even be skeptical or hostile to AI based projects due to fears of being replaced (Fatima et al., 2023).

1.2. Statement of the problem

A 2018 study, titled *Working and organizing in the age of the learning algorithms*, categorized the consequences of learning algorithms. One consequence is transforming of expertise. The consequence poses a challenge for workers and organizations to investigate and understand which parts of jobs will likely be automated, and what effects it will have on the rest of the work. This in turn requires management of the inherent tension between people and the algorithm. Other impacts include the reshaping of occupational work boundaries, providing new forms of control, and augmentation of coordination (Faraj et al., 2018).

Scenarios developed by Mckiensy Global Institute suggest that by 2030, 75 to 375 million workers (3-14% of the global workforce) will need to switch occupational categories (Manyika et al., 2018). Approximately 50% of global entities are exploring AI, and 30% are actively deploying AI solutions. The rapid evolution of AI models and tools intensifies this demand, reflected in the doubling of career opportunities posted on LinkedIn requiring AI skills since 2022. Looking ahead to 2030, AI is expected to reshape 65% of job skills, emphasizing the urgent need for targeted education and training (Jolly et al, 2023).

AI has the potential to substantially change the role of how medical care and public health programs might be implemented in the near future, especially in health systems where distribution of and access to care have so far been challenging. In low-and middle-income countries (LMICS) like Ethiopia, the value of AI is seen two ways. One with its potential to build health systems by supporting and standardizing clinical judgments and applying healthcare processes more objectively with data-oriented approach. The second, is that AI powered tools could increase quantity and quality of medical care in areas where skilled health workers are in shortage (Ciecierski-holmes et al., 2021). Ethiopia as a LMICs country is in a position to profit from the benefits that use of AI comes with. Electronic Health Records (EHR) data connected with novel AI technologies can provide accurate insight into patient care (Al Kuwaiti et al., 2023). With pooled estimated EMR to be at 51.85% and strategies to digitalize care at the national level, the country seems to be on track to benefit from integrating AI in the health care system (Tegene et al., 2022).

With its boundless potential and inevitable entrance to Ethiopian healthcare system, investigations of factors influencing its eventual successful integration are warranted. Literatures examining factors that influence the intent to use have identified perceptions of health professional to be among the ones influencing adoption and use. Yet, information on the perception of physicians in Ethiopia regarding the use, benefits and challenges of using AI in Ethiopia's health care system are lacking. Thus, the study was conducted to contribute to filling this gap by conducting a survey to explore health professionals' perceptions of AI potential and challenges, and its role in changing organizational behavior of the country's health services.

1.3. Research questions

This study will be guided by the following questions

1. What are the perceived benefits of adopting AI to Ethiopian healthcare system?
2. What are the perceived challenges of adopting AI to Ethiopian healthcare system?
3. What is the perceived implication of adopting AI on the organization of health facilities?
4. What is the perceived implication of adopting AI on professionals (physicians)?

1.4. Objectives

1.4.1 General Objective

The general objective of the study is to explore the role of AI in changing organizational behavior of health services through studying the perceptions of physicians.

1.4.2. Specific Objectives

The specific objectives of the study are:

- To assess perceived benefits in adopting AI in Ethiopia healthcare systems
- To assess perceived challenges in adopting AI in Ethiopian health care systems
- To assess perceived implications of adopting AI on health care organizations
- To assess perceived implications of adopting AI on professionals

1.5 Scope of the study

The study aimed to explore the perception of health professionals on the role of AI in changing organizational behavior of health services providing institutions, its implications on professionals themselves as well as the challenges associated with its wider use. However, scope of study was limited to the physician segment of health professional Study was not limited geographically. Participants with access to internet had the chance to participate.

1.6. Significance of the study

AI related studies coming from the health sector in Ethiopia are limited. Knowledge gap exists with regard to the expected benefits and potential challenges of using AI in the Ethiopian health care system. With its bright and promising future, it's in the interest of the country to prepare and optimize use of for the betterment of the health system. The significance of the study also lies in exploring the level of AI awareness and use in the country. It will also raise questions for further study in addition to pointing to areas that may require immediate action to promote awareness about and enhance adoption and use of AI in Ethiopia's health care system.

1.7. Limitation of the study

The study has several limitations. Due to resources and time constraints the study focused only one segment of health workers, physicians. In addition, the data collected from respondents was also limited as the survey was conducted on-line and the questions had to be limited.

Chapter Two - Literature Review

2.1 Definition and Types of AI

No unanimous definition of AI exists. Various definitions of AI can be found in the literature. Kononenko (2001) explains AI as a part of computer science that tries to make computers more intelligent. According to Technology (2021), AI refers to the science and engineering of making intelligent machines, through algorithms or set of rules which the machine follows to mimic human cognitive functions, such as learning and problem solving. Tran et al. (2019) states that AI commonly refers to the computational technologies that mimic or sitmulate processes supported with human intelligence, for instance, reasoning, deep learning, adaptation, interaction and sensory understanding. This study adopts the definition given by Younis et al., (2024) which defines AI as software system that uses data sources to either make autonomous judgements or support people in making decisions.

Younis et al. (2024) examined the impact of AI on organizational behavior and provided classification of AI based on capabilities and functionalities. Based on capabilities AI is categorized into three types of AI. These are Narrow AI, General AI, and Super AI. Narrow AI refers to machine or device that focuses on only one narrow task, and cannot perform beyond its limitations, as in Alexa and Siri cellphone functions. General AI, also called Strong AI, can learn any type of intellectual task that humans can learn. This type is not fully achieved yet. The third one, Super AI Type, is the one that is expected to exceed human intelligence, and its existence is still hypothetical.

Based on functionalities, AIs are grouped into four different types. These are reactive machines, limited memory, theory of mind, and self-aware machines. Reactive AI does not have past memory and works only with present data. Limited memory AI makes decision through learning from past data, but memory is short. Theory of mind AI understands people's emotions and thoughts, a type not fully achieved. The last one is Self-aware AI that is expected to not only understand but also perceived and evoke human emotions, and to have emotions and beliefs of its own and this type is not achieved yet (Younis et al., 2024).

Therefore, AI is not one ubiquitous universal technology. It rather represents subfields. Machine Learning (ML) and Deep Learning (DL) are examples. ML is branch of computer science, study algorithms that allow computer programs to automatically improve through experience. DL is a subset of machine learning that uses multilayered neural networks called deep neural networks, to stimulate the complex decision-making power of human brain. Individually or in combination, ML and DL add to intelligence to applications. These types of learning have transformed field of medical images analysis and their role in clinical decision support have been significantly enhanced (Technology, 2021; Ching et al., 2018).

2.2 Role of AI in Healthcare

In comparison to other sectors such as industries, finance, trade and transportation, the health sector has been regarded as slow in adopting new technologies. As Information and Communication Technologies (ICT) make their path in industry, advances are being made in what is being named Digital health. It is part of what is being widely accepted as the fourth industrial revolutions. Digital health is the use of big data, analytics and AI in the health sector. The emergence of such advanced analytics and algorithms are transforming the current disease management focus to more proactive and predictive strategy aiming to keep people healthy and well. Its delivery models also offer great opportunity to improve access to care and to streamline operational processes and strengthen efficiency, productivity and responsiveness (Snowdon, n.d.). Current evidence shows that AI is playing number of roles and initiating changes within the healthcare system. A study entitled *A review of Artificial Intelligence in Healthcare* summarized the roles of AI in the health care system into six categories: Medical imaging and diagnostics; Virtual patient care; Medical research and discovery; Patient engagement and compliance; and Rehabilitation and administrative application (Al Kuwaiti et al., 2023).

AI needs to overcome numerous challenges to exert and cause radical change in the sector. Ethical concerns rise due to accountability issues. The exponential growth in AI capabilities is forging a space for its application in wide range of clinical practice and decision making. This application raises the question of accountability for wrong decision. This is creating the dilemma of who takes the responsibility from legality point of view. There are also challenges faced due to lack of regulations and governance both as at policy and hospital level to properly address issues regarding

implementation and AI use. Lack of capacity of developing and maintaining information technology (IT), increased cost with storing and back up data are also among the major obstacles to its implementation (Al Kuwaiti et al., 2023).

2.3 AI and Organizational Behavior

With advances in AI and growing use of AI in various sectors, it's the impact of AI on health service organizations and operations is getting increasing attention. Resultant effects of AI implementation in health sector and organizations as outlined in literature span across multiple areas crucial to healthcare operations. These include diagnosis, clinical care, medical research and discovery, resource planning, job security, administrative applications and technology and data sharing. These themes are discussed further in subheadings below.

2.3.1 Diagnosis, Clinical Care and Medical Research

The integration of AI and DL technologies is significantly impacting healthcare delivery and medical research. Initial forays into DL applications in patient treatment hold promise for recommending personalized treatment strategies and predicting treatment outcomes, signaling paradigm shift towards individualized therapies (Davenport and Kalakota, 2019).

In healthcare institutions, particularly within the UK, AI is increasingly utilized to augment diagnosis processes. Levering advanced algorithms, AI analyzes medical data to tremendous speed and precision, assisting clinicians in navigating complex patient data patterns and facilitating accurate diagnoses (Ching et al., 2018; Nutfield Council, 2018.). Additionally in medical research setting, AI expedites the analysis of vast and complicated datasets, thereby boosting drug discovery and catalyzing medical breakthroughs. Notably at the Institute of Cancer Research, the development of an AI 'robot scientist' named Eve exemplifies the potential of AI in accelerating drug discovery (Nutfield Council, 2018.).

Recent empirical studies underscore AI's capacity to rival or surpass human performance in critical healthcare tasks notably in disease diagnosis. Algorithms exhibit superior proficiency in detecting malignant tumors and optimizing the selection of cohorts for clinical trials. Nevertheless, the

widespread adoption of AI across broader medical domains is anticipated to undergo a protracted evolution due to multifaceted considerations (Davenport and Kalakota, 2019), notably legal and ethical issues.

The implementation of AI within distinct medical specializations showcases varying degrees of integration and utilization. In dermatology, AI advancements empower computational systems to undertake image-based patterns recognition and classification of skin lesions, tasks traditionally reliant on human expertise. Similarly, in ophthalmology, DL models such as pretrained convolutional neural networks demonstrate comparable efficacy to ophthalmologist in analyzing retinal images and stratifying diabetic retinopathy grades (Xie et al., 2019).

2.3.2 Job Security and Resource Management

Integration of AI into LIMCs health systems presents a promising path for enhancing efficiency and effectiveness. A scoping review by Ciecierski-Holmes et al. (2021) concluded that multifaceted benefits are observed from AI use within these contexts. Prominent improvements included enhanced workflows, reduction in diagnostic time, and increased efficiency, all of which contribute to betterment of care delivery. However, challenges are observed. In particular in clinical settings with limited capacity for adopting AI tools have shown to cause higher workload. This underlines the necessity for tailored strategies for implementation, so the technology potential can be maximized while addressing constraints.

Furthermore, AI holds considerable promise in optimizing planning and resource allocation within health and social care services. The Watson Care Managers system developed by IBM exemplifies its potential though its pilot initiatives were aimed at improving cost efficiency by matching individuals with suitable care providers within allocated budgets and designing personalized care plans. The system endeavors to streamline resource utilization and enhance service delivery. Such initiatives underscore the transformative role of AI in fostering inclusive, more equitable and sustainable healthcare system (Nutfield Council, 2018.).

AI also impacts professionals. The start of learning algorithms heralded a paradigm shift in healthcare professions, with implications for workforce dynamics and professional expertise. Ali (2023) reported the transformative potential of learning algorithms in reshaping occupational

boundaries and accountability frameworks. Notably, in the field of radiology algorithms demonstrated comparable accuracy in detecting malignancies with trained radiologists. Thus, it might force radiologists to relinquish preliminary scanning of medical images to the algorithms in order to focus on the more complicated cases. The other scenario is the migration of image reading to other health professional such as emergency doctors who can rely on AI to identify urgent medical issues without the need to wait for report from radiologists. This in turn may create the need of redefinition of the role of radiologist, necessitating a recalibration of training paradigms and professional responsibilities. Moreover, the proliferation of AI driven diagnostic tools raises questions regarding organizational control and task allocation within healthcare setting, prompting a reevaluation of traditional hierarchies and workflows.

Complementing these insights, Younis et al (2024) underscore the transformative impact of AI on healthcare professionals, particularly among young doctors of Egypt. The study reveals widespread adoption of AI tools with 69% of participant doctors identifying themselves as users and 57% of the sample reporting AI implementation at their working companies. Coupled with these findings the report also showed AI to have significant positive effect on job satisfaction, personality traits and professional attitudes. The findings emphasize the imperative need for integrating AI education and training into medical curricula, ensuring that healthcare professionals are equipped to leverage AI technologies effectively while navigating through their evolving roles and responsibilities.

2.3.3 Technology and Data sharing

In healthcare world, the increasing adoption of technology introduces complexities in coordinating between organizations and their information systems. The challenge is exacerbated by the prevalence of outdated systems within may healthcare institutions. This also comes with integration difficulties arising from the incompatibility of diverse technologies, each developed independently for varying purposes overtime. In the literature the indispensability of appropriate infrastructure, encompassing both hardware and software components is widely reported. Th emphasis is mainly on establishing robust infrastructure systems capable of seamlessly connecting the myriad applications utilized in healthcare setting ranging from Enterprise Resource Program (ERP) data to patient care data with EMR (Snowdon, n.d.).

2.3.4 Administrative applications

In the domain of health care administration, the utilization of AI presents a spectrum of applications amid at enhancing operational efficiencies and restructuring administrative processes. While the transformative potential for AI may not be revolutionary in this domain compared to patient care, its adoption promises substantial benefits (Davenport and Kalakota, 2019). In the field of healthcare administration AI finds diverse applications encompassing tasks such as clinical documentation, medical record management, claims processing, and revenue cycle management. Additionally healthcare organizations have explored the integration of AI driven chatbots for patient interaction, mental health support, wellness initiatives and telehealth services. Natural Language Processing (NLP) based applications offer convenience for patients in tasks like prescription refill and appointment scheduling.

Integration of AI into healthcare administration also raises the implications for healthcare workforce. Concerns have been raised regarding potential automation of jobs and subsequent displacement of workers. Collaborative research between Deloitte and the Oxford Martin Institute projected that up to 35% of jobs in the UK could face automation by AI over the next two decades. But the actual impact of job loss may be mitigated by various external factors, including the cost and feasibility of automation technologies, labor market dynamics and regulatory frameworks (Davenport and Kalakota, 2019). Despite the projections, to date there have been no documented instances of job elimination in the sector attributable to AI. The limited penetration of AI into the industry and the challenges associated with integrating AI into clinical workflow and EMR systems have contributed to the minimal job displacement impact observed thus far.

AI in healthcare administration has also the potential to alleviate administrative burdens. For instance, in US the implementation of voice-text writing has resulted in significant time saving for physicians and nurses. Moreover, there is evidence of the deployment of Robotic Process Automation (RPA) functions in various clinical revenue cycle administration tasks, including claim processing and medical record management. Additionally, insurance agencies are leveraging AI based tools to enhance the accuracy and efficiency of claims verification processes (Al Kuwaiti et al., 2023).

To fortify operational procedures and enhance the delivery of medical services, the healthcare sector increasingly relies on the utilization of medical data and analytics. In recent years the proliferation of medical data and its multifaceted dimensions have witnessed an exponential surge, driven by contributions from diverse stakeholders including medical professionals, researchers and patients themselves. Especially, EMR, medical imaging data and data derived from array of monitoring devices, including health tracking devices and mobile application, constitute substantial components of this growing datasets (Ali, 2023; Liu et al., 2020; Xie et al., 2019; Antoniou et al., 2018).

2.4 Current Status and Future of AI

The current landscape of AI in healthcare reveals its current shortcomings in comparison to human physicians, particularly in lacking common sense and clinical intuition. Yet it increasingly serves as a tool for automating repetitive tasks within healthcare organizations by leveraging patterns extracted from datasets. Anticipating the next five to ten years, a transformative shift is expected where healthcare institutions transition from passive adopters of AI platforms to active co-innovators with technology partners in the development of novel AI system tailored for precision healthcare. Looking further ahead, the long-term potential of AI in healthcare promises to revolutionize care delivery, transitioning towards a preventative, personalized and data-driven model of disease management known as precision medicine. Amidst challenges faced by healthcare systems in improving population health, enhancing patient and caregiver experiences, and addressing the escalating cost of care, AI emerges as promising solution. By democratizing and standardizing healthcare delivery through AI augmentation, healthcare system aims to achieve the ‘quadruple aim’ of encompassing improved outcomes for patient, enhanced experiences for caregivers, enhanced population health, and cost containment. The vision entails the integration of AI across facets of healthcare delivery including precision diagnostics, therapeutics, and medicine. Thereby facilitating a more connected and personalized approach to care. The rapid acceleration of research in AI application within the sector highlights its vast potential and versatility, spanning domains from drug discovery to virtual clinical consultations, disease diagnosis, prognosis, medication management and health monitoring. As the landscape of AI driven healthcare continues to evolve its transformative impact holds the promise of reshaping healthcare delivery

systems, ultimately ushering in an era of medicine characterized by personalized, data-driven and cost-effective care (Technology, 2021).

2.5 Use of AI in Ethiopia

Literature on the application of AI in Ethiopia, is limited. A systematic review conducted to evaluate the utilization and determinants of EHR in Ethiopia revealed a pool estimate of EMR adoption at 51.85%. Factors such as age, with younger age groups exhibiting higher usage rates alongside the presence of EMR manuals, routine EMR training and managerial support, were identified as key determinants influencing EMR utilization among healthcare professionals in Ethiopia (Tegene et al., 2022). In addition, a report from Gonder, Ethiopia, offers insights into potential utility of DL techniques in the interpretation of ultrasound images. The application aims to mitigate intra/inter-observer variability and lower the requisite skill level, thereby facilitating broader access to ultrasound assessment of pleural effusion, particularly in LMICs (Morilhat et al., 2022).

Against this backdrop, the establishment of Ethiopian Artificial Intelligence Institute (EAII) in 2020 marks a significant milestone in the country's AI landscape. With the visionary outlook, EAII aspires to be a state-of-the-art National AI Research and Development Center by 2030, assuming a pivotal role in spearheading innovative AI-enabled solutions at both national and international levels. EAII's portfolio encompasses major projects that cover diverse sectors including health, agriculture, language, and finance. In healthcare domain, the institute has initiated several groundbreaking projects including Diabetes Mellitus Detection, Breast Cancer Detection, Skin Disease Detection and EthioTelehealth Systems[2]. This reflects the concentrated efforts being made to leverage AI advancement in healthcare delivery and outcomes in the country.

[2] https://products.aii.et/health

2.6 Conceptual framework

The following conceptual framework guided the design and implementation of the study.

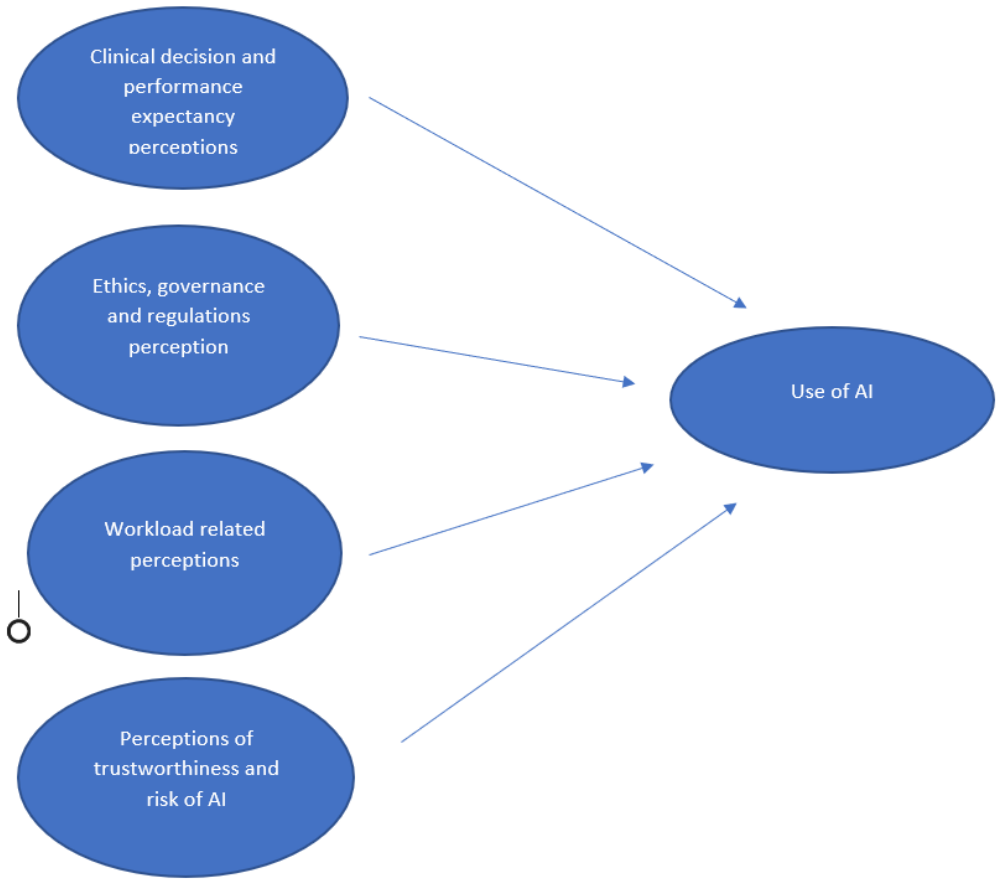

Figure 1. Conceptual framework of the study (Adopted from Choudhury & Asan, 2022)

Chapter Three: Methodology

3.1 Study Area

The study had no geographical limitations. It was conducted by inviting only physicians among Ethiopian health workforces. As of 2018, there were 8395 physicians in Ethiopia (Sedeta et al., 2022).

3.2 Study Design and Research Approach

The study implemented a cross sectional- exploratory survey design. Due to its ability to provide insights to unconscious motivation, long term influences from past experiences and individual psychology within the organizational context, the psychodynamic paradigm has been chosen for the study.

3.3 Sample Size Determination and Sampling Selection

Sample size was determined using the following formula, where Z = 1.96, p=0.5 and E = 10%.

$$n = \frac{Z^2 x\ p\ x\ (1-p)}{E^2}$$

Sample size was determined to be 97. Accounting 35 % non-response rate the total sample size for study was calculated to be 132. See Annex 1 for detailed steps used in the calculation of sample size for the study.

3.4 Data Collection Method

Primary data was collected using electronic structured (google forms) self-administered questionnaire. Both the Amharic version of the questionnaire (See Annex 2a) and the English version (Annex 2b) were prepared, and respondents were allowed to choose the versions they feel comfortable working with. Section One of the questionnaire was about demographic characteristic of the respondent while section two had subject matter questions drawn from literature and

centered towards benefits, challenges, and implications of AI use for health professionals and for heath sector organizations. The second section used 5- point Likert Scale (1- strongly disagree, 2- disagree, 3-neutral, 4- agree and 5 strongly agree) to measure perceptions of participants towards the central themes of benefits, challenges, organizational and professional implications. The questionnaire was disseminated to study respondents through online platforms in which only physicians are members[3].

3.5 Data Cleaning and Analysis

Data collected were checked for completeness, consistency, and clearance. Data was then entered into SPSS version 27 for analysis. Descriptive analysis was done to determine frequency distributions of all variables. Cross tabulations and Chi square calculations were made to assess associations of AI use and familiarity with other variables.

The following regression models were used to explain different dependent variables. AI use is a binary dependent variable coded as 1 if a respondent uses AI and 0 otherwise. Therefore, a binary logistic regression model was employed to identify factors influencing AI use by respondents (Kleinbaum and Klein, 2010). On the other hand, an Ordered Logit Model (Long and Freese, 2001) was used to explain factors affecting respondents' familiarity with AI, which is an ordered variable with five outcomes. Respondents' perceptions of AI were measured over four-thematic areas, each composed of several specific issues measured along a five-point Likert-scale. For each thematic group, a composite score was computed using a Principal Component Analysis (Hair et al., 2019) and these composite scores were used as dependent variables for the subsequent linear regressions (Weisberg, 2014). In other words, the composite scores were used to identify factors influencing perceptions of respondents regrading AI use benefits and challenges as well as its implications on health care organizations and on professionals, i.e., physicians.

[3] Cronbah Alpha was calculated to be 0.917

3.6 Plan for dissemination

The results of the study are submitted to Addis Ababa University, College of Business and Economics, School of Commerce, Project Management Graduate Program. It will also be submitted to other relevant and concerned bodies, notably to the hospital where the author works, and to the Ministry of Heath hoping that it will inform planning and decision making. Finally, the results of the study will be shred widely through presentation in scientific conferences and by publishing on scientific journals.

Chapter Four – Results and Discussion

4.1 Respondents' Profile

The study had 132 participants with no missing data. Majority of participants were male (69.7%). Their age ranged between 26 and 45. Approximately 91% of participants were found to be younger than or equal to 35 years of age. Age group 31-35 constituting 59.1%, while 31.8% of participants were found to be in the age group of 26-30 years. Looking at the educational status of participants, two-thirds (67.4 %) of participants were Specialists or engaged in their specialty training. General Practitioners and Sub specialists constituted 26.5% and 6.1% respectively. Significant percentage (68.9) of participant have 3- 10 years of experience in the field. 87.1% of surveyed participants worked in public owned hospitals. And most of them (80.3%) worked in referral level hospital (See Annex 3 for profile of respondents).

73.5% of the respondents (N=97) were specialists. Their areas of specialization covered a total of 22 medical specialty fields. But with a total of 32, surgical specificalities' constituted the majority of specialist participants (24.2%). These fields of specialization were regrouped into four broader categories of medical specialties (medical, surgical, primary care, and others) to facilitate analysis. (For more information, please see Annex 4).

4.2. Descriptive Analysis

Only 35.6% of the respondents reported that they use AI. As it can be inferred form figure 2, nearly two-thirds (65.2%) of all respondents reported their familiarity of AI use in healthcare as *Slightly familiar* or *Not familiar*. This indicates the need to promote awareness about the potential role of AI in improving health care service in Ethiopia.

Overall, the survey showed optimistic outlook on the potential of AI to benefit the healthcare system. 79% of respondents (agreeing and strongly agreeing combined) expressed their belief in AI's ability to enhance healthcare delivery, 72% felt that use of AI could result in enhanced clinical decision-making capability, 59.1% recognized its ability to reduce cost. This finding related with

a study conducted in Saudi Arabia where 70.5% of the respondents expressed agreement that use of AI helps reduce health cost (Chaieb et al., 2023).

Similar sentiments were shared on use of AI leading to better patient outcomes, improved diagnosis accuracy, and accelerated medical advancement and drug discovery. A study in Saudi Arabia found that 89% of the respondent believed that AI improves diagnosis accuracy and treatment, while the percentage pf respondents of this study with similar view was only 59%. The proportions are comparable with a study in Portugal where 60.9% of surveyed Portuguese doctors believe that AI will increase diagnosis accuracy (Pedro et al., 2023).

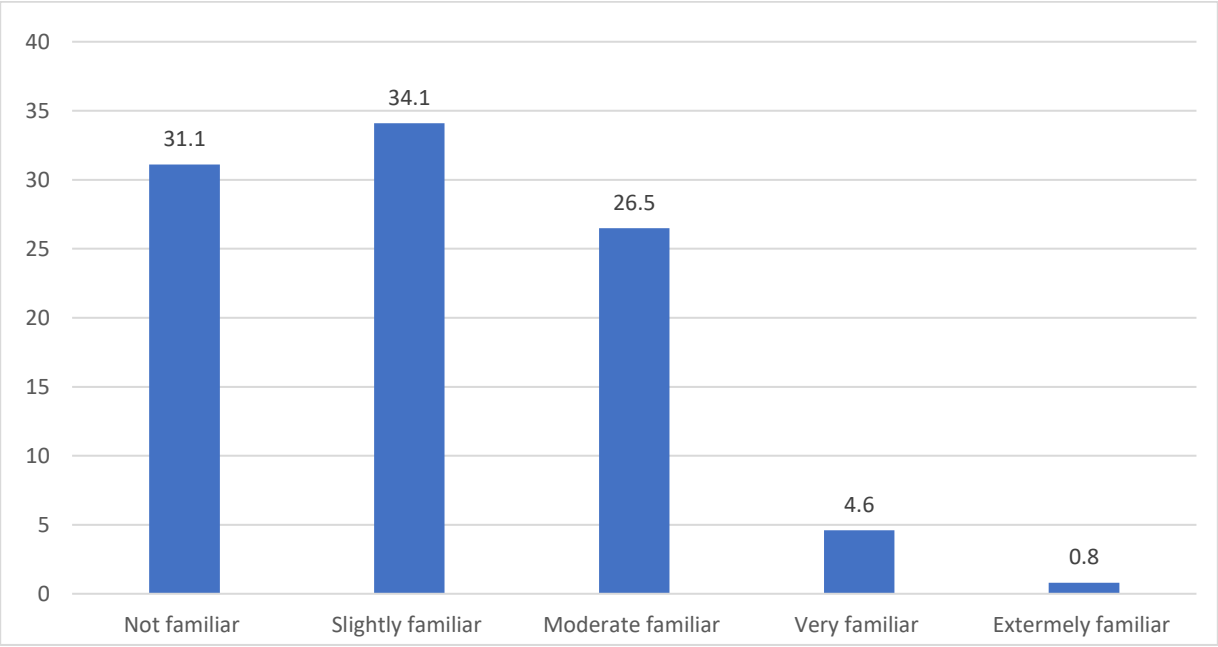

Figure 2. Percentage reported level of familiarity of AI use by physicians (N= 132)

Source: Compiled from data collected by the student)

With regard to challenges and potential roadblocks to AI integration into Ethiopia's health system, over half of (59.8%) of respondents believe that lack of proper oversight and regulations could hinder its adoption. High costs associated with infrastructure, technology and skilled personnel were indicated as barrier by nearly half (48.5%) of participants. Regarding trustworthiness and lacking human insight, 43.9% stated their doubts and 46.2% agree that AI based decisions lack

human insight. Similar sentiments were seen in relation to ethical consideration, potential risks for privacy and confidentially of patient data, and for rapid obsolesce of technologies in use. . Pedro et al (2023) found that 72% of physicians in Portugal were concerned about privacy and violation of health information with the use AI, much higher percentage that the respondents of this study.

The majority (80%) believe that AI training will improve skills and trust of the technology while job displacement worries linger among 42.7% of the respondents. This is also in line with the findings of Chaieb et al., (2023) who reported that 86% of the health professionals believe that they need to be trained on AI to build their trust on the technology. Respondent perceive that AI will result in workload reduction (87.9%). The percentage is higher than 60.9% reported by a study in Portugal regarding the role of AI in increasing diagnosis accuracy (Pedro et al., 2023)..

But physicians fear that they may have a diminished role (69.7%). 60% of the respondents see its potential to improve patient care (over 60% agree for treatment planning, remote monitoring etc.) and efficacy (over 60% agree for resource allocation, data), concerns exist regarding job displacement (42.7%), professional identity (69.7) and power dynamics (47.7). Pedro et al (2023) also reported similar results - 73.4% of respondents believe that AI will increase access to health services of residents in remote areas. Complete frequency analysis results of the Likert Scale are provided in Annex 5.

4.3 Evaluating associations

4.3.1. Chi Square test results

The study used Chi Square test to evaluate associations between variables of interest. AI use and level of familiarity were the dependent variables whereas age, gender, educational status, field of study, years of experience, hospital level, and hospital ownership were considered as independent variables. AI use was not found to be associated with any of the independent variables (all P values were greater than 0.10). Level of familiarity was found to have been significantly associated with age (P= 0.03) and showed close to significant association with hospital ownership (P= 0.101). The following table shows the results. Table 1 presents summary results of Chi square tests, and tables of chi square results generated using SPSS are attached as Annex 6.

Table 1. Chi-square test results or the associations between dependent variables AI use (use or not) and level of familiarity with independent variables. (N=132)

Dependent variable	Independent variable	Pearson Chi Square (X^2)	Degree of freedom (df)	P – Value
Have you used AI in your work?	Age	4.942	4	0.293
	Gender	0.090	1	0.764
	Educational Status	2.690	2	0.261
	Field of specialty (grouped)	1.256	4	0.869
	Years of experience	3.446	2	0.179
	Hospital level	1.093	2	0.579
	Hospital Ownership	0.327	1	0.568
Level of familiarity	Age	28.198	16	0.03
	Gender	5.110	4	0.276
	Educational Status	6.418	8	0.600
	Field of specialty (grouped)	15.013	16	0.524
	Years of experience	12.328	8	0.137
	Hospital level	5.711	8	0.680
	Hospital Ownership	7.760	4	0.101

Source: Compiled from survey responses by the student.

4.3.2. Regression Analyses Results

As indicated above in the methods section, different regression models were used to investigate further associations between dependent and independent variable. This was proceeded with undertaking Principal Component Analysis to cluster responses to questions on benefit, challenges, and implications of AI use on organizations and on professionals (See Annex 7).

Table 2 shows the association between AI use and factors considered in the study using binary logistic regression model. The regression analysis result showed that educational status, being sub-specialist (P=0.20) and being in surgical specialty field (P=0.045) were found to be having statistically significant association with AI use. In addition, highly significant association was found between being slightly familiar, moderately familiar and very familiar (P for all here being

<0.001). This clearly illustrates that AI use goes with familiarity, and increasing awareness amongst physicians will facilitate adoption and use of AI.

Table 2. Factors associated with respondents' AI use (N=132)

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Gender (female)	.787	.544	2.093	1	.148	2.197
	Age (30-35)	.418	.534	.612	1	.434	1.519
	Age (36-40)	.012	1.413	.000	1	.993	1.012
	Age (41-45)	-16.867	40192.970	.000	1	1.000	.000
	Specilaits (including those in residency training	.684	.679	1.013	1	.314	1.981
	Sub-Specialist	3.625	1.559	5.409	1	.020	37.543
	Medical Specialities	-.818	.658	1.548	1	.213	.441
	Surgical Specialities	-1.460	.728	4.017	1	.045	.232
	Other Specialities	2.388	3.847	.385	1	.535	10.897
	3-10 years of experience	.699	.547	1.632	1	.201	2.011
	More than 10 years of experience	-.871	2.119	.169	1	.681	.419
	General Hospital	-1.886	1.765	1.142	1	.285	.152
	Referral Hospital	-1.435	1.656	.751	1	.386	.238
	Privately Owned	-.389	.748	.271	1	.603	.678
	Slightly familiar	3.250	.959	11.490	1	<.001	25.789
	Moderately familiar	3.968	.969	16.760	1	<.001	52.871
	Very familiar	4.235	1.216	12.127	1	<.001	69.090
	Exteremely familiar	-18.105	40192.970	.000	1	1.000	.000
	Constant	-3.149	1.814	3.012	1	.083	.043

a. Constant Variable(s) - Gender (male), Age (26-30), Educational Status (General Practitioner), Field of Speciality (Primary Care Specialities), Years of experience (less than 3 years), Hospital level (Primary Hospitals), Ownership (Publicly owned), Level of familiarity (Not familiar)

Table 3 shows associations between factors considered and level of familiarity with AI using Ordered Logit Regression model. The result revealed that level of familiarity was not significantly associated with any of the factors considered in the study. But being a specialist in medical specialty had close to significance level (P=0.101) of association with being aware of AI use.

Table 3. Factors associated with respondents' level of familiarity with AI use in the health system (N=132)

Parameter Estimates

		Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold	[FamiliarityNew = 1.00]	14.781	2.102	49.452	1	<.001	10.661	18.900
	[FamiliarityNew = 2.00]	16.349	2.098	60.699	1	<.001	12.236	20.462
	[FamiliarityNew = 3.00]	18.219	2.106	74.871	1	<.001	14.092	22.346
	[FamiliarityNew = 4.00]	20.742	2.309	80.669	1	<.001	16.216	25.268
Location	Gender (female)	.156	.383	.167	1	.683	-.594	.907
	Age (31-35)	-.289	.376	.593	1	.441	-1.026	.447
	Age (36-40)	1.297	.844	2.360	1	.124	-.358	2.951
	Age (41-45)	15.609	.000	.	1	.	15.609	15.609
	Specialist (includes thoes in residency trainint)	.596	.497	1.437	1	.231	-.378	1.571
	Sub-Specialist	.403	.980	.169	1	.681	-1.518	2.323
	Medical specialities	-.802	.490	2.682	1	.101	-1.762	.158
	Surgical specialities	-.342	.518	.436	1	.509	-1.358	.673
	Other specialities	-1.295	1.553	.696	1	.404	-4.339	1.748
	General Hospital	-.105	1.054	.010	1	.921	-2.171	1.961
	Referral Hospital	-.276	.970	.081	1	.776	-2.177	1.625
	3-10 years of experience	-.140	.385	.133	1	.715	-.895	.614
	More than 10 years of experience	1.454	1.347	1.167	1	.280	-1.185	4.094
	Private Owned	-.907	.559	2.631	1	.105	-2.003	.189

Link function: Logit. constant variables - Gender (male), Age (26-30), Educational Status (General Practitioner), Speciality Fields (Primary Care Specialities), Hospital level (Primary Hospital), Years of Experience (less than 3 years), Hospital ownership (Public owned)

Pseudo R-Square

Cox and Snell	.137
Nagelkerke	.148
McFadden	.056

Link function: Logit.

Table 4 presents the results of the regression analysis on factors associated with respondents' perceptions of AI benefits scores given by respondents using linear regression model (as response variable of the Likert scale were converted into numeric scales or scores). The results show that benefit perceptions are not significantly associated with the factors considered and except with familiarity, when being very familiar (at P<0.05) and extremely familiar (at P<0.10).

Table 4. Factors associated with respondents' benefit perceptions scores (N=132)

a

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.558	.584		.955	.342
	Gender (female)	-.203	.207	-.094	-.979	.330
	Age (31-35)	-.133	.205	-.066	-.651	.516
	Age (36-40)	-.473	.428	-.131	-1.104	.272
	Age (41-45)	-.005	1.061	.000	-.005	.996
	Specialist (icludes those in residency training programs)	.007	.268	.004	.028	.978
	Sub-Specialist	.002	.507	.001	.004	.997
	Medcial Specialities	.001	.266	.000	.002	.998
	Surgical Specialities	.152	.275	.066	.554	.581
	Other Specialities	.379	.792	.046	.478	.634
	General Hospital	-.603	.583	-.226	-1.035	.303
	Primary Hospital	-.509	.538	-.203	-.947	.346
	3- 10 years of experience	-.220	.211	-.102	-1.040	.301
	More than 10 years of experince	.398	.570	.083	.698	.487
	Privately Owned	.113	.308	.038	.368	.713
	Slightly familiar	-.035	.244	-.017	-.143	.887
	Moderate familiar	-.020	.266	-.009	-.075	.940
	Very familiar	.806	.398	.214	2.023	.045
	Exteremly familiar	1.925	1.030	.168	1.869	.064
	AI_UseNew	.399	.215	.192	1.850	.067

a. Dependent Variable: REGR factor score Benefit Score Costant Variables - Gender (male), Age (26-30), Educational Status (General Practitioner), Speciality Fields (Primary Care Specialities), Year of experiences (less than 3 years), Hospital level (Primary Hospital), Hospital Ownership (Publicly) , Level of familiarity (Not familiar) R-Square - 0.159 F- Static - 1.118

Table 5 presents linear regression results of factors influencing respondents' perceived challenges in using AI in the health system. As indicated in the table, perception score for challenges was significantly associated with gender (P=0.049). Being female is likely to be associated with identify challenges of using AI. This result is in agreement with the finding of Pedro et al.(2023 who also concluded that women doctors perceived more disadvantages of AI. Significant associations were also observed between academic level particularly being specialist (P=0.090) and challenge perception score. Also, challenge perception scores and familiarity, being extremely

familiar were significantly associated (P=0.052). Specialty showed was close to significance (P=0.101) level association with challenge score.

Table 5. Factors influencing respondents' perception of challenge in using AI (N=132)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.189	.591		.320	.750
	Gender (female)	.418	.210	.193	1.994	.049
	Age 31-35	-.210	.207	-.103	-1.012	.314
	Age 36-40	-.356	.433	-.099	-.822	.413
	Age 41-45	1.225	1.073	.107	1.141	.256
	Specialist (includes those in residency programs)	.447	.271	.210	1.651	.101
	Sub-Specialist	.879	.513	.210	1.712	.090
	Medical Specialities	-.076	.269	-.033	-.283	.777
	Surgical Specialities	-.264	.278	-.115	-.949	.345
	Other Specialities	.151	.801	.018	.188	.851
	General Hospital	-.482	.589	-.180	-.818	.415
	Referral Hospital	-.639	.544	-.255	-1.175	.243
	3-10 years of experience	-.014	.214	-.006	-.063	.950
	More than 10 years of experience	-.056	.576	-.012	-.098	.922
	Privately Owned	.136	.311	.046	.437	.663
	Slightly familiar	.131	.247	.062	.531	.596
	Moderatly familiar	-.018	.269	-.008	-.067	.946
	Very familiar	.450	.403	.120	1.117	.266
	Exteremely familiar	2.049	1.042	.178	1.966	.052
	AI_Use	.156	.218	.075	.717	.475

a. Dependent Variable: REGR factor score Challenge Score Constant Variable; Gender (male) , Age (26-30), Educational status (General Practitioner), Speciality fields (Priamary Care Specialities), Years of experience (less than 3 years), Level of Hospital (Primary Hospital), Hospital Ownership (Public owned), Level of familiarity (Not familiar) R Square - 0.140 F static -- 0.961

Table 6 presents associations test results using linear regression model between factors considered and perceptions on AI implications on organizations. The findings show that organizational perception score was found to be significantly related with familiarity level of being very familiar (P= 0.01) and being extremely familiar (P= 0.087).

Table 6. Factors influencing respondents' perception of implications of AI use on health care organizations (N=132)

a

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.296	.585		.506	.614
	Gender (female)	-.122	.207	-.056	-.589	.557
	Age (31-35)	-.141	.205	-.069	-.686	.494
	Age (36-40)	-.509	.429	-.141	-1.187	.238
	Age (41-45)	1.011	1.062	.088	.952	.343
	Specialist (includes those in residency training program)	.085	.268	.040	.318	.751
	Sub-Specialist	.266	.508	.064	.524	.601
	Medical Specialities	.043	.266	.019	.162	.872
	Surgical Specialities	.233	.275	.101	.845	.400
	Other Specialities	.471	.793	.058	.594	.554
	General Hospital	-.445	.583	-.166	-.762	.448
	Referral Hospital	-.450	.538	-.180	-.836	.405
	3- 10 years of experience	-.200	.211	-.093	-.945	.347
	More than 10 years of experience	.470	.570	.098	.823	.412
	Privately Owned	.048	.308	.016	.154	.878
	Slightly familiar	.194	.244	.093	.795	.428
	Moderate familiar	.129	.266	.057	.485	.629
	Very familiar	1.050	.399	.279	2.634	.010
	Extermely Familiar	1.779	1.031	.155	1.725	.087
	AI_Use	.172	.216	.083	.799	.426

a. Dependent Variable: REGR factor score Orgazniztional Composite Score Constant Variables - Gender (Male), Age (26-30), Educational Status (General Practitioner), Speciality Fields (Primary Care specialities), Hosptial Level (Primary Hospital), Years of Experience (less than 3 years), Hospital Ownership (Public Owned) and Level of familiarity (Not familiar). R square - 0.158 and F static - 1.1.05

Table 7 presents associations test results using linear regression model between factors considered in the study and perceptions of respondents on the implications of AI use on professionals. The findings show that perceptions of AI use on professionals is significantly associated with age (age group category 41-45) (P=0.033), with education level – with being specialist (P=0.026), and sub-

specialist (P=0.077), with 3-10 years of work experience (P=0.039), and with being extremely familiar with AI (P=0.008).

Table 7. Factors influencing respondents' perception of implications of AI use on professionals (N=132)

a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.011	.567		.020	.984
	Gender (female)	-.019	.201	-.009	-.094	.925
	Age (31-35)	-.111	.199	-.055	-.560	.577
	Age (36-40)	-.481	.416	-.133	-1.156	.250
	Age (41-45)	2.228	1.030	.194	2.163	.033
	Specialist (includes those in residence training program	.587	.260	.276	2.260	.026
	Sub-Specialist	.878	.492	.210	1.783	.077
	Medical Specialities	-.260	.258	-.114	-1.007	.316
	Surgical Specialities	-.326	.267	-.142	-1.221	.225
	Other Specialities	.361	.769	.044	.469	.640
	General Hosptial	-.231	.566	-.086	-.408	.684
	Referral Hosptial	-.239	.522	-.095	-.458	.648
	3-10 years of experience	-.429	.205	-.199	-2.094	.039
	More than 10 years of experience	.435	.553	.091	.786	.433
	Privately Owned	.169	.299	.057	.565	.573
	Slightly familiar	.237	.237	.113	.999	.320
	Moderately familiar	.136	.258	.060	.528	.599
	Very familiar	.613	.387	.163	1.586	.116
	Exterme familiar	2.681	1.000	.233	2.681	.008
	AI_Use	.221	.209	.106	1.057	.293

a. Dependent Variable: REGR factor score Professional compoiste Score Constant Variable - Gender (male). Age (26-30), Education Status (General Practitioner), Speciality Fields (Primary Care Specilities), Hospital Level (Primary Hospital), Years of experience (less than 3 years), Hospital Ownership (Public Owned), Level of familiarity (Not familiar) R square - 0.208 F-static 1.552

The study survey showed that there is low level of AI use by physicians working in Ethiopian healthcare system. But there is a general agreement on the potential benefits and perceived challenges in using AI, and its implications on health care providing organizations and on health care professionals.

Chapter Five - Conclusions and Recommendations

5.1. Conclusions

The development artificial intelligence is believed by many as having the potential to dramatically transform the way we do things as did the invention of machines that marked the industrial revolution. The use of AI us rapidly expanding across different sectors of the economy, transforming banking, transportation, agriculture, education, health care, and other fields. In addition to reducing the demand for labour, AI is also replacing labor. In the health care system, rapidly evolving technologies are being used. AI technologies used in healthcare and medicine include surgical robots, natural language processing (NLP), rule-based expert systems, knowledge engineering, machine learning, and image and signal processing. These technologies are used to monitor, detect, and assess risks and generate information that enhances decision making in diagnosis and the treatment of patients. In particular, the fields of radiology, dermatology, and ophthalmology have benefited greatly from AI. The use of AI is not restricted to advancements in scientific fields. It has benefits to professionals and organizations as well. Benefits to professionals include access to automated decision making, improved patient monitoring, early diagnosis, and simplified procedures. For healthcare service providing organizations, adopting AI results in quicker diagnosis time, cost reduction, performance improvement, and better monitoring of workflow, which all contribute to increasing capabilities of organizations to be competitive.

Yet adopting and wider use of AI in the health care system is constrained by a number of challenges such as data availability, data digitalization and consolidation, data regulations relating to privacy, law and governance regarding editing and sharing patient data. In addition, organizations that plan to adopt AI will have to manage the potentially divergent views and interests of their staff members around the benefits and disadvantages of AI. Some employees may mistrust, or even be skeptical or hostile to AI due to fears of being replaced. Projections show that AI is expected to reshape two-thirds of job skills, emphasizing the urgent need for targeted education and training. In the health sector, AI has the potential to substantially change the way how medical care and public health programs might be implemented, and how medical professionals will be trained.

Developing countries like Ethiopia could benefit from advances in and use of AI to two ways: (i) to build health systems by supporting and standardizing clinical judgments and applying healthcare processes more objectively with data-oriented approach; and (ii) to increase quantity and quality of medical care in areas where skilled health workers are in shortage. Yet, factors influencing the adoption and use of AI in the health sector are yet to be thoroughly investigated and addressed. The perceptions of physicians in Ethiopia regarding the use, benefits, and challenges of using AI in Ethiopia's health care system have not been systematically studied. This study was conducted to contribute to filling this gap and propose measures that may be needed to health professionals' perceptions of AI potential in improving effectiveness, efficiency, and accessibility of health services in Ethiopia.

The study was conducted to assess perceptions of Ethiopian physicians regarding the benefits and challenges of adopting AI in Ethiopian health care systems and its implications on healthcare organizations and on professionals. A questionnaire-based survey was distributed to on-line platforms where only physicians are members. A total of 132 physicians (97 of whom were specialists) participated in survey. Their responses were analyzed using descriptive and inferential statistics. The findings can be summarized as follows:

The following are the main findings of the study:

- The familiarity of physicians on AI use in the health sector is very low as 65.2% of the respondents reported their level of familiarity as slightly familiar or not familiar. Likewise, the use AI was found to be low, as only 35.6% respondents reported that they use AI.
- Most respondents recognize that AI use will enhance health delivery (79%), improve health access in remote areas (73.4%), enhance clinical decision-making capability (72%), improve patient care (60%), reduce workload of physicians (87.9%), and help reduce costs of health service organizations (59.1). Most (80%) believe that training on AI will improve their skills and build their trust on the technology while possibilities of job displacement worry close to half (42.7%) of the respondents, and two-thirds (69.7%) of physicians fear that they may have a diminished role with increased use of AI in the health care system.
- Challenges that would hinder adoption and wider use of AI in Ethiopia's health care system were identified to be lack of proper oversight and regulations regarding access to and use

of patinet data and to protect health information (59.8%), high costs associated with infrastructure, technology and skilled personnel (48.5%), doubts amongst physicians about trustworthiness of AI (43.9%), and lack of human insight in AI based decisions (46.2%).

- Level of familiarity of AI use in health care systems was significantly associated with age of the physician. But AI use by physicians was not affected by the age, gender, educational status, field of study, years of experience of the physician nor by the level (primary or referral) or ownership (state or private) of the hospital where physician work.
- Further analyses of the responses using regression models revealed the following.
    - Level of familiarity was not significantly associated with any of the demographic characteristics of respondents and with the characteristics of hospitals where the physicians work. But being a specialist in medical specialty category had close to significance level (P=0.101) of association with being aware of AI use.
    - Educational status (being sub-specialist (P=0.20) and being in surgical specialty field (P=0.045) and familiarity level with AI use (P <0.001) were found have statistically significant association with AI use. AI use was found to be significantly associated with sub-specialist. Being sub-specialist compared to those at educational level of general practitioner resulted in more AI use. Compared to primary care specialties, those from surgical specialties were found to use AI more.
    - The perceptions of respondents regarding benefits of AI use are not significantly associated with the type of hospitals they work in or with their demographic characteristics except for familiarity of AI use. Being very familiar (at P<0.05) and extremely familiar (at P<0.10) showed statistically significant association with perceiving AI benefits by physicians. Likewise, perception score for challenges was not significantly associated with demographic characteristics of respondents, except for gender (P=0.049), indicating that being female is likely to be associated with identifying challenges of using AI.
    - The perceptions of respondents regarding the implications of AI use on health care organizations was not significantly associated with demographic characteristics of respondents, except for level of familiarity. Being very familiar (P= 0.01) and being extremely familiar (P= 0.087) have statistically significant associations with respondent's responses regarding implications of AI use on organizations.

- The perceptions of respondents on the implication AI use on professionals or was significantly associated with age (P=0.033), with education level (P=0.026), and years of experience (P=0.039), and with level of familiarity with AI (P=0.008).

5.2. Recommendations

Based on the findings of the study, the following recommendations are proposed.

- It is necessary to organize and offer training for health professionals, in this case physicians, to increase their familiarity about the expanding role and use of AI in the health care system. The training needs to target those physicians in the early stages of medical career about and use of AI is more among specialist and sub-specialists than general practitioners.
- Further study is recommended to better understand and address the fear of physicians in terms of implications of wider use of AI on organizational behavior of health care facilities and on the professionals themselves.
- In view of adapting to use of AI in the health care system, it important to capitalize on perceived benefits of AI and address concerns of physicians regarding challenges, including technical and logistical limitations and concerns about access to patient data.
- It will be advisable for the Ministry of Health to invest in increasing awareness of staff about AI and invest in building capacity to acquire and use AI to expedite its seamless integration in the Ethiopian health care system.

Finally, it is recommended that similar studies be conducted to reach other categories of health service workforce to get more inclusive picture as this study was limited only to physicians.

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Annexes

Annex 1. Sample size calculations

Sample size for this survey was determined the following formula.

$$n = \frac{Z^2 x\ p\ x\ (1-p)}{E^2}$$

Were, n= required sample size

Z= Z-score corresponding to confidence level of 95% (1.96)

P= 0.5

E = 10%

Substituting above formula, we find

$$n = \frac{1.96^2 x\ 0.5\ (1-0.5)}{0.1^2}$$

$$n = \frac{3.8416\ x\ 0.5\ x0.5}{0.01}$$

$$n = \frac{0.9604}{0.01}$$

$$n = 96.04 \sim 97$$

Accounting for 35% - non response rate = 132

Annex 2a. Survey Questionnaire (Amharic Version)

አዲስ አበባ ዩኒቨርሲት
የንግድ እና ኢኮኖሚክስ ኮሌጅ
የንግድ ትምህርት ቤት
የፕሮጀክት አስተዳደር የምረቃ ፕሮግራም

የዳሰሳ መጠይቅ

የስምምነት ቅጽ

ሰላም ። አክሊለ ሀብተማርያም እባላለሁ። ይህንን ጥናት የማካሂደው በአዲስ አበባ ዩኒቨርሲቲ የንግድ ትምህርት ቤት በፕሮጀክት ማኔጅመንት ማስተርስ ዲግሪ በከፊል ለማሟላት ነው። መጠይቁ የሰውሰራሽ አስተውሎት ድርጅታዊ ባህሪን የመለወጥ ሚና ለመዳሰስ አስፈላጊውን መረጃ ለመሰብሰብ የታሰበ ነው።

የጥናት ርዕስ - በጤና አገልግሎቶችን ድርጅታዊ ባህሪ ለመለወጥ የሰራሽ አስተውሎት ሚና; የሐኪሞች ግንዛቤ ስለ እምቅ አቅም እና ተግዳሮቶች

የሚያቀርቧቸው ምላሾች ሙሉ በሙሉ ሚስጥራዊ ይሆናሉ። ምላሾች የሰው ሰራሽ አስተውሎት በጤና ስርዓት ውህደት ሊፈጠሩ የሚችሉ እምቅ አቅም እና የሚችሉ ተግዳሮቶች ለማጥናት ይውላል

ለተሳትፎወ አመሰግናለሁ

ክፍል I -			
ኮድ	ጥያቄዎች	መልሶች	አስተያየት
1.	ዕድሜ	I. 20-25 II. 25-30 III. 30-35 IV. 40-45 V. 45-50 VI. >50	
2.	ፆታ	I. ሴት II. ወንድ	
3.	የትምህርት ደረጃ	I. ጠቅላላ ህኪም II. ስፔሻሊስት III. ንዕሰ ስፔሻሊስት	
4.	ስፔሻሊቲ አይነት	I. የውስጥ ደዌ ህክምና II. የህፃናት ህክምና III. የማህፀን እና ፅንስ ህክምና IV. ቀዶ ጥገና V. የሰመመን ህክምና VI. ራዲዮሎጂ VII. ፓቶሎጂ VIII. ሳይካትሪ IX. የቤተሰብ ሕክምና X. አንኮሎጂ XI. ሌላ	
5.	በሰራ ላይ የቆዩበት አመት	I. ከ 3 ዓመት በታች II. 3-10 ዓመታት III. ከ 10 ዓመታት በላይ	
6.	የሚሰሩት ሆስፒታል ደረጃ	I. የመጀመሪያ ደረጃ ሆስፒታል II. አጠቃላይ ሆስፒታል III. ሪፈራል ሆስፒታል	
7.	የሚሰሩት በግል ወይስ የመንግስት ሆስፒታል ?	I. የግል II. የመንግሰት	
8.	በሰራዎ ሰው ሰራሽ አሰተውሎት ተጠቅመው ያቃሉ?	I. አውቃለሁ II. አላውቅም	
9.	በጤና ስርዓቶች ውስጥ ስለ የሰው ሰራሽ አሰተውሎት አጠቃቀም ያለዎት መረዳት	I. አላቅም II. በትንሹ አውቃለሁ III. በመጠኑ አውቃለሁ IV. በጣም አውቃለሁ V. እጅግ በጣም አውቃለሁ	

ክፍል 2 -						
ኮድ	ጥያቄዎች	በጣም አልስማማም።	አልስማማም።	ገለልተኛ	ተስማማ	በጠንካራ ሁኔታ ተስማማ
1	በኢትዮጵያ የጤና ስርዓት ውስጥ ሰው ሰራሽ አስተውሎት ተግባራዊ ማድረግ የስርዓቱ ቅልጥፍና እና ውጤታማነት እንደሚያሳድግ አምናለሁ					
2	ሰው ሰራሽ አስተውሎት በስራ ላይ መዋል የህክምና ውሳኔ አሰጣጥና ውጤታማነትን ይጨምራል ብዬ አምናለሁ					
3	የሰው ሰራሽ አስተውሎትን መጠቀም የታካሚዎቹን የመዳን ዕድል ይበልጥ ያሻሻላል ብዬ እጠብቃሉ					
4	የሰው ሰራሽ አስተውሎትን ወደ ጤና ስርዓት የስራ ፍሰት ማስተዋወቅ የተሻለውን አጠቃቀምን የሃብት (የሰው፣ የቁሳቁስ እና የገንዘብ) ያመጣል ብዬ አምናለሁ።					
5	የሰው ሰራሽ አስተውሎት ወደ ጤና ስርዓት መግባት የስራ ወጪን ይቀንሳል ብዬ አምናለሁ					
6	ሰው ሰራሽ አስተውሎት በስፋት መጠቀም የስነ ምግባርና የተጠያቂነትን ጥያቄ የሚያስከትል ይመስለኛል					
7	የቁጥጥር ደንቦች አለመኖርና እና የአስተዳደር ውስንነት የሰው ሰራሽ አስተውሎት በጤና ስርዓት ውስጥ ያለውን ተቀባይነት ውሱን ያደርገዋል ብዬ አምናለሁ					
8	የ ሰው ሰራሽ አስተውሎት አጠቃቀም በከፍተኛ የመሠረተ ልማት፣ የቴክኖሎጂ እና የሰለጠነ የሰው ኃይል ወጪ የተገደበ ነው ብዬ አምናለሁ።					
9	ለሰው ሰራሽ አስተውሎት ላይ የተመሰረተ ውሳኔ አሰጣጥ ላይ ጥርጣሬዎች አሉኝ					
10.	ሰው ሰራሽ አስተውሎት ውስብስብ የሆኑ ጉዳዮች ላይ ውሳኔዎችን ለመወሰን ሠዋዊ መረዳት ይጎዋል ብዬ አስባለሁ					
11.	የህክምና ባለሙያዎች ከሰው ሰራሽ አስተውሎት ጋር ያላቸው ትውውቅ አናሳ መሆን በስርዓት ውስጥ ያለውን አጠቃቀም ገድቦታል					
12.	ከሰው ሰራሽ አስተውሎት አጠቃቀም ዙሪያ መሰልጠን በሰው ሰራሽ አስተውሎት ላይ ያለኝን እምነት ይጨምሩልኛል ብዬ አምናለሁ					
13.	የሰው ሰራሽ አስተውሎት መጠቀም የታካሚ መረጃን ማግኘትን በማመቻቸት የስራ ጫናዬን እና ጭንቀቴን እንደሚቀንስ አምናለሁ።					
14.	ሰው ሰራሽ አስተውሎት መደበኛ ተግባራትን በማቃለል ይበልጥ ውስብስብ እና ልዩ እንክብካቤ ላይ እንዳተኩር ይረዳኛል					
15.	ሰው ሰራሽ አስተውሎት የ**ታካሚ** መረጃ **ግላዊነት እና ምስጢራዊነት አደጋ እንደሚፈጥር አምናለሁ።**					
16.	ሰው ሰራሽ አስተውሎት መጠቀም የምርመራ ውጤት ትክክለኛነት እንደሚያሻሽል አምናለሁ.					
17.	የሰው ሰራሽ አስተውሎት በ**ታካሚ** መረጃ ውስጥ ያሉ አዝማሚያዎች በመለየት የሕክምና ዕቅድን ይረዳል.					

18	በርቀት ታካሚ ክትትል ውስጥ የሰው ሰራሽ አስተውሎት መጠቀም የጤና ጉዳዮችን አስቀድሞ ለማወቅ እና ወቅታዊ ሕክምና ለማድረግ ይረዳል። በዚህም ለገጠር ነዋሪዎች የጤና አገልግሎቶችን ተደራሽነት እንደሚያሻሽል አምናለሁ					
19	የሰው ሰራሽ አስተውሎት በጤና መስኩ ላይ ያለኝን ችሎታ እና እውቀት ለማሻሻል ይረዳል ብዬ አምናለሁ።					
20	የሰው ሰራሽ አስተውሎት የተወሰኑ የጤና መስክ የሰው ባለሙያዎችን ይተካል ብዬ እፈራለሁ። ይህ በስራ ተቀጣሪነት እና በስራ ደህንነት ላይ ተጽእኖ ሊያሳድር ይችላል					
21	የሰው ሰራሽ አስተውሎት የሰራተኞችን ስብጥር እና ቁጥር ይለውጣል ብዬ አምናለሁ።					
22	የሰው ሰራሽ አስተውሎት የጤና ተቋማት ትላልቅ መረጃ ስብስቦችን እንዲመረምሩ እና አዝማሚያዎችን እና ክስተቶችን እንዲለዩ ያስችላቸዋል ብዬ አስባለሁ ። ምሳሌ፡ የበሽታ ወረርሽኝ መከሰት					
23	ሰው ሰራሽ አስተውሎት በኢትዮጵያ ጤና ተቋማት ለሚከሰቱ የጤና ጉዳዮች አዳዲስ መፍትሄዎችን እንዲሰጡ ያስችላቸዋል ብዬ አምናለሁ።					
24	ሰው ሰራሽ አስተውሎት የሕክምና እድገቶችን እና የመድሃኒት ግኝትን ያፋጥናል ብዬ አምናለሁ					
25	ሰው ሰራሽ አስተውሎት በተቋማት እና በመላው የጤና ባለሙያዎች መካከል ያለውን ግንኙነት ያሻሽላል ብዬ አምናለሁ።					
26	ሰው ሰራሽ አስተውሎት መጠቀም በጤና ተቋማት ውስጥ ያለውን የኃይል አሰላለፍ ሊለውጥ ይችላል ብዬ አምናለሁ					
27	በጤና ባለሙያዎች ዘንድ የሚገኝ የማይታወቅ ፍርሃትና ጭንቀት ሰው ሰራሽ አስተውሎት ወደ ጤና ስርዓት እንዳይገባ እንቅፋት እንደሚሆን አምናለሁ					
28	በባለሙያዎች ፈጣን የቴክኖሎጂ እርጅናን መፍራት ሰው ሰራሽ አስተውሎት ወደ ጤና ስርዓቱ እንዳይገባ እንቅፋት እንደሚሆን አምናለሁ።					
29	ሰው ሰራሽ አስተውሎት መጠቀም ሙያዊ ማንነት ይሸረሽራል ብዬ አምናለሁ።					
30	ለውጥን መቃወም እንዲሁም የጤና ባለሙያዎች አመለካከት የሰው ሰራሽ አስተውሎት በስፋት ለመጠቀም እንቅፋት ይሆናል ብዬ አምናለሁ።					

Annex 2b. Survey Questionnaire (English Version)

Addis Ababa University

College of Business and Economics

School of Commerce

Project Management Graduate Program

Consent Form

Hello, my name is Aklile Habtemariam. I am conducting this research for partial fulfillment of Master of Arts in Project Management degree at Addis Ababa University, School of Commerce. The questionnaire is intended to collect the necessary information to explore the role of AI in changing organizational behavior.

Study Title - Role of AI in changing organizational behavior of health services; perception of physicians on potential and challenges.

The responses you provide will be fully confidential. Responses will be analyzed to provide findings that will provide insights to AI adoption, integration and possible challenges. There by aiding in policy making, project and initiative development.

I appreciate your consent for participation.

Section I – Demographic characteristics of respondents		
No.	Questions	Answers (please circle the selected one)
2.	Age	I. 20-25 II. 25-30 III. 30-35 IV. 40-45 V. 45-50 VI. >50
18.	Sex	I. Female II. Male
19.	Educational Status	I. General practitioner II. Specialist III. Subspecialist
20.	Field of specialty	I. Internal Medicine II. Pediatrics III. Obstetric and Gynecology IV. Surgery V. Anesthesiology VI. Radiology VII. Pathology VIII. Psychiatry IX. Family Medicine X. Oncology
21.	Number of years you have been practicing	I. Less than 3 years II. 3-10 years III. More than 10 years
22.	The level of hospital you been working in	I. Primary Hospital II. General Hospital III. Referral Hospital
23.	Is the hospital public or privately owned	I. Public II. Private
24.	Have you used AI in your work?	I. Yes II. NO
25.	Your level of familiarity about use of AI in health systems	I. Not familiar II. Slightly familiar III. Moderately familiar IV. Very familiar

		V. Extremely familiar

Section II (Please put a tick mark on the selected response)						
No.	Questions	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
1.	I believe that integrating AI into healthcare system will enhance efficiency and effectiveness of health service in Ethiopia					
2.	I believe adopting AI will increase clinical decision-making effectiveness					
3.	I expect AI systems lead to better patient outcomes					
4.	I believe introduction of AI into healthcare workflow leads to optimal allocation and use of resources (human, material and financial).					
5.	I believe introduction of AI into healthcare system reduces health care costs.					
6.	I think wider AI adoption to healthcare system comes with ethical concerns					
7.	I think lack of appropriate oversight and regulations and limited capabilities to govern AI will reduce its wider adoption in the health care system.					
8.	I believe use of AI system is constrained by high initial cost of infrastructure, technology, and Skilled manpower.					
9.	I have doubts in full trustworthiness of AI based decision making.					
10	I think AI technologies lack the human insight necessary to make nuanced healthcare decisions.					
11	I think little exposure of medical professionals to AI has limited its use in Ethiopian healthcare system.					
12	I believe training on AI use will help me build trust in its applications.					
13	I believe utilizing AI will reduce my workload and stress by facilitating patient data access and retrieval.					
14	I think automating routine tasks using AI will allow me to focus more on complex health care challenges and provide more specialized care to patients.					
15	I believe AI poses risk to privacy and confidentiality of patient data.					

16	I believe that use of AI improves accuracy of diagnosis.					
17	I think AI will aid in identifying patterns and trends in patient data to inform treatment plan.					
18	I believe that use of AI in remote patient monitoring enables early detection of health issues and make timely interventions and by so doing improve accessibility of health services to rural people					
19	I believe AI aids in upgrading my skill and knowledge in the field.					
20	I fear that AI technologies will replace human professionals in certain aspects of healthcare delivery, and this may impact employment and job security.					
21	I believe AI technology may lead to changes in staff composition and number in health care providing institutions.					
22	I think AI will enable health institutions to analyze large data sets and identify trends and forecast events such as disease outbreak/spread patterns					
23	I believe AI will help health institutions to provide innovative solutions to emerging health challenges					
24	I believe AI accelerates medical advancements and drug discovery.					
25	I believe AI improves communications among healthcare teams across and within institutions.					
26	I think use of AI may alter existing power dynamics within an organization.					
27	I think unconscious fear or anxiety among health professionals that AI may affect their role in healthcare system is limiting its implementation.					
28	I believe fear of rapid technological obsolescence by professionals hinders AI integration into the health system.					
29	I am concerned that use of AI will erode my professional identity.					
30	I believe resistance to change/attitude of health professional hinders wider use of AI in the health system					

Annex 3. Respondents' Profile

Variable		Frequency	Percentage
Age	26-30	42	31.8
	31-35	78	59.1
	36-40	11	8.3
	41-45	1	0.8
	Total	132	100
Gender	Female	40	30.3
	Male	92	69.7
	Total	132	100
Education status	General Practitioner	35	26.5
	Specialist (includes those in residency training)	89	67.4
	Sub-specialist	8	6.1
	Total	132	100
Experience Years	Less than 3 years	35	26.5
	3-10 years	91	68.9
	More than 10 years	6	4.5
	Total	132	100
Hospital Level	Primary Hospital	4	3.0
	General Hospital	22	16.7
	Referral Hospital	106	80.3
	Total	132	100
Hospital Ownership	Private	17	12.9
	Public	115	87.1
	Total	132	100

Annex 4. Specialist and Sub-specialist medical fields of respondent physicians, regrouped into four specialization categories for regression analysis

Medical field		Frequency	Percentage	Specialty category assigned to
Anesthesiology		5	5.15	Medical
Dermatovenerology		2	2.06	Medical
Emergency Medicine		6	6.18	Medical
Family Medicine		1	1.03	Primary care
Internal Medicine		13	13.40	Primary care
MPH		2	2.06	Others
Neurology		1	1.03	Medical
Nuclear Medicine		1	1.03	Medical
Obstetric and Gynecology		2	2.06	Primary
Ophthalmology		1	1.03	Surgical
Pathology		1	1.03	Medical
Pediatrics		12	9.1	Primary
Psychiatry		6	6.18	Medical
Radiology		12	12.37	Medical
Surgery		32	32.98	Surgical
	Total	97	100	
Surgical Specialty Type				
	General Surgery	6	18.75	Surgical
	Neurosurgery	5	15.62	Surgical
	Orthopedic and Traumatology	7	21.87	Surgical
	Otolaryngology, Head and Neck Surgery	4	12.5	Surgical
	Pediatric Surgery	1	3.12	Surgical
	Plastic and Reconstructive Surgery	7	21.87	Surgical
	Thoracic Surgery	1	3.12	Surgical
	Urology	1	3.12	Surgical
	Total	32		

Annex 5. Percentage of responses of study participants to questions on Likert Scale (N=132)

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I believe that integrating AI into healthcare system will enhance efficiency and effectiveness of health service delivery in Ethiopia **(Benefit)**	1.5	2.3	16.7	56.1	23.5
I believe adopting AI will increase clinical decision-making effectiveness **(Benefit)**	3.0	3.8	21.2	52.3	19.7
I expect AI systems lead to better patient outcomes **(Benefit)**	2.3	4.5	29.5	47.7	15.9
I believe introduction of AI into healthcare system reduces healthcare costs. **(Benefit)**	2.3	6.1	21.2	53.8	16.7
I believe that use of AI improves accuracy of diagnosis. **(Benefit)**	2.3	8.3	30.3	50.0	9.1
I believe AI will help Ethiopian health institutions to provide innovative solutions to emerging health challenges. **(Benefit)**	3.0	3.0	22.0	52.3	19.7
I believe AI accelerates medical advancements and drug discovery. **(Benefit)**	1.5	3.8	22.0	53.8	18.9
I think lack of appropriate oversight and regulations and limited capabilities to govern AI will reduce its wider adoption in the healthcare system. **(Challenges)**	2.3	4.5	15.2	59.8	18.2
I believe use of AI system is constrained by high initial cost of infrastructure, technology and skilled manpower. **(Challenges)**	2.3	7.6	22.0	48.5	19.7
I have doubts in full trustworthiness of AI based decision making **(Challenges)**	3.0	15.9	26.5	43.9	10.6
I think AI technologies to lack the human insight necessary to make nuanced healthcare decisions **(Challenges)**	2.3	9.1	24.2	46.2	18.2
I think wider AI adoption to healthcare system comes with ethical concerns. * **(Challenges)**	1.5	6.1	25	47.7	19.7
I think little exposure of medical professionals to AI has limited its use in Ethiopian healthcare system **(Challenges) ***	3	10	9.8	62.1	18.2
I believe AI poses risk to privacy and confidentiality of patient data. **(Challenges)**	4.5	15.9	30.3	34.8	14.4
I think unconscious fear/anxiety among professionals that AI may affect their role healthcare system limiting its implementation. **(Challenges)**	6.8	22.0	25.8	40.2	5.3
I believe fear of rapid technological obsolesce by professionals hinders AI integration into the health system. **(Challenges)**	5.3	15.9	40.2	15.9	0.8

I believe resistance to change/attitude of health professional hinders wider use of AI in the healthcare system **(Challenges)**	3.8	15.9	28.8	43.2	8.3
I believe training on AI use will help build trust in its applications **(Professional)**	1.5	3.0	13.6	61.4	20.5
I believe AI aids in upgrading my skill and knowledge in the field. **(Professional)**	3.0	6.8	18.9	51.5	19.7
I fear that AI technologies will replace human professionals in certain aspects of care delivery, and this may impact employment and job security. **(Professional)**	5.3	19.7	22.0	11.4	
I believe utilizing AI will reduce my workload and stress by facilitating patient data access and retrieval **(Professional)**	1.5	3.0	7.6	59.1	28.8
I believe AI technology may lead to changes in staff composition and number in health care providing institutions. **(Professional)**	2.3	9.1	18.9	59.1	10.6
I am concerned that use of AI will erode my professional identity. **(Professional) ***	16.7	36.4	28.0	36.4	2.3
I think automating routine tasks using AI will allow me to focus more on complex health care challenges and provide more specialized care to patient. **(Organizational)**	1.5	1.5	18.2	55.3	23.5
I think AI will aid in identifying patterns and trends in patient data to inform treatment plan. **(Organizational)**	1.5	3.0	15.2	62.9	17.4
I believe introduction of AI into healthcare workflow leads to optimal allocation and use of resources (human, material and financial) **(Organizational)**	1.5	3.0	15.2	57.6	22.7
I believe that use of AI in remote patient monitoring enables detection of health issues and make timely interventions and by so doing improve accessibility of health services to rural people. **(Organizational)**	1.5	3.0	20.5	60.6	14.4
I think AI will enable health institutions to analyze large data sets and identify trends and forecast events such as disease outbreak patterns. **(Organizational)**	2.3		10.6	63.6	23.5
I believe AI improves communications among healthcare teams across and within institutions. **(Organizational)**	1.5	5.3	13.6	55.3	24.2
I think use of AI my alter existing power dynamics within the health organizations. **(Organizational)**	3.0	6.1	34.8	47.7	8.3

Source: Compiled by the student from survey results

Annex 6. Tables of Chi Square Test Results

Age * Have you used AI in your work?

Crosstab

Count

		Have you used AI in your work?		
		No	Yes	Total
Age	26-30	29	13	42
	31-35	0	1	1
	31-35	46	31	77
	36-40	9	2	11
	41-45	1	0	1
Total		85	47	132

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	4.942[a]	4	.293
Likelihood Ratio	5.688	4	.224
N of Valid Cases	132		

a. 5 cells (50.0%) have expected count less than 5. The minimum expected count is .36.

Gender * Have you used AI in your work?

Crosstab

Count

		Have you used AI in your work?		
		No	Yes	Total
Gender	Female	25	15	40
	Male	60	32	92
Total		85	47	132

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.090[a]	1	.764		
Continuity Correction[b]	.010	1	.919		
Likelihood Ratio	.089	1	.765		
Fisher's Exact Test				.844	.457
N of Valid Cases	132				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 14.24.

b. Computed only for a 2x2 table

Educational Status * Have you used AI in your work?

Crosstab

Count

		Have you used AI in your work?		
		No	Yes	Total
Educational Status	General Practitioner	23	12	35
	Specialist (includes those in Residency training)	59	30	89
	Sub-Specialist	3	5	8
Total		85	47	132

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	2.690[a]	2	.261
Likelihood Ratio	2.550	2	.279
N of Valid Cases	132		

a. 1 cells (16.7%) have expected count less than 5. The minimum expected count is 2.85.

Specialty Field (Grouped into four) * Have you used AI in your work?

Crosstab

Count

		Have you used AI in your work?		
		No	Yes	Total
Grouped into four		23	12	35
	Medical	22	12	34
	Other	1	1	2
	Primary Care	16	12	28
	Surgical	23	10	33
Total		85	47	132

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	1.256[a]	4	.869
Likelihood Ratio	1.242	4	.871
N of Valid Cases	132		

a. 2 cells (20.0%) have expected count less than 5. The minimum expected count is .71.

Number of years you have been practicing * Have you used AI in your work?

Crosstab

Count

		Have you used AI in your work?		
		No	Yes	Total
Number of years you have been practicing	3-10 years	54	37	91
	Less than 3 years	26	9	35
	More than 10 years	5	1	6
Total		85	47	132

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	3.446[a]	2	.179
Likelihood Ratio	3.627	2	.163
N of Valid Cases	132		

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is 2.14.

The level of hospital you have been working * Have you used AI in your work?

Crosstab

Count

		Have you used AI in your work?		
		No	Yes	Total
The level of hospital you have been working	General Hospital	16	6	22
	Primary Hospital	2	2	4
	Referral Hospital	67	39	106
Total		85	47	132

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	1.093[a]	2	.579
Likelihood Ratio	1.106	2	.575
N of Valid Cases	132		

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is 1.42.

Is the hospital your working in public or Privately owned * Have you used AI in your work?

Crosstab

Count

		Have you used AI in your work?		
		No	Yes	Total
Is the hospital your working in public or Privately owned	Private	12	5	17
	Public	73	42	115
Total		85	47	132

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.327[a]	1	.568		
Continuity Correction[b]	.090	1	.764		
Likelihood Ratio	.335	1	.563		
Fisher's Exact Test				.787	.390
N of Valid Cases	132				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 6.05.

b. Computed only for a 2x2 table

Age * Your level of familiarity about use of AI in health systems

Crosstab

Count

		Your level of familiarity about use of AI in health systems					
		Extremely familiar	Moderately familiar	Not familiar	Slightly familiar	Very familiar	Total
Age	26-30	1	10	12	17	2	42
	31-35	0	0	0	0	1	1
	31-35	0	23	20	27	7	77
	36-40	0	2	8	1	0	11
	41-45	0	0	1	0	0	1
Total		1	35	41	45	10	132

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	28.198[a]	16	.030
Likelihood Ratio	21.472	16	.161
N of Valid Cases	132		

a. 18 cells (72.0%) have expected count less than 5. The minimum expected count is .01.

Gender * Your level of familiarity about use of AI in health systems

Crosstab

Count

		Your level of familiarity about use of AI in health systems					
		Extremely familiar	Moderately familiar	Not familiar	Slightly familiar	Very familiar	Total
Gender	Female	1	10	15	13	1	40
	Male	0	25	26	32	9	92
Total		1	35	41	45	10	132

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	5.110[a]	4	.276
Likelihood Ratio	5.605	4	.231
N of Valid Cases	132		

a. 3 cells (30.0%) have expected count less than 5. The minimum expected count is .30.

Educational Status * Your level of familiarity about use of AI in health systems

Crosstab

Count

		Your level of familiarity about use of AI in health systems					
		Extremely familiar	Moderately familiar	Not familiar	Slightly familiar	Very familiar	Total
Educational Status	General Practitioner	1	11	12	9	2	35
	Specialist (includes those in Residency training)	0	21	26	34	8	89
	Sub-Specialist	0	3	3	2	0	8
Total		1	35	41	45	10	132

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	6.418[a]	8	.600
Likelihood Ratio	6.923	8	.545
N of Valid Cases	132		

a. 8 cells (53.3%) have expected count less than 5. The minimum expected count is .06.

specialty (Grouped into four) * Your level of familiarity about use of AI in health systems

Crosstab

Count

		Your level of familiarity about use of AI in health systems					
		Extremely familiar	Moderately familiar	Not familiar	Slightly familiar	Very familiar	Total
Grouped into four		1	11	12	9	2	35
	Medical	0	8	6	15	5	34
	Other	0	1	1	0	0	2
	Primary Care	0	6	10	12	0	28
	Surgical	0	9	12	9	3	33
Total		1	35	41	45	10	132

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	15.013[a]	16	.524
Likelihood Ratio	17.551	16	.351
N of Valid Cases	132		

a. 13 cells (52.0%) have expected count less than 5. The minimum expected count is .02.

Number of years you have been practicing * Your level of familiarity about use of AI in health systems

Crosstab

Count

		Your level of familiarity about use of AI in health systems					
		Extremely familiar	Moderately familiar	Not familiar	Slightly familiar	Very familiar	Total
Number of years you have been practicing	3-10 years	1	27	26	32	5	91
	Less than 3 years	0	7	10	13	5	35
	More than 10 years	0	1	5	0	0	6
Total		1	35	41	45	10	132

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	12.328[a]	8	.137
Likelihood Ratio	13.139	8	.107
N of Valid Cases	132		

a. 8 cells (53.3%) have expected count less than 5. The minimum expected count is .05.

The level of hospital you have been working * Your level of familiarity about use of AI in health systems

Crosstab

Count

		Your level of familiarity about use of AI in health systems					
		Extremely familiar	Moderately familiar	Not familiar	Slightly familiar	Very familiar	Total
The level of hospital you have been working	General Hospital	0	7	8	5	2	22
	Primary Hospital	0	1	2	0	1	4
	Referral Hospital	1	27	31	40	7	106
Total		1	35	41	45	10	132

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	5.711[a]	8	.680
Likelihood Ratio	6.665	8	.573
N of Valid Cases	132		

a. 8 cells (53.3%) have expected count less than 5. The minimum expected count is .03.

Is the hospital your working in public or Privately owned * Your level of familiarity about use of AI in health systems

Crosstab

Count

		Your level of familiarity about use of AI in health systems					
		Extremely familiar	Moderately familiar	Not familiar	Slightly familiar	Very familiar	Total
Is the hospital your working in public or Privately owned	Private	0	5	4	4	4	17
	Public	1	30	37	41	6	115
Total		1	35	41	45	10	132

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	7.760[a]	4	.101
Likelihood Ratio	6.017	4	.198
N of Valid Cases	132		

a. 4 cells (40.0%) have expected count less than 5. The minimum expected count is .13.

Annex 7. Principal Component Analysis for thematic areas of perceptions on benefit, challenges, and implications for organizations and for professionals

Benefit Component

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.610	65.852	65.852	4.610	65.852	65.852
2	.760	10.864	76.716			
3	.587	8.381	85.097			
4	.435	6.208	91.305			
5	.298	4.253	95.558			
6	.163	2.327	97.884			
7	.148	2.116	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component 1
Enhance_EffiencyandEffectivness_New	.889
Increase_Clinical_decision_effectivenessNew	.870
Better_patient_outcomeNew	.877
Reduce_CostNew	.730
Improvement_inAccuracy_ofDiagnosis	.689
Innovative_Solutions_New	.805
Advacement_Discovery_New	.800

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

Challenge Component

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.166	31.658	31.658	3.166	31.658	31.658
2	1.858	18.584	50.242	1.858	18.584	50.242
3	1.006	10.064	60.306	1.006	10.064	60.306
4	.920	9.197	69.503			
5	.789	7.887	77.390			
6	.580	5.801	83.191			
7	.568	5.681	88.872			
8	.430	4.298	93.169			
9	.367	3.665	96.834			
10	.317	3.166	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component		
	1	2	3
Lackof_regulation_governingNew	.719	-.113	-.314
HIgh_cost_constraintsNew	.496	-.211	.327
Doubts_AI_decisionmakingNew	.558	-.339	.421
Lack_human_insightNew	.577	-.357	.382
Privacy_and_ConfidentialtiyNew	.583	-.250	-.071
Unconciousfear_Axiety_New	.465	.703	.124
RapidTec_Obsolesence_fear_New	.550	.679	.113
Ethical_ConcernNew2	-.694	.364	.289
Limited_exposureNew2	-.455	.034	.601
Resistance_New	.462	.638	.008

Extraction Method: Principal Component Analysis.

a. 3 components extracted.

Professional component

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.362	39.367	39.367	2.362	39.367	39.367
2	1.637	27.276	66.642	1.637	27.276	66.642
3	.721	12.015	78.658			
4	.606	10.101	88.759			
5	.382	6.360	95.119			
6	.293	4.881	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component	
	1	2
Empolyment_JobSecurityNew2	-.503	.677
Staff_compsoitionNew2	-.609	.534
Erode_Professional_IdentitiyNew2	-.126	.740
Skill_UpgradeNew	.717	.303
Workload_Stress_ReducationNew	.792	.430
Training_onAINew	.762	.265

Extraction Method: Principal Component Analysis.

a. 2 components extracted.

Organizational component

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.977	56.809	56.809	3.977	56.809	56.809
2	.861	12.299	69.108			
3	.638	9.118	78.226			
4	.458	6.538	84.764			
5	.439	6.275	91.039			
6	.336	4.798	95.837			
7	.291	4.163	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
Optimal_Resource_Allocation_New	.725
Automating_RoutineTasks_New	.790
Patient_Data_PatternsandTrendsNew	.790
Remote_MonitoringNew	.806
Event_Forcast_New	.791
Team_Communications	.765
Powerdynamics_New	.586

Extraction Method: Principal Component Analysis.

a. 1 components extracted.