

A Review of The Research on The Acceptance of Technology (TAM) Of AI Applications in The Field of Medical Services

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ABSTRACT

The continuous development of AI technology has penetrated into all aspects of human life, not only assisting and replacing some human labor, but also making great progress in important fields such as education, robotics and unmanned driving. Due to the particularity of medical services and the basic rights of the public such as their own security and privacy, the application of AI is particularly easy to attract public attention. The acceptance of AI technology by the public and doctors is not only affected by the AI technology itself, but also related to the user's perceived usefulness (PU) and perceived ease of use (PEOU). Through the review of the literature on the technology acceptance model (TAM), the evolution process of the technology acceptance model in different time periods is sorted out. Especially in the context of the global pandemic of the new crown epidemic, the development and challenges of AI applications in the medical field have given a new perspective on the study of technology acceptance model. Technology acceptance research is an interdisciplinary research, which has naturally attracted the attention of various related disciplines, and this comprehensive and interactive research trend refines and enriches the concept and system of the TAM model. Despite this, under the subdivision of AI applied medicine, no relevant research and exploration have been carried out.

Keywords: Artificial Intelligence, Medical Field, Technology Acceptance Model (TAM), Developing Countries,

1. Background

During the COVID-19 pandemic, due to the strong demand for medical services and limited mobility, medical service technology based on artificial intelligence has developed rapidly and played a significant role (Wu, H., Lu, X., & Wang, H., 2023). The potential of the AI revolution in medicine is fully demonstrated. However, in this process, concerns about the unknowability of the process of AI diagnosis, the so-called AI black box, have led to skepticism about AI and obstacles to building trust. As the cornerstone of protecting the most basic human rights, medical services have

reservations about AI-assisted diagnosis and treatment as end users, whether they are doctors or patients. When medical resources are strained due to the pandemic, artificial intelligence (AI) and machine learning (ML) methods can be used to provide assistance and services to healthcare workers to solve the problem of medical resources. Here is an argument that artificial intelligence (AI) is not the future of healthcare. It has become a reality in the medical community, and its importance in improving healthcare delivery is expected to grow significantly in the coming decades. However, the lack of transparency in AI use is not unique to the healthcare industry, but it receives less attention than other consumer-facing service industries (He, X., Zheng, X., & Ding, H., 2023).

At present, with the continuous expansion and widespread application of the field of AI, the research on the application of artificial intelligence in all aspects has formed a global research direction, Swiss researcher Andrea Ferrario and Italian researcher Micele Loi put forward the concept of "explainability promotes trust in artificial intelligence", that is, trust when there is legitimate reason to believe that artificial intelligence is trustworthy, which in turn will lead to dependence on artificial intelligence in the absence of monitoring (Ferrario & Loi, 2022). Discussing this new concept in the context of the medical service industry should focus on the complexity of interactive cooperation between doctors and AI systems, focusing on distinguishing the different levels of human trust in AI and doctors, and the impact of this trust on patients, so as to conduct further monitoring. At the same time, there are different voices pointing out that researchers and AI developers often claim that "trust" is a key determinant of the successful adoption of AI in medicine. Public trust in AI in healthcare is based not only on expert opinions, but also on reliable empirical research and conceptual understanding (Kästner et al., 2021). Trust can only be built on a sufficient foundation and comprehensive understanding, and AI applications can be further built on the premise of trust. [8] It is argued that the opaque algorithms and user-centric design of AI applications still make audiences feel distrustful.

Ben Shneider-Man proposed human-centered AI ethics principles, but people still believe that AI access in the field of medical services poses a danger (Shneiderman, 2020). Advances in artificial intelligence (AI) have made it increasingly suitable for supplementing expert decisions on various tasks in the form of decision support systems. Clinical medicine has successfully used the detection of diabetic retinopathy to predict the chance and time of rehospitalization in the field of deep learning. This application helps discover new drugs and can also help clinicians complete care more efficiently.

2. Research methods and theoretical framework

To further complete the research on user acceptance of artificial intelligence in the medical field, this paper sorts out the relevant research on the acceptance of AI in the medical field by adopting the commonly used models (several different TAM models and TRA models) for acceptance research, because the model is widely used in acceptance research and has a certain representativeness. After comparison, the most suitable model for acceptance study was selected for the next study. Due to the small

number of studies on the acceptance of artificial intelligence in the medical field, the conclusions drawn from existing studies may be biased. 1. Theoretical basis: 1. TAM model

As early as the 70s of the 19th century, the academic community began to analyze the problem of closed door acceptance from the perspective of sociology and psychology, focusing on explaining why individuals engage in conscious behavior, and the theory of simplicity and its ease of use make it very popular and suitable for many research environments, where predicting behavior is the main purpose of researchers. (Muchran et al. 2023) The TRA model was first proposed by Fishbein and Azjen in 1975 for sociological and psychological research, but has only recently become the basis for studying the behavior of individuals using information technology.

TRA is the basis of the TAM model.2. Improvement and development of TAM (Technology Acceptance Model) is a method used to measure technology acceptance. TAM provides a theory as the basis for studying and understanding user behavior when using and receiving information systems, and user motivation to adopt new technologies can be explained by three structures: ease of use (PEU), perceived usefulness (PU), and intention to use. Venkatesh & Davis (2000) developed the TAM 2 theory to further explain the structure of perceived usefulness. Venkatesh and Bala (2008) combined TAM 2 with the perceptual ease of use developed by Venkatesh (2000) to become TAM 3 (Ladepi, 2018). Therefore, the researchers used the TAM 3 method to determine the acceptance of STMIK Rosma's e-learning for Google Drive.

Table1: Development of the TAM model

	TAM	TAM2	TAM3
Year	1989	2000	2011
Theory	User acceptance of technology is influenced by perceived ease of use and usefulness.	External variables such as subjective norms and subjective supervisory support are added to the TAM.	Social factors are introduced, and external social systems and individual social systems are considered.
Variable	Perceived Ease of Use Perceived Usefulness	- Perceived ease of use - Usefulness - Subjective norms Subjective supervisor support	- Perceived ease of use - Perceived usefulness - Social impact - Individual impact
External variables	None	- Subjective Norms - Subjective Supervisor Support	The introduction of external variables takes into account factors at the social and individual levels.

Social impact	None	None	The influence of social systems on individual systems is considered
Individual impact	None	None	The influence of individual systems on social systems is considered

At present, TAM is the most widely used acceptance model. At present, many published studies on artificial intelligence focus on the technology itself, because developers are keen to prove the effectiveness of the technology, and the impact of other factors on technology acceptance is unclear (Ismatullaev et al,2022).

Through further combing the existing research and personal preliminary investigation and research, the fields of AI application are also differentiated in terms of medical services, and the level of different types of medical service behaviors is different, and the degree of attention received will also be different (Muehlematter et al., 2023).

Table 2: According to the invasiveness of the human body

Invasive level	Examples
Non-invasive	Medical image analysis, vital sign monitoring, health management and prevention
Mild invasive	Telemedicine consultations, intelligent assistants, and voice recognition
Moderately invasive	Robotic-assisted surgery, gene editing, and personalized medicine
Highly invasive	Brain-computer interfaces, implantable medical devices

It can also be divided in other ways, and the resulting data will also be different.

Table 3: Other types of classification

Classification method	Examples
Classification of uses	Diagnosis and image analysis, treatment and surgical assistance, health management and monitoring
Technical classification	Machine learning and deep learning, natural language processing, and perception technology
Data source classification	Clinical data application, genetic data application, patient generation data
Classification of interaction methods	Human-computer interaction, robot collaboration

3. A review of research related to AI acceptance in the medical field

Japanese scholars conducted an online survey of 399 doctors and 600 members of the public in Japan in 2018, using TAM as a research tool, covering 20 projects, and many

respondents were optimistic about the role of artificial intelligence in medicine. However, when asked if they would like to use AI-powered medicine, they often gave negative answers. This contrast further proves that some uncovered areas, such as lack of regulation, opaque medical information, and the division of accountability responsibilities, hinder the acceptance of AI in the field of medical services by doctors and the public. China's medical system has problems such as weak preventive medicine and poor medical foundation. With the continuous development of AI technology in China and its application in the field of medical services, we will continue to improve China's basic medical services, reduce unnecessary referrals, and improve the efficiency of medical services (Tamori et al., 2022).

In 2019, Chinese scholars designed an acceptance model for the acceptance of ophthalmic artificial intelligence based on technology acceptance theory and other healthcare-related research variables. This particular acceptance model was validated by a questionnaire survey of 474 respondents (a national random sample) involving 32 questionnaires and a 7-point Likert scale. Structural equation models are used to evaluate the reliability and validity of items and structures through confirmatory factor analysis, and to analyze the path effects, significance, goodness-of-fit, and mediating and moderating effects of the models. According to its research conclusions, the application of artificial intelligence in diagnostics and clinical laboratory analysis is underdeveloped, and the Chinese public generally distrusts medical personnel and the Chinese healthcare system (Ye et al., 2019). Therefore, stakeholders such as doctors and AI vendors should avoid misleading or overly exaggerated publicity when promoting AI healthcare products (Kanagarajah, A. ,2024).

Researchers in India have surveyed the acceptance of artificial intelligence (AI) in healthcare, with particular attention to the lack of professionals in developing countries, the uneven distribution of medical conditions, and the poor quality of medical services (Thakkar & Bharathi, 2023). These developing countries are specifying the penetration rate of relevant AI in various sectors, including healthcare, to harness the potential benefits of AI. These applications, ranging from being used for faster disease diagnosis to assisting in the effective handling of epidemic situations, surveyed several medical experts based on five factors in two popular technology adoption models (UTAUT 2 and TAM 2) and found that they positively influenced the behavioral intentions of medical professionals to adopt AI in their professional lives.

Decision-makers in developing countries can take appropriate measures to promote the adoption of AI in their countries based on two important factors identified to address existing healthcare issues and improve the quality of healthcare services (Thakkar, J. J., & Bharathi, S. V. ,2023).

The above research results are all the research we can see on the acceptance of artificial intelligence in medical care, which focuses on two problems, the first problem is that for the application of AI in the medical field, doctors generally accept it more than patients (Tamori et al., 2022; Ye et al., 2019; Thakkar & Bharathi, 2023). As ordinary patients, most people often have distrustful reservations about the application of artificial intelligence in medicine, especially when it comes to their own medical applications (Ferrario & Loi, 2020; Ye et al., 2019). Although the sample size

limitations of the studies described above may result in conclusions that are not broadly illustrative (Tamori et al., 2022; Ye et al., 2019). At the same time, there is no subdivision of fields and methods in AI research, so further detailed research is needed to understand the true acceptance of artificial intelligence in the medical field (Muehlematter et al., 2023).

4. Conclusions and prospects

Acceptance research in subdivided fields can obtain quantitative data more directly and accurately, which is conducive to the upgrading of AI technology-related applications, and can also conduct data analysis commercially and profile target customer groups in the market. Therefore, this paper reviews the existing research on artificial intelligence in the medical field and analyzes the scientific nature of the TAM model in the acceptance research, and believes that the evaluation of the acceptance of AI in the medical industry needs to be subdivided in terms of detailed application categories and user portraits, so that the subdivided acceptance research will be more convincing and representative than the existing research. When such a study is concluded, it will help improve the decision-making of artificial intelligence developers and improve the application direction of artificial intelligence in the medical industry, which has certain practical application value and social significance.

The current research has certain limitations in terms of research scope and research methods, such as the relatively concentrated sources of data and the incomplete investigation of medical subdivision scenarios. In future research, we can consider synthesizing more medical service application scenarios, combining longitudinal long-term tracking and municipal analysis, and collecting diversified data on a larger scale to deeply explore the differences in the acceptance of AI technology in different scenarios, so as to provide a more representative reference value for the promotion and use of AI technology in the medical industry.

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