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Perception of emerging technology-based medical services among Astana IT University students

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Research Article

Keywords: Emerging technology-based medical services, digitalization, students' perception, electronic appointment system, AI chatbot, video consultations

Posted Date: September 24th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-11143315/v1

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Additional Declarations: The authors declare no competing interests.

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Abstract - As digital transformation continues to reshape the healthcare sector, higher education institutions are increasingly adopting emerging technology-based medical services to support student well-being. This study aims to evaluate the perceptions of students at Astana IT University regarding such services, specifically focusing on the electronic appointment system, AI chatbot, and video consultations with specialists. Through a quantitative survey conducted among 391 students, the study tests hypotheses concerning the effectiveness of these technologies in improving medical service experiences. The results indicate that electronic appointment systems and AI chatbots significantly influenced positive perceptions, while video consultations had a comparatively lesser impact. These findings support the implementation of a medical platform, AITUMED, adapted to the needs of students. Future research should explore the long-term effects of these services on student satisfaction and trust, with a focus on implementing new digital medical services at the university and examining the potential of advanced tools.

Keywords - Emerging technology-based medical services, digitalization, students' perception, electronic appointment system, AI chatbot, video consultations

I. Introduction

The purpose of this article is to evaluate students' perceptions of emerging technology-based medical services at Astana IT University.

Research question: How do Astana IT University students perceive the emerging technology-based medical services, including the electronic appointment system, AI chatbot and video consultations with specialists?

Hypotheses:

Electronic appointment system:

Null Hypothesis (H0): There is no significant difference in students' perception of the electronic appointment system compared to traditional appointment booking methods.

Alternative Hypothesis (H1): Students perceive the electronic appointment system as an efficient tool for scheduling medical appointments.

AI chatbot:

Null Hypothesis (H0): Students do not perceive the AI chatbot as an effective tool for medical queries.

Alternative Hypothesis (H1): Students perceive the AI chat-bot as an effective tool for medical queries.

Video consultations with specialists:

Null Hypothesis (H0): Students do not perceive video consultations with specialists as a valuable alternative to in person medical consultations.

Alternative hypothesis (H1): Students perceive video consultations with specialists as a valuable alternative to personal medical consultations.

Existing research on emerging technology-based medical services highlights the growing acceptance of technology based healthcare solutions among students. Atherton et al. [1] analyzed patient engagement with electronic appointment systems, finding that digital scheduling improves efficiency and convenience. Research on AI-chatbots in healthcare indicates that AI functionality improves interaction with emerging technology-based services by making them faster and more convenient. Since most scenarios are programmed, users can simply select the appropriate options, optimizing the process [2]. Odeh et al. [3] examined video consultations with specialists and found that they remove barriers to physical accessibility, promoting equal access to medical care

regardless of students' location or individual circumstances. These findings provide a basis for evaluating Astana IT University students' perceptions of emerging technology-based medical services.

II. Literature Review

A. *The impact of Health Information Systems on students' well-being in higher education institutions*

Healthcare Information Systems (HIS) have proven their importance in the transformation of medical services, including higher education. These technologies not only optimize administrative processes, but also have a significant positive impact on the health and well-being of students. HIS is a complete approach to managing medical records, processes, and services. It includes telemedicine technologies, wearable devices, appointment platforms, and electronic medical records (EMR). To effectively meet the needs of students, higher education systems must integrate medical care with user- friendly digital interfaces. As noted by Atherton et al. [1], HIS promotes data centralization, which significantly reduces delays and duplication in the provision of medical services. Students, being a key category of the university, often face difficulties in receiving timely medical care, especially during periods of intense academic workload. Telemedicine, being an integral part of HIS, removes barriers to physical accessibility and promotes equal access to medical care, regardless of the location and individual circumstances of students. This significantly reduces inequality in the healthcare sector and improves the quality of medical care at universities [3]. The results shown in Figure 1 demonstrate that the ease of use and perceived usefulness of electronic appointment systems are key factors in achieving competitive advantages. At the same time, the quality of the website plays a less significant role for patients, as their expectations in this aspect are low. However, this indicates that there are opportunities for further improvement [4].

Model	B	t-Value	Sig.
Website quality → Satisfaction	−0.024	1.321	0.117
Ease of use → Satisfaction	0.622	1.044	0.000
Perceived usefulness → Satisfaction	0.518	6.553	0.000
Service quality → Satisfaction	−0.192	−1.022	0.324

Fig. 1. Factors influencing patient satisfaction with electronic appointment systems

[4]

HIS actively use AI algorithms to monitor and analyze trends in the field of medicine. This allows medical institutions to identify potential risks in advance and implement preventive measures. For example, systems can automatically track the vaccination history of patients and promptly remind them of the need to update vaccinations, contributing to compliance with public health standards. A study by Kitsios et al. [4] confirms that such measures not only contribute to strengthening students' emotional stability, but also reduce the number of school absences due to health reasons. Thus, HIS creates an environment at universities focused on the well-being of students, minimizing potential threats to their health.

EMR plays an important role in ensuring the health of students, going beyond the simple availability of medical services. With a centralized medical data management system, EMRs simplify the monitoring of medical history, diagnoses, treatments, and preventive measures. This digital transformation improves the quality of medical care by providing doctors with up-to-date and complete patient information [5].

However, one of the most significant challenges in implementing HIS in higher education institutions remains the high cost of development. Key cost items include the initial purchase of the system, infrastructure modernization, royalties, staff training and subsequent technical support [6]. An additional obstacle is the resistance of university and medical center staff who are accustomed to traditional, paper-based working methods [7]. Only a systematic approach to overcoming these barriers will ensure the sustainable and effective integration of HIS into the university medical environment [8].

B. *Emerging technologies in healthcare*

Digital solutions are computerized methods of performing tasks that would otherwise require more complex and time-consuming approaches. In other words, it is the use of technology to optimize processes and solve various problems. In the modern world, medical digital technologies have gone from traditional telemedicine to the use of 3D printing [9]. Among the key achievements of digital medicine are AI in diagnostics, EMR and telemedicine. These solutions not only improve the coordination of healthcare workers but also improve the overall effectiveness of the healthcare system. For example, wearable devices and remote monitoring technologies allow patients to independently monitor their health, providing continuous monitoring of vital signs and early diagnosis of possible diseases [10].

AI and big data analysis simplify administrative processes and improve diagnostic accuracy, which confirms the significant impact of digital solutions on healthcare. AI-based systems are capable of analyzing medical images, predicting treatment outcomes, and offering personalized therapy regimens based on large-scale data sets [11]. An additional advantage of digitalization is automated services such as AI-based chatbots. According to research on AI chatbots for diabetics [2], such technologies allow users to receive dietary recommendations for diabetes and make an appointment with- out having to ask a lot of questions. Process automation by 82-85% makes interaction with digital services faster and more convenient, since most scenarios are already embedded in the system, and users can only choose the appropriate options. A diagnostic chatbot powered by AI, using Natural Language Processing (NLP), has the potential to transform healthcare through the analysis of symptoms and medical history input by patients. Through the processing of unstructured clinical notes, EMR, and patient interactions, the chatbot is able to offer real-time, evidence-based suggestions. It assists healthcare professionals in making quicker, more precise diagnoses and treatment decisions, recognizing

possible risks and enhancing patient care. The AI-driven system, through its capacity to learn and improve incessantly, has the potential to aid clinical decision-making, minimize medicine errors, and improve the overall healthcare experience for both patients and healthcare providers [12]. Despite the obvious advantages, the widespread adoption of digital solutions faces a number of challenges. The main barriers include underdeveloped infrastructure, imperfect management systems, and resistance to change. In addition, the excessive use of algorithms raises ethical issues, especially when it comes to making decisions that affect patients' health [11].

Telemedicine is becoming increasingly important, especially in remote and rural areas where access to medical services is limited. One of the successful examples of its implementation is the mobile healthcare project (mHealth) within the framework of the Smart City concept. In the Kyzylorda region, the installation of telemedicine equipment in medical institutions was implemented, which allowed local residents to receive consultations without having to travel to the regional center, reducing transportation costs and saving time [13].

Nevertheless, the implementation of digital solutions remains a challenging task. Many medical organizations still use outdated data processing systems, and fragmented infrastructure prevents effective exchange of medical information. Hospitals and clinics often operate on incompatible platforms, which makes data integration difficult and reduces the interoperability of healthcare IT systems [11]. Another barrier is the lack of training for medical professionals. The complexity of new technologies raises concerns, and without proper training, this can lead to a decrease in work efficiency and an increase in the number of treatment errors [14].

Digital medical services have already transformed the interaction between patients and medical institutions, significantly improving the availability, speed and quality of medical care. The introduction of an integrated, patient-centered approach will help create a more innovative and adaptive healthcare system that meets modern challenges and requirements [7].

III. Methodology

The study uses a quantitative method to analyze the perception of emerging technology-based medical services among students of Astana IT University. Quantitative research methods allow to collect numerical data that can be objectively analyzed without the influence of personal opinions of the researcher [15]. This increases the accuracy and reliability of the results. Also, they can be used to ask a large number of people, which helps identify common trends. In addition, such methods allow statistics to be used to verify assumptions and identify links between various factors. This method can be used to identify how emerging technology-based medical services affect the reduction in wait times and accuracy of information provided to students [15]. Quantitative methods help to measure improvements in the student experience by providing numerical data to confirm or refute hypotheses. This is important to analyze as it allows for informed recommendations to be made to improve these services [15].

To collect information, a survey was conducted among students, providing a standardized response format. The survey was distributed in electronic format through the Microsoft Forms platform, ensuring anonymity and voluntary participation. The participants were informed about the objectives of the study, the guarantee of confidentiality and the possibility to withdraw from participation at any time without explanation. The survey included in general 16 questions and consisted of multiple choice and Likert scale questions designed to assess students' familiarity with use of, and satisfaction with digital health services. The Likert scale was particularly useful for measuring the degree of agreement or disagreement with specific statements regarding accessibility, effectiveness, and trust in emerging technology-based medical services [15]. For the study, students from Astana IT University were chosen. A standard method was used to calculate the sample size, which was determined to be 365 students. This calculation took into account potential deviations and ensured statistical significance, enabling reliable and precise findings. In total, 391 responses were collected, exceeding the required sample size and thereby increasing the credibility of the results.

IV. Results and Discussion

To interpret the survey results and test the hypotheses, a regression analysis was conducted. The multiple linear regression model was applied using the following formula 1:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \epsilon \quad (1)$$

where:

- Y = students' perceptions (dependent variable)
- X_1 = electronic appointment system
- X_2 = video consultations
- X_3 = AI chatbot
- β_0 = intercept (constant term)
- $\beta_1, \beta_2, \beta_3$ = regression coefficients
- ϵ = error term

in the formula 2, where R is the multiple correlation coefficient, and R^2 indicates the extent to which the independent variables explain the variance of the dependent variable.

$$R = \sqrt{R^2} \quad (2)$$

Figure 2 represents that the regression model has a degree of freedom of 3. This indicates that the model incorporates three predictors - electronic appointment system, video consultations, and an AI chatbot that contribute to explaining the variability of the dependent variable. The F statistics of 25.17 represent the ratio of the variance explained by the model to the residual variance, demonstrating that the predictors significantly contribute to explaining the dependent variable. Furthermore, a p-value of <0.001 strongly supports the conclusion that the predictors collectively have a significant impact on the students' perceptions.

Model	df	F	p
Regression	3	25.17	<.001

Fig. 2. Analysis of variance

Figure 3 presents the results of a regression analysis examining the relationship between independent variables and the dependent variable - students' perceptions. The figure shows that the electronic appointment system has a coefficient of 0.51, demonstrating a statistically significant relationship. This suggests that the availability of an electronic appointment system is a key factor influencing students' perceptions. In contrast, the variable for video consultations has a coefficient (B) of 0.05, indicating a minor positive impact. However, its p-value of 0.375 suggests that this effect is not statistically significant, meaning there is insufficient evidence to conclude that video consultations play a meaningful role in shaping students' perceptions. The AI chatbot variable has a coefficient (B) of 0.18, signifying a statistically significant relationship. Therefore, the hypotheses regarding the electronic appointment system and AI chatbot were confirmed, as both were found to significantly impact student perception. In contrast, the hypothesis concerning video consultations was not statistically supported and was rejected.

Model	B	Beta	Standard error	t	p	95% confidence interval for B
Constant	3.34		0.15	21.79	<.001	[3.04, 3.64]
Electronic appointment system	0.51	0.31	0.08	6.34	<.001	[0.35, 0.67]
Video consultations	0.05	0.04	0.05	0.89	0.375	[-0.06, 0.15]
AI chatbot	0.18	0.18	0.05	3.72	<.001	[0.09, 0.28]

Fig. 3. Regression coefficients

Based on these findings, the potential for the practical implementation of a medical platform called "AITUMED" was demonstrated in the form of a prototype, as shown in Figures 4, 5, 6. Developed for students of Astana IT University, this platform includes key digital features that have been found to significantly influence student perception, such as an electronic appointment system and an AI chatbot. Additional features include approval and denial of certificates with checking Optical Character Recognition (OCR) from the administrator's side, symptom tracker, queue system and others.

Future work should focus on implementing new digital medical services at the university and exploring advanced tools such as NLP and Name Entity Recognition (NER) models. NLP algorithms that process and analyze medical documents and EHR can extract valuable information to improve the efficiency and accuracy of medical services. Meanwhile, the NER model can be used to implement the automatic generation of medical certificates based on scanned information. For the successful implementation of these technologies, it is important to assess their impact on student perception and satisfaction. Research that tracks student attitudes over time, especially after the implementation of new tools, will help identify trends in trust and satisfaction among students.

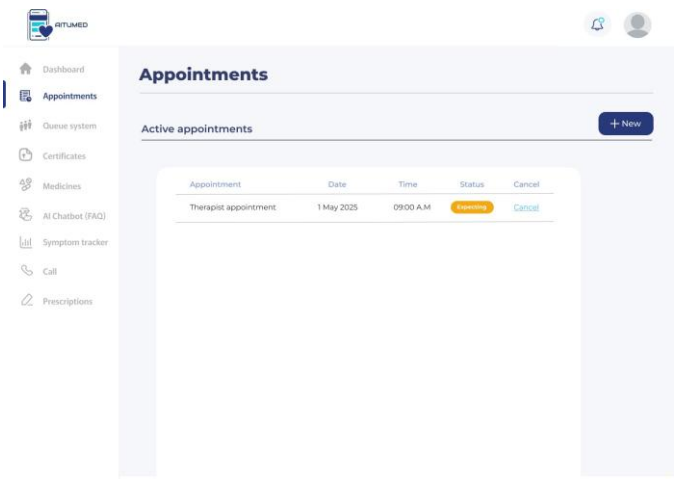


Fig. 4. Electronic appointment system

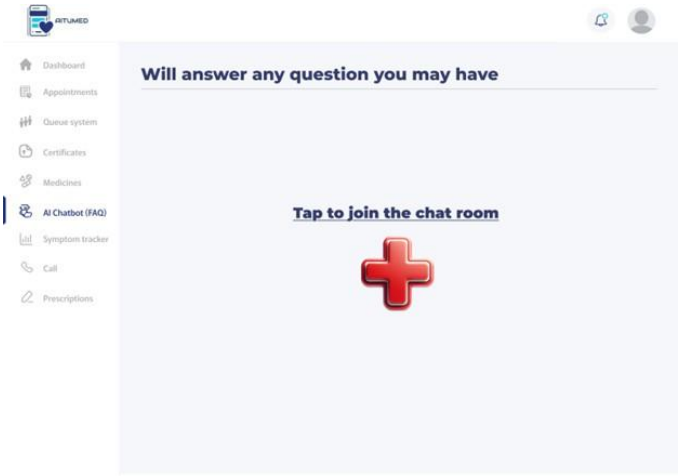


Fig. 5. AI Chatbot

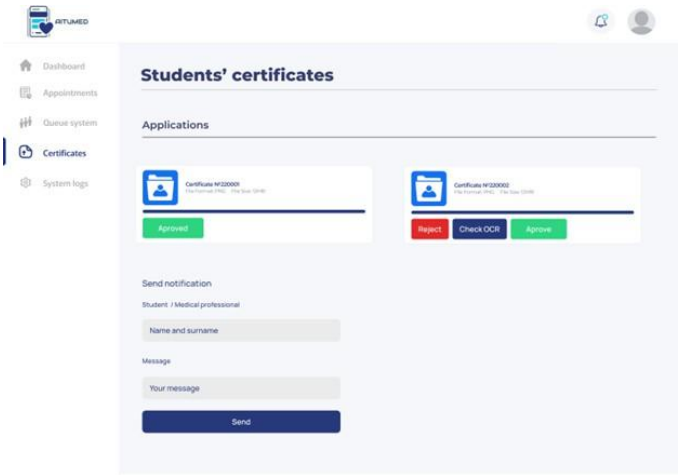


Fig. 6. Approval and denial of certificates

V. Conclusion

The results of the study confirm the important role of emerging technology-based medical services in improving access to medical services and student well-being. The analysis showed that electronic appointment systems and AI chat-bots have a significant impact on the perception of digital health among students, while video consultations play a less significant role. This suggests that convenience, automation, and ease of use are key drivers of student engagement with emerging technology-based medical services. Despite the obvious benefits, the adoption of emerging technology-based medical services comes with a number of challenges, including infrastructure limitations, the need to train staff, resistance to new technologies and also this study is limited to Astana IT University students perceptions only. Effective implementation requires a systematic approach that includes developing interoperable platforms, improving digital literacy of students, and strengthening data protection measures. These findings are consistent with recent studies in Kazakhstan and Uzbekistan. A qualitative study of patient perceptions of AI in Kazakhstan found that while patients acknowledged the benefits of AI in healthcare, they emphasized the importance of human control and expressed concerns about data privacy and the potential for medical errors [16]. Furthermore, research in Uzbekistan on digital technologies in healthcare highlighted how digital systems, particularly e-appointments, have improved efficiency, although digital literacy and the quality of human interaction remain key challenges [17]. These comparisons highlight a common trend: although new technologies are generally valued for their convenience and ability to improve healthcare, it is important to address ethical, social, and educational challenges to ensure successful integration and build users' trust. Future research should assess the long-term impact of emerging technology-based medical services on student satisfaction and trust in such services. A promising direction is the implementation of NLP and NER algorithms for automated analysis of medical data, which will improve the accuracy and speed of data processing. The digitalization of healthcare services in universities is a necessary step to improve their efficiency and accessibility. Developing of emerging technology-based medical platform could be a practical solution. By integrating an AI chatbot, electronic appointment system, and secure data management, it can optimize medical services provided. However, for successful integration, it is important to consider not only technical, but also behavioral, educational, and ethical factors that influence the perception and use of emerging technologies.

Acknowledgment

The authors acknowledge the individuals whose support, guidance, and contributions made the successful completion of this research possible. The School of Creative Industries at Astana IT University is gratefully acknowledged for providing the academic environment and resources necessary to conduct this study. Special thanks are extended to Associate Prof. N. Ibadildin for his expert guidance and constructive feedback throughout all stages of the research. His knowledge, patience, and consistent support were essential in improving the overall quality of the work. Appreciation is also extended to Dr. T. Karibekov, Head of the "MedTech" Scientific and Innovation Center at Astana IT University, for his valuable engagement during the research process.

References

[1] H. Atherton, A. Eccles, L. Poltawski, J. Dale, J. Campbell, and G. Abel, "Investigating patient use and experience of online appointment booking in primary care: Mixed methods study," *Journal of Medical Internet Research*, vol. 26, p. e51931, 2024.

[2] S. Kolanu, S. J. Dutta, S. Roy, and M. M., "A diabetic diet suggester and appointment scheduler chatbot using artificial intelligence and cloud," *International Research Journal on Advanced Science Hub*, vol. 3, pp. 77–81, 2021.

[3] A. Odeh, R. Abdelhadi, and H. Odeh, "Medical patient appointments management using smart software system in UAE," 2019.

[4] F. Kitsios, S. Stefanakakis, M. Kamariotou, and L. Dermentzoglou, "Digital service platform and innovation in healthcare: Measuring users' satisfaction and implications," *Electronics*, vol. 12, p. 662, 2023.

[5] A. A. Ibrahim, M. I. Ahmad Zamzuri, R. Ismail, A. H. Ariffin, A. Ismail, M. H. Muhamad Hasani, and M. R. Abdul Manaf, "The role of electronic medical records in improving health care quality: A quasi-experimental study," *Medicine*, vol. 101, p. e29627, 2022.

[6] L. Korchevska, "Development of the national market for healthcare services in the Republic of Kazakhstan in the context of the digitalization of the economy," *BULLETIN OF THE KARAGANDA UNIVERSITY. ECONOMY SERIES*, vol. 105, pp. 44–53, 2023.

[7] M. Senbekov, T. Saliev, Z. Bukeyeva, A. Almabayeva, M. Zhanaliyeva, N. Aitenova, Y. Toishibekov, and I. Fakhradiyev, "The recent progress and applications of digital technologies in healthcare: A review," *International Journal of Telemedicine and Applications*, vol. 2020, pp. 1–18, 2020.

[8] S. Hermes, T. Riasanow, E. K. Clemons, M. Bo¨hm, and H. Krcmar, "The digital transformation of the healthcare industry: exploring the rise of emerging platform ecosystems and their influence on the role of patients," *Business Research*, vol. 13, pp. 1033–1069, 2020.

[9] siteservice, "7 digital solutions services every company needs," 2022.

[10] M. Peyroteo, I. A. Ferreira, L. B. Elvas, J. C. Ferreira, and L. V. Lapa˜o, "Remote monitoring systems in patients with chronic diseases in primary health care: a systematic review (preprint)," *JMIR mHealth and uHealth*, vol. 9, 2021.

[11] M. Bayeshova and A. Omarov, "Digitalization of healthcare system of Kazakhstan," *BULLETIN OF THE KARAGANDA UNIVERSITY-MATHEMATICS*, vol. 94, pp. 121–128, 2019.

[12] S. Yelne and et al., "Harnessing the power of ai: A comprehensive review of its impact and challenges in nursing science and healthcare," *Cureus*, vol. 15, no. 11, 2023.

[13] "Succeed cases — Electronic government of the Republic of Kazakhstan," 2024.

[14] S. Nijor, G. Rallis, N. Lad, and E. Gokcen, "Patient safety issues from information overload in electronic medical records," *Journal of Patient Safety*, vol. 18, 2022.

[15] H. Taherdoost, "What are different research approaches? comprehensive review of qualitative, quantitative, and mixed method research, their applications, types, and limitations," *Journal of Management Science Engineering Research*, vol. 5, pp. 53–63, 2022.

[16] A. Tursynbek, D. Zhaksylykova, J. P. Cruz, and E. M. Balay-odao, "Perspectives of patients regarding artificial intelligence and its application in healthcare: A qualitative study," *Journal of Clinical Nursing*, 12 2024.

[17] A. Munavvar, "Academic journal of digital economy and stability digital technologies transforming healthcare delivery in uzbekistan: Insights and challenges," *Academic Journal of Digital Economics and Stability*, vol. 38, pp. 181–186, 2025.