



## CHALLENGES OF DIGITAL TRANSFORMATION IN PRIMARY HEALTHCARE INSTITUTIONS IN UZBEKISTAN: A QUALITATIVE STUDY

**Ashurova Sitora**

Westminster International University in Tashkent

ORCID: 0009-0002-0637-3281

[sit.ashurova@wiut.uz](mailto:sit.ashurova@wiut.uz)

**Abstract.** Digital technologies are gradually becoming part of healthcare management and service delivery in Uzbekistan. In recent years, primary healthcare institutions have started using digital medical systems intended to simplify patient registration, improve access to medical information, and reduce paperwork. Despite these expectations, the implementation process has not always been smooth at the operational level. Healthcare workers often face technical, organizational, and administrative difficulties while using digital systems in daily practice. This paper examines the major challenges affecting digital transformation in primary healthcare institutions in Uzbekistan through a qualitative approach. Semi-structured interviews were conducted with healthcare personnel working in primary healthcare settings. The findings show that unstable internet connection, system failures, excessive workload, incomplete system functions, and weak organizational support continue to affect the effectiveness of digital healthcare services. At the same time, participants acknowledged several positive aspects of the system, including online access to medical certificates and laboratory results. The study suggests that digital healthcare implementation cannot be understood only as a technological process. Organizational conditions, staff workload, management practices, and patient readiness also influence implementation outcomes. The findings provide practical insights for improving digital healthcare implementation in Uzbekistan.

**Keywords:** digital transformation, primary healthcare, healthcare digitalization, DMED system, qualitative research, Uzbekistan.

## O'ZBEKISTONDAGI BIRLAMCHI SOG'LIQNI SAQLASH MUASSASALARIDA RAQAMLI TRANSFORMATSIYA MUAMMOLARI: SIFAT TADQIQOTI

**Ashurova Sitora**

Toshkent shahridagi Xalqaro Westminster universiteti

**Annotatsiya.** Raqamli texnologiyalar O'zbekistonda sog'liqni saqlash boshqaruvi va xizmat ko'rsatish tizimining muhim qismiga aylanib bormoqda. So'nggi yillarda birlamchi tibbiyot muassasalarida bemorlarni ro'yxatdan o'tkazishni soddalashtirish, tibbiy ma'lumotlardan foydalanish imkoniyatini yaxshilash hamda qog'ozbozlikni kamaytirish maqsadida raqamli tibbiy tizimlar joriy etila boshlandi. Biroq, ushbu tizimlarni amaliyotga tatbiq etish jarayoni operatsion darajada har doim ham muammosiz kechmayapti. Tibbiyot xodimlari kundalik faoliyatda raqamli tizimlardan foydalanish jarayonida texnik, tashkiliy va ma'muriy qiyinchiliklarga duch kelmoqda. Mazkur maqola O'zbekistondagi birlamchi tibbiyot muassasalarida raqamli transformatsiyaga ta'sir qiluvchi asosiy muammolarni sifat tadqiqoti asosida tahlil qiladi. Tadqiqot davomida birlamchi tibbiyot muassasalarida faoliyat yuritayotgan

tibbiyot xodimlari bilan yarim tuzilgan intervyular o'tkazildi. Natijalar internet aloqasining beqarorligi, tizimdagi nosozliklar, ortiqcha ish yuklamasi, tizim funksiyalarining to'liq ishlamasligi hamda tashkiliy qo'llab-quvvatlashning sustligi raqamli sog'liqni saqlash xizmatlari samaradorligiga salbiy ta'sir ko'rsatayotganini ko'rsatdi. Shu bilan birga, ishtirokchilar tizimning ayrim ijobiy jihatlarini ham qayd etdilar, jumladan, tibbiy ma'lumotnomalar va laboratoriya natijalarini onlayn olish imkoniyati mavjudligi ta'kidlandi. Tadqiqot natijalari shuni ko'rsatadiki, sog'liqni saqlash tizimida raqamli texnologiyalarni joriy etishni faqat texnologik jarayon sifatida baholash yetarli emas. Tashkiliy sharoitlar, xodimlar ish yuklamasi, boshqaruv amaliyoti va bemorlarning tayyorgarlik darajasi ham ushbu jarayon natijalariga ta'sir ko'rsatadi. Tadqiqot natijalari O'zbekistonda raqamli sog'liqni saqlash tizimini takomillashtirish uchun amaliy tavsiyalar beradi.

**Kalit so'zlar:** raqamli transformatsiya, birlamchi tibbiy yordam, sog'liqni saqlashni raqamlashtirish, DMED tizimi, sifat tadqiqoti, O'zbekiston.

## ПРОБЛЕМЫ ЦИФРОВОЙ ТРАНСФОРМАЦИИ В УЧРЕЖДЕНИЯХ ПЕРВИЧНОГО ЗДРАВООХРАНЕНИЯ УЗБЕКИСТАНА: КАЧЕСТВЕННОЕ ИССЛЕДОВАНИЕ

**Ашурова Ситора**

Международный Вестминстерский университет в городе Ташкенте

**Аннотация.** Цифровые технологии постепенно становятся важной частью управления и предоставления медицинских услуг в Узбекистане. В последние годы в учреждениях первичной медико-санитарной помощи начали внедряться цифровые медицинские системы, направленные на упрощение регистрации пациентов, улучшение доступа к медицинской информации и сокращение бумажного документооборота. Однако процесс внедрения данных систем на практическом уровне не всегда проходит без трудностей. Медицинские работники сталкиваются с техническими, организационными и административными проблемами при использовании цифровых систем в повседневной деятельности. В данной статье рассматриваются основные проблемы, влияющие на цифровую трансформацию в учреждениях первичной медико-санитарной помощи Узбекистана, на основе качественного исследования. В ходе исследования были проведены полуструктурированные интервью с медицинскими работниками, осуществляющими деятельность в учреждениях первичной медико-санитарной помощи. Результаты показали, что нестабильное интернет-соединение, технические сбои системы, чрезмерная рабочая нагрузка, неполная функциональность системы и недостаточная организационная поддержка продолжают снижать эффективность цифровых медицинских услуг. В то же время участники отметили и некоторые положительные стороны системы, включая возможность онлайн-доступа к медицинским справкам и результатам лабораторных исследований. Результаты исследования показывают, что внедрение цифровых технологий в здравоохранение нельзя рассматривать исключительно как технологический процесс. Организационные условия, рабочая нагрузка персонала, управленческие практики и готовность пациентов также оказывают влияние на результаты внедрения. Полученные результаты предоставляют практические рекомендации по совершенствованию цифрового здравоохранения в Узбекистане.

**Ключевые слова:** цифровая трансформация, первичная медико-санитарная помощь, цифровизация здравоохранения, система DMED, качественное исследование, Узбекистан.

## Introduction.

Healthcare systems increasingly rely on digital technologies to manage patient information, improve coordination, and reduce administrative inefficiencies (Agarwal et al., 2023). Electronic medical records, online registration systems, telemedicine platforms, and integrated databases are now widely discussed as tools for improving healthcare accessibility and management (Kruse et al., 2022).

In Uzbekistan, digitalization has also become part of broader public sector reforms. Considerable attention has been given to introducing electronic systems into healthcare institutions, particularly in primary healthcare settings where patient flow is high and administrative processes remain complex. The Digital Medical Electronic Data (DMED) system was introduced to simplify registration procedures, reduce paperwork, and improve communication between healthcare providers and patients. However, practical implementation often differs from policy expectations. Existing studies usually emphasize the potential benefits of healthcare digitalization, including improved efficiency, better patient monitoring, and easier access to medical information (Verhoef et al., 2021), (Kruas et al., 2021). At the same time, research from developing countries shows that healthcare digitalization frequently creates additional operational difficulties during implementation stages. Technical failures, insufficient infrastructure, staff resistance, and increased administrative workload remain common challenges (Kuek and Hakkennes, 2020), (Tortorella et al., 2022).

In the context of Uzbekistan, empirical studies examining healthcare workers' direct experiences with digital systems remain limited. Most discussions focus on policy goals and technological modernization rather than the practical realities faced by frontline healthcare personnel. This creates a gap between formal digitalization strategies and everyday institutional practice.

The present study examines the major challenges affecting digital transformation in primary healthcare institutions in Uzbekistan. Particular attention is given to organizational barriers, healthcare workers' perceptions, and management-related difficulties associated with the implementation of the DMED system. The study addresses the following research question:

What are the major challenges affecting digital transformation in primary healthcare institutions in Uzbekistan?

The objectives of the study are:

- to identify organizational barriers affecting digital transformation in primary healthcare institutions.
- to examine healthcare workers' perceptions of digital transformation.
- to explore management-related challenges in implementing digital systems.

## Literature review.

Healthcare digitalization is often associated with improvements in efficiency, patient care, and information management. Healthcare organizations increasingly depend on digital systems for patient registration, diagnosis, monitoring, and communication between departments (Reis et al., 2020). The spread of electronic health records and integrated medical databases has changed how healthcare institutions manage clinical and administrative processes.

Still, technological adoption in healthcare differs from digitalization in many other sectors. Healthcare systems involve sensitive data, high patient volumes, and continuous interaction between administrative and clinical tasks. As a result, implementation problems can directly affect service quality and employee workload (Cresswell & Sheikh, 2022).

Although these studies highlight the benefits of healthcare digitalization, many of them focus primarily on technologically advanced healthcare systems. Less attention is given to implementation difficulties in resource-constrained settings (Odekunle et al., 2021). Poor internet connection, unstable electricity supply, and outdated hardware often reduce the effectiveness of digital systems. Even when digital platforms are officially implemented,

healthcare workers may continue relying on paper documentation because electronic systems function inconsistently.

Another important issue concerns workload and administrative burden. Research indicates that digital systems may initially increase staff responsibilities rather than simplify them (McBride et al., 2021). Healthcare workers frequently report spending additional time entering data, correcting technical errors, or repeating procedures when systems fail to save information correctly. In some cases, digitalization shifts attention away from patient interaction toward administrative reporting requirements.

Healthcare workers' perceptions also influence implementation outcomes. Staff members are more likely to accept digital systems when technologies are reliable, easy to use, and supported by management (Venkatesh et al., 2022). However, when systems are incomplete or poorly adapted to local working conditions, employees may perceive digitalization as an additional source of pressure rather than support.

Management-related factors are equally important. Previous research suggests that successful digital transformation requires not only technological investment but also organizational coordination, staff training, and realistic workload planning (Nilsen et al., 2023). Weak institutional support may create frustration among healthcare workers and reduce confidence in digital reforms.

Patient-related factors should also be considered. While younger patients often adapt quickly to online healthcare services, elderly populations may struggle with digital platforms and electronic registration systems (Sixsmith and Gutman, 2021). This creates inequalities in access to healthcare services and increases pressure on frontline staff who must assist patients unfamiliar with digital technologies.

In Uzbekistan, healthcare digitalization has accelerated within broader public administration reforms and e-government initiatives. Recent policy documents emphasize the introduction of electronic medical records, integrated patient databases, and digital service delivery in primary healthcare institutions (World Health Organization, 2021). (European Observatory on Health Systems and Policies, 2022). However, empirical studies examining healthcare workers' experiences with these systems remain limited.

Overall, the literature suggests that healthcare digitalization is not simply a technical process. It is closely connected with organizational structure, institutional capacity, employee adaptation, and social conditions. Understanding these factors is particularly important in countries where healthcare digitalization is still developing.

### **Research methodology.**

This study employed a qualitative research approach to examine the challenges affecting digital transformation in primary healthcare institutions in Uzbekistan. A qualitative design was considered suitable because the research focused on healthcare workers' experiences, perceptions, and operational difficulties associated with the use of digital healthcare systems.

Data were collected through semi-structured interviews conducted with healthcare providers working in primary healthcare institutions located in both urban and rural areas of Uzbekistan. The participants included registration nurses, family doctors, nurses, and administrative personnel who had direct experience using the DMED system in their daily work.

A total of 10 interviews were conducted between March and April 2026. Participants were selected using purposive sampling to ensure that respondents had practical experience with digital healthcare platforms. The interviews focused on technical infrastructure, workload, organizational processes, management support, and patient interaction. Each interview lasted approximately 20–40 minutes. Data collection continued until recurring patterns and thematic repetition became evident across interviews.

The study included healthcare personnel from different professional roles and institutional settings to capture diverse experiences related to digital healthcare implementation.

Table 1.

### Distribution of Study Participants by Professional Role and Institutional Setting

Participant Category	Number of Participants
Registration nurses	3
Family doctors	3
Nurses	2
Administrative personnel	2
Urban healthcare institutions	5
Rural healthcare institutions	5
Total participants	10

The interviews were analyzed using thematic analysis. After transcription and repeated review of the interview materials, recurring themes and patterns were identified and grouped into broader analytical categories. Several themes consistently appeared across participants, including technical instability, increased administrative workload, incomplete system functionality, and unequal patient adaptation to digital services.

Participation in the study was voluntary, and confidentiality was maintained throughout the research process. Personal identifiers were removed during transcription and analysis to protect participants' privacy. Initial codes were generated manually from repeated patterns in participants' responses and later grouped into broader thematic categories.

### Analysis and discussion of results.

Technical instability emerged as one of the most consistent concerns across the interviews. Many participants reported regular internet interruptions, system freezing, and occasional power outages that disrupted routine clinical and administrative work. These problems were mentioned more frequently by healthcare workers from rural clinics, where internet connectivity was described as less stable and technical support less accessible.

Several healthcare workers explained that system interruptions delayed patient registration, slowed documentation processes, and increased patient waiting times. One participant from a rural clinic explained: ***"Sometimes the system freezes several times during registration, and patients become impatient because the queue keeps growing"*** (Registration nurse, rural clinic). In some cases, staff members had to repeat the same procedures multiple times because the system failed to save entered information correctly. One nurse noted that after completing screening forms, the data occasionally disappeared after submission, forcing staff to restart the process while patients waited in line.

Participants also discussed problems related to incomplete or malfunctioning screening modules within the DMED system. According to several respondents, only a limited number of screening functions operated consistently, while others either failed to open or worked irregularly. These technical issues created frustration among healthcare personnel who were still expected to complete all required procedures despite system limitations.

The findings support previous research suggesting that infrastructure limitations remain a significant obstacle to healthcare digitalization in developing healthcare systems [9]. However, the interviews also show that technical failures affect more than operational efficiency alone. Many healthcare workers felt that system problems created additional pressure because employees could later be held responsible for incomplete reporting even when technical failures were outside their control. In this sense, technological instability becomes both an organizational and managerial issue rather than simply a technical one.

Another major theme identified across the interviews was the growing administrative burden associated with digital healthcare systems. Although the DMED platform was introduced to simplify work processes and reduce paperwork, many participants believed that digitalization had increased workload in practice.

Healthcare providers from both urban and rural institutions reported that patient numbers often exceeded the system's operational assumptions. Urban healthcare workers particularly emphasized excessive patient flow, especially during vaccination periods and peak consultation hours. Several respondents explained that while the system allocates a limited number of patient appointments per day, healthcare workers are unable to refuse additional patients in real clinical settings.

Participants frequently described situations where digital documentation consumed substantial time during patient registration and screening procedures. Repeated data entry caused by system errors further intensified the workload. Some healthcare workers stated that administrative tasks increasingly competed with direct patient interaction, reducing the amount of time available for medical care itself. A family doctor from an urban clinic noted: *"We spend a lot of time entering information into the system, and sometimes it feels like documentation becomes more important than communication with patients"* (Family doctor, urban clinic).

An additional concern involved workload recognition and compensation. Several participants noted that extra work performed beyond official system limits was often not reflected in salary calculations or institutional reporting mechanisms. This created dissatisfaction among healthcare personnel and weakened motivation toward digital system use.

These findings correspond with previous studies arguing that healthcare digitalization may initially increase administrative complexity instead of reducing it [10]. The interviews suggest that the problem is not digitalization itself, but rather the mismatch between system design and actual working conditions inside primary healthcare institutions.

The interviews revealed mixed attitudes toward the DMED system. While many healthcare workers criticized technical and organizational problems, participants also acknowledged several practical advantages associated with digital healthcare services.

Several respondents mentioned that online access to laboratory results, medical certificates, and appointment systems reduced unnecessary clinic visits and simplified some administrative procedures for patients. Younger patients were described as adapting relatively quickly to online services, particularly electronic appointment booking functions.

At the same time, many participants expressed dissatisfaction with the overall functionality and reliability of the system. Healthcare workers from both urban and rural clinics noted that some system functions remained incomplete or poorly adapted to real working conditions. A number of respondents also stated that they had not observed major improvements in system performance despite using the platform for several years.

An important finding emerging from the interviews is that healthcare workers evaluate digital transformation primarily through its effect on everyday work routines rather than through broader modernization goals. When digital systems reduce delays and simplify documentation, employees tend to view them positively. However, when technologies create repeated interruptions, additional reporting pressure, and patient dissatisfaction, digitalization is often perceived as an additional burden.

These findings are consistent with earlier research showing that staff acceptance of healthcare technologies depends strongly on system usability, reliability, and institutional support. The interviews also indicate that employee resistance is not necessarily linked to unwillingness to use technology itself. In many cases, dissatisfaction reflects practical concerns regarding workload, technical instability, and unrealistic operational expectations.

Differences in patient adaptation to digital healthcare services also emerged as an important issue during the interviews. Many participants observed that younger patients were

generally more comfortable using online appointment systems and digital platforms, while elderly patients often experienced difficulties navigating digital services independently. Several participants mentioned that elderly patients often preferred direct communication because they were unfamiliar with online appointment systems.

Healthcare workers explained that older patients frequently preferred traditional face-to-face registration procedures and required additional assistance from staff members. *“Older patients usually prefer coming directly to the clinic because many of them do not know how to use online appointments”* (Nurse, rural clinic). Several participants stated that this occasionally created tension inside healthcare institutions, particularly when patients with online appointments were served more quickly than those waiting in physical queues.

Participants from rural healthcare institutions noted that digital literacy problems were sometimes combined with limited internet access among patients, making online healthcare services less accessible outside urban areas. In contrast, urban respondents focused more on overcrowding and appointment management problems resulting from high patient demand.

The findings suggest that healthcare digitalization may unintentionally create new inequalities if implementation strategies fail to account for differences in age, technological skills, and regional infrastructure. This reflects broader concerns raised in previous healthcare digitalization research. While digital systems can improve efficiency and accessibility for some patient groups, they may simultaneously create additional barriers for vulnerable populations who lack digital confidence or access to technology.

Management-related problems were also discussed extensively across the interviews. Many healthcare workers believed that digital transformation was introduced without sufficient consideration of actual institutional capacity, staffing limitations, and operational realities.

Several participants emphasized the need for additional staff support, improved coordination, and simplification of digital procedures. *“Sometimes management expects everything to work perfectly even when the system itself has problems”* (Administrative staff, urban clinic). Registration nurses in particular described significant pressure associated with managing patient flow, documentation, and digital data entry simultaneously.

Participants also expressed concern regarding the limited responsiveness of management structures to recurring technical problems. Some healthcare workers felt that institutional expectations regarding reporting and digital performance remained high even when systems malfunctioned regularly. This contributed to frustration and reduced confidence in the effectiveness of digital reforms.

The findings support earlier studies suggesting that successful digital transformation requires organizational adaptation alongside technological implementation. The interviews indicate that digital healthcare systems cannot function effectively without realistic workload planning, stable infrastructure, continuous technical support, and active communication between management and healthcare personnel.

Overall, the findings demonstrate that the challenges of digital transformation in primary healthcare institutions are multidimensional. Technical issues, organizational structures, workload pressures, management practices, and patient adaptation are closely interconnected and collectively shape healthcare workers' experiences with digital systems in Uzbekistan.

### **Conclusion and suggestions.**

Digital transformation in Uzbekistan's primary healthcare system continues to expand, yet the findings of this study indicate that important implementation challenges remain at the operational level. Healthcare workers described recurring technical instability, incomplete system functions, excessive administrative workload, and organizational limitations that affect the effectiveness of digital healthcare services in daily practice.

The interviews also show that healthcare workers evaluate digital systems mainly through their impact on everyday work processes and patient interaction. While some functions of the DMED system improve access to medical information and reduce certain paperwork procedures, persistent technical problems and reporting pressures continue to create dissatisfaction among healthcare personnel.

Another important issue identified in the study concerns unequal patient adaptation to digital healthcare services. Elderly patients often experience difficulties using online systems, which not only affects accessibility but also increases pressure on frontline healthcare workers responsible for patient registration and guidance.

The findings suggest that digital transformation in healthcare should not be viewed only as a technological modernization process. Its effectiveness also depends on organizational conditions, infrastructure quality, workload distribution, management support, and patient readiness. In the case of Uzbekistan, improving technical reliability and strengthening institutional support mechanisms appear particularly important for the successful implementation of digital healthcare systems.

From a practical perspective, policymakers and healthcare administrators should pay greater attention to stable internet infrastructure, continuous technical support, realistic workload planning, and additional support for healthcare workers adapting to digital systems. More inclusive approaches may also be needed to ensure that elderly and digitally vulnerable patients are not excluded from healthcare access.

The study has several limitations. The sample size remains relatively small, and the findings are based on selected primary healthcare institutions. In addition, the research focused primarily on healthcare workers' experiences and did not include patient perspectives. Future studies may expand the sample across different regions of Uzbekistan and examine digital healthcare implementation from both provider and patient perspectives.

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