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The Effectiveness of Smart Applications on the Workforce Performance in the Saudi Primary Healthcare: Insights from Medical and Administrative Personnel

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Abstract

This study investigated the usage of smart applications among medical and administrative personnel in primary healthcare in Saudi Arabia, focusing on their impact on workforce performance and the challenges faced in their implementation. Employing the descriptive analytical approach, the research utilized a questionnaire as the primary data collection instrument. The participants included 87 medical and administrative personnel at King Fahad Medical City (KFMC) in Riyadh. A sample size of 87 medical and administrative personnel was targeted. Data analysis revealed a generally positive perception of smart applications, with a total mean score of 3.57 indicating favourable attitudes towards their integration in service delivery. However, challenges such as weak data protection systems, inadequate training, and a lack of qualified personnel were identified, yielding a mean score of 3.68. The other hand, the participants showed a high mean score of 4.36 for the workforce performance. The correlation analysis showed a positive relationship between the extent of smart applications usage and workforce performance. Based on these findings, the research recommended that comprehensive training programs should be implemented to improve staff proficiency in using smart applications, the hospital must strengthen data protection measures to enhance user confidence, fostering interdepartmental collaboration and communication will streamline processes, recruiting qualified personnel to manage smart applications is essential, and continuous monitoring and evaluation of application impacts on performance are also recommended.

Keywords: *Smart Applications, Workforce Performance, Primary Healthcare, Medical Personnel, Administrative Personnel, Saudi Arabia*

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1. Introduction

In recent years, the healthcare sector has witnessed significant transformations driven by technological advancements, particularly the integration of smart applications (Ala et al., 2024). These innovations have emerged as pivotal tools in enhancing the efficiency and effectiveness of healthcare delivery systems worldwide (Peralta-Ochoa et al., 2023).

The concept of smart applications encompasses a range of digital tools designed to streamline processes, facilitate communication, and enhance decision-making (Kumar et al., 2024). These applications include electronic health records (EHRs), telemedicine platforms, mobile health (mHealth) solutions, and various management systems that support both clinical and administrative functions (Li et al., 2023). The implementation of such technologies is expected to optimize workflows, reduce administrative burdens, and ultimately improve patient care outcomes (Zhang et al., 2022). As healthcare systems increasingly embrace digital transformation, understanding the impact of these tools on workforce performance becomes crucial for maximizing their potential benefits.

Workforce performance in healthcare is a multifaceted construct that includes efficiency, quality of care, employee satisfaction, and overall productivity (Sharma et al., 2024). High-performing healthcare teams are essential for delivering safe and effective care, which directly correlates with patient outcomes and organizational success (Chopade et al., 2023). Research (e.g. Quy et al., 2022; Saha & Rathore, 2024) indicates that digital health interventions can significantly enhance workforce performance by reducing errors, increasing speed of service delivery, and improving communication among team members.

Several studies have highlighted the importance of gaining insights from healthcare professionals when evaluating the impact of technological interventions. For instance, a study by Rani et al (2024) emphasized that the successful implementation of health information systems depends on the acceptance and engagement of end-users. Similarly, Islam et al (2022) found that user satisfaction and perceived usefulness are critical factors influencing the effectiveness of digital health tools.

Moreover, the role of administrative personnel in the healthcare system is often overlooked in discussions about workforce performance (Kwon et al., 2022). These individuals play a crucial role in ensuring the smooth operation of healthcare facilities, managing resources, and facilitating communication between clinical staff and patients (Nasr et al., 2021). Understanding their perspectives on smart applications is essential for developing comprehensive strategies that address the needs of the entire workforce. Research shows that when administrative staff are equipped with effective tools, their ability to support clinical functions improves, leading to enhanced service delivery (Paul et al., 2021).

The effectiveness of smart applications can also be evaluated through various metrics, including time savings, reduction in errors, and improvements in patient outcomes. A study by Lee & Yoon (2021) demonstrated that the implementation of EHRs significantly reduced the time required for administrative tasks, allowing medical personnel to focus more on patient care. Furthermore, telemedicine applications have been shown to improve access to care and patient engagement, positively impacting workforce performance and patient satisfaction (Tavakoli et al., 2020).

Despite the potential benefits of smart applications, challenges remain in their implementation and integration into existing workflows. Resistance to change, lack of training, and concerns about data security can hinder the successful adoption of these technologies (Ala et al., 2024). Understanding the barriers faced by medical and administrative personnel is crucial for developing strategies that facilitate the effective use of smart applications. Research by Li et al (2023) highlighted that addressing user concerns and providing adequate training can significantly enhance the acceptance and effectiveness of digital health tools.

The Saudi healthcare system has undergone substantial reforms in recent years, driven by the Vision 2030 initiative, which aims to enhance healthcare services and ensure the sustainability of the system (Alsufyani et al., 2020). The integration of smart applications aligns with this vision, promoting the adoption of technology to improve service delivery and workforce efficiency. As the Kingdom seeks to modernize its healthcare infrastructure, the perceptions and experiences of medical and administrative personnel regarding these applications are vital for understanding their effectiveness and areas for improvement (Albarrak et al., 2021).

In the context of Saudi Arabia, the unique cultural and organizational dynamics within the healthcare system must be considered when assessing the effectiveness of smart applications. The hierarchical nature of healthcare organizations can influence how technology is perceived and utilized by staff (Paul et al., 2021). The current research aims to fill the gap in the literature by providing a comprehensive analysis of the effectiveness of smart applications on workforce performance in Saudi primary healthcare. By gathering insights from both medical and administrative personnel, this study seeks to understand their experiences, challenges, and perceptions of these technologies. The findings will contribute to the ongoing discourse on digital health transformation in Saudi Arabia and offer practical recommendations for enhancing workforce performance through the effective implementation of smart applications.

1.2. Statement of the Problem

Saudi Arabia has placed significant emphasis on the development of its healthcare system as part of its overall developmental plans (AlGibreen, 2020). The country aims to equip healthcare personnel with modern technical skills while enhancing the competencies and capabilities of healthcare leaders. Furthermore, the Kingdom's Vision 2030 emphasizes the importance of building a qualified workforce and ensuring that all healthcare personnel receive training and education in accordance with global best practices in science and ethics, thereby aligning with the contemporary revolution in science and technology (Al-Anezi, 2021).

Despite these efforts, indicators and data from public healthcare institutions in Saudi Arabia reveal numerous obstacles that hinder the effective utilization of modern technologies to improve workforce performance and enhance the quality of healthcare services. For instance, studies conducted by Alassafi (2021) and Jadi (2020) indicated the presence of organizational and administrative barriers that prevent the full implementation of advanced technologies in many hospitals, particularly among patients and healthcare staff. Additionally, research by Abdullah & Fakieh (2020) highlighted that many healthcare workers lack the necessary skills to use modern technologies and face a lack of both material and moral incentives to leverage these technologies in their work.

On the other hand, studies such as those by Alsufyani et al (2020) and Albarrak et al (2021) found that the use of smart applications in healthcare institutions in Saudi Arabia continues to encounter challenges. These include some patients' inability to effectively use these applications and the lack of awareness of the value of smart applications in operations (Abdullah & Fakieh, 2020; Jadi, 2020). Moreover, the study by Al-Anezi (2021) indicated that many hospitals face financial and organizational difficulties, as well as a lack of specialized technical departments responsible for optimally managing smart applications in their healthcare operations. On the other hand, Alassafi (2021) stressed the necessity of encouraging and motivating healthcare workers to adopt contemporary technologies and smart applications in their job performance**.**

Therefore, this study seeks to examine the effectiveness of smart applications on the workforce performance in the Saudi primary healthcare by getting insights from medical and administrative personnel working in one of the leading primary healthcare hospitals in Riyadh city, namely, King Fahad Medical City (KFMC).

1.3. Research Questions

This study seeks to answer the following questions:

1. To what extent are smart applications used in the Saudi primary healthcare from the perspective of medical and administrative personnel?
2. What are the challenges that face the use of smart applications in the Saudi primary healthcare from the perspective of medical and administrative personnel?
3. How does the use of smart applications influence the overall level of workforce performance in the Saudi primary healthcare from the perspective of medical and administrative personnel?

1.4. Research Objectives

This study aims to achieve the following objectives:

1. To evaluate the extent of smart application usage in Saudi primary healthcare as perceived by medical and administrative personnel.

2. To identify the challenges faced by medical and administrative personnel in the utilization of smart applications within Saudi primary healthcare.
3. To assess the impact of smart application usage on the overall level of workforce performance in Saudi primary healthcare from the perspective of medical and administrative personnel.

1.5. Research Significance

The integration of smart applications in the Saudi primary healthcare system holds significant promise for improving workforce performance among medical and administrative personnel. As healthcare organizations continue to embrace digital transformation, understanding the perceptions and experiences of staff is crucial for maximizing the benefits of these technologies. By exploring the effectiveness of smart applications and addressing the challenges faced by personnel, this research aims to contribute valuable insights that will inform future strategies for enhancing healthcare delivery in Saudi Arabia.

This study aims to fill a gap in the existing literature regarding the impact of smart applications on workforce performance within the context of Saudi primary healthcare. By exploring this relationship, the research will contribute theoretical insights into how technology influences healthcare delivery and employee efficiency.

The research will provide actionable insights for healthcare administrators and policymakers on how smart applications can enhance workforce performance. This can lead to improved service delivery and better patient outcomes in Saudi primary healthcare settings. Also, the findings can serve as a guide for the effective implementation of smart applications in healthcare institutions. By understanding which applications are most effective, healthcare organizations can allocate resources more efficiently and select technologies that align with their operational goals

1.6. Research Scope

This study investigates the effectiveness of smart applications on workforce performance within the context of Saudi primary healthcare, specifically at King Fahad Medical City (KFMC) in Riyadh. The research is centered on gathering insights exclusively from the medical and administrative personnel employed at KFMC. The study focuses on these key aspects: the extent of smart application usage at KFMC, the challenges encountered in their implementation, and the current level of workforce performance. Additionally, it seeks to explore the potential correlation between the utilization of smart applications and workforce performance.

2. Literature Review

Smart applications, often defined as advanced software solutions that utilize technologies such as artificial intelligence (AI), machine learning, and mobile computing, facilitate efficient data management and enhance communication among healthcare professionals (Tavakoli et al., 2020). These applications can be categorized into several types, including Electronic Health Records (EHRs), Mobile Health Applications (mHealth), telemedicine platforms, and decision support systems (Lee & Yoon, 2021). Each type serves a unique function, contributing to improved clinical workflows and patient outcomes.

The importance of smart applications in healthcare cannot be overstated. They streamline processes, reduce administrative burdens, and enable healthcare providers to deliver more personalized care (Paul et al., 2021). For instance, EHRs allow for the seamless sharing of patient information among providers, minimizing the risk of errors and enhancing coordination of care (Papa et al., 2020). Meanwhile, mHealth applications empower patients to monitor their health conditions in real time, fostering greater engagement in their own healthcare journeys (Nasr et al., 2021). The growing reliance on telemedicine, particularly in light of the COVID-19 pandemic, further highlights the critical role of smart applications in ensuring continuity of care despite physical barriers (Quy et al., 2022).

The effect of smart applications on workforce performance metrics has been a focal point of research in healthcare settings. Numerous studies (e.g. Zhang et al., 2022; Saba Raoof & Durai, 2022) indicate that the adoption of these technologies can lead to improvements in efficiency, productivity, and job satisfaction among healthcare personnel. For example, the use of decision support systems has been shown to enhance clinical decision-making by providing timely and relevant information, thus reducing the cognitive load on healthcare professionals (Kown et al., 2022). Furthermore, smart applications often facilitate better

communication and collaboration among team members, which is vital for delivering high-quality care (Rani et al., 2024).

However, the incorporation of smart applications in healthcare presents numerous challenges that can hinder their effective implementation and utilization. One significant obstacle is the resistance to change among healthcare professionals (Islam et al., 2022). Many practitioners are accustomed to traditional methods and may be hesitant to adopt new technologies, fearing that smart applications could complicate their workflows rather than enhance them. Also, the lack of technological infrastructure, lack of support from top management, lack of maintenance and technical support, and recent technologies have been cited as major challenges to the adoption of smart applications in healthcare (Saha & Rathore, 2024; Chopade et al., 2023).

Another challenge is the issue of interoperability (Li et al., 2023). Many smart applications are developed in isolation, leading to discrepancies in how data is shared across different systems. This lack of seamless integration can create barriers to comprehensive patient care, as healthcare providers may struggle to access complete patient histories or coordinate treatment effectively.

Data privacy and security concerns also pose significant challenges (Kumar et al., 2024; Peralta-Ochoa et al., 2023). With the increasing reliance on digital solutions, the risk of data breaches and unauthorized access to sensitive patient information becomes more pronounced. Healthcare organizations must navigate complex regulations and ensure robust cybersecurity measures are in place to protect patient data, which can be resource-intensive and costly (Zhang et al., 2022).

Additionally, ensuring that healthcare professionals receive adequate training to effectively use smart applications is crucial (Sharma et al., 2024). Without proper training, staff may underutilize or misuse these technologies, leading to suboptimal outcomes. Finally, the financial implications of adopting smart applications can be daunting, particularly for smaller healthcare facilities (Quy et al., 2022). The initial investment in technology, ongoing maintenance, and potential costs associated with staff training can strain budgets, making it challenging for some organizations to fully embrace these innovations (Papa et al., 2020).

A review of international literature reveals a growing body of evidence linking the use of smart applications to enhanced workforce performance in healthcare settings. A study by Saba Raoof & Durai (2022) found that the implementation of EHR systems significantly reduced the time spent on administrative tasks, allowing healthcare professionals to focus more on patient care. Similarly, Ala et al (2024) indicated that mobile health applications improved the efficiency of healthcare delivery by enabling real-time communication among providers. These findings suggest that smart applications not only enhance individual performance but also contribute to improved organizational outcomes.

In Saudi Arabia, the relevance of smart applications in healthcare has garnered significant attention, particularly as the country moves towards achieving its Vision 2030 goals. Research conducted Alassafi (2021) highlighted the positive impact of mobile health applications on the performance of healthcare workers in Riyadh, demonstrating increased efficiency and satisfaction among users. Another study Abdullah & Fakieh (2020) examined the role of telemedicine in enhancing workforce performance, revealing that healthcare professionals reported greater flexibility and reduced workload as a result of utilizing telehealth services.

Despite the promising findings, it is essential to acknowledge that the studies linking smart applications to workforce performance often differ in their focus and methodology. For instance, while Paul et al (2021) concentrated on EHR systems, other studies, such as that by Lee & Yoon emphasized telemedicine's role in healthcare delivery. This variability highlights the need for further research to explore the comprehensive impact of different types of smart applications across diverse healthcare settings.

Moreover, while many studies have addressed the positive effects of smart applications, there are also challenges associated with their implementation. Research by Zhang et al. (2021) indicated that despite the potential benefits, issues such as resistance to change among staff and inadequate training can hinder the effective use of these technologies. Such obstacles must be addressed to fully realize the potential of smart applications in enhancing workforce performance.

In conclusion, the effectiveness of smart applications on workforce performance in healthcare is supported by a growing body of literature that highlights their importance and impact. The various types

of smart applications, including EHRs, mHealth, and telemedicine, each contribute uniquely to improving efficiency and job satisfaction among healthcare professionals (e.g. Nasr et al., 2021; Jadi, 2020; Al-Anezi, 2021; Rani et al., 2024). International and Saudi studies consistently demonstrate the positive correlation between smart application usage and workforce performance metrics, although the specific focus and context of these studies vary. As healthcare continues to evolve, ongoing research will be essential in understanding the multifaceted relationship between technology and workforce performance, ensuring that healthcare providers can leverage these tools effectively to enhance patient care.

3. Research Methodology

3.1. Research Design

This study uses the descriptive analytical approach. The descriptive analytical approach is a research methodology that combines two key elements: descriptive and analytical techniques. This approach is commonly used in various fields, including social sciences, healthcare, and market research, to provide a comprehensive understanding of a phenomenon (Bhattacharyya, 2006).

In the descriptive phase, researchers systematically gather and present data about a specific subject. This could involve qualitative or quantitative data collection methods, such as surveys, interviews, observations, or existing data sets. The goal is to outline the characteristics, behaviors, or conditions of the subjects being studied without manipulating any variables (Kumari et al., 2023).

The analytical phase follows the descriptive phase and involves examining the collected data to identify patterns, relationships, or trends. This may involve statistical analysis, thematic coding, or other analytical techniques to interpret the data. Researchers can explore correlations between variables, assess causal relationships, or gain insights into underlying mechanisms (Verma et al., 2024).

By combining these two phases, the descriptive analytical approach provides a holistic view of the research topic. It allows researchers to not only describe what is happening but also to analyze why it may be occurring. In this study, the effectiveness of smart applications on workforce performance in healthcare, the descriptive component could detail how frequently these applications are used among healthcare professionals, while the analytical component could investigate how their usage correlates with improvements in workforce performance.

3.2. Participants

The participants of this study included all medical and administrative personnel working at King Fahad Medical City (KFMC) in Riyadh City, Kingdom of Saudi Arabia. The research population comprised (112) medical and administrative personnel. Using the sample size calculator where the confidence level is 95%, margin of error is 5%, the target sample size was (87) medical and administrative personnel.

3.3. Data Collection

The researcher used a questionnaire as the data collection instrument for this study. The questionnaire was designed based on relevant literature and previous studies that discussed the impact of smart applications on workforce performance in healthcare. The questionnaire consisted of two parts. The first part included the demographics of the participants which comprised three variables: education, job, and years of experience. The second part consisted of (30) items distributed equally on three sections: the extent of using smart applications, the challenges facing the use of smart applications, and the level of workforce performance. The five-point Lickert scale is used as the response scale in the questionnaire with the following five options: strongly agree (5), agree (4), neutral (3), disagree (2), and strongly disagree (1).

The researcher distributed the questionnaire on the participants in person and got responses from (87) participants with a response rate of (100%).

The researcher verified the content validity of the questionnaire by submitting it to a number of juries in healthcare management. The researcher responded to the juries' remarks and modifications and produced a final version of the questionnaire. On the other hand, the researcher used Cronbach's Alpha to verify the reliability of the questionnaire. The findings of Cronbach's Alpha are shown in table 3.1.

Table 3.1

Cronbach's Alpha for Questionnaire Reliability

Sections	No of Items	Cronbach's Alpha
The extent of using smart applications	10	0.654
The challenges facing the use of smart applications	10	0.714
The level of workforce perceptions	10	0.822

Table 3.1 shows that the reliability coefficient of the questionnaire sections ranges between 0.654 and 0.822 which is a good reliability score. This ensures that the questionnaire is a reliable tool for this study.

The participants were informed of the purpose of the questionnaire and provided their consent to participate in the study. They were assured that their responses would remain confidential. Prior to the distribution of the questionnaire, approval was obtained from the hospital management to ensure compliance with institutional guidelines. The questionnaire was administered to participants during their regular working hours, with a request for them to return the completed questionnaires the following day. Upon collecting the data, the researchers conducted a statistical analysis of the data to get the results.

Data Analysis

The Statistical Package for the Social Sciences (SPSS) software was utilized for data analysis. The following statistical tools were employed in this research:

1. **Percentage and Frequency:** they are used to indicate the percentage and frequency for each data point.
2. **Standard Deviation:** This is employed to indicate the degree of variation present among participants' responses.
3. **Mean:** This measure was used to determine the relative importance of items in relation to the study outcomes.
4. **Pearson Correlation Coefficient:** This measure was used to determine the correlation between the use of smart applications and the level of workforce performance.

4. Results & Discussion

This part presents the research findings. It presents the results of the questionnaire, and a discussion of these results based on the relevant literature.

Table 4.1Demographics of the Participants

Education	Frequency	Percentage
Master	29	33%
Doctorate	21	24%
Bachelor	37	31%
Total	**87**	**%100**
Years of Experience	**Frequency**	**Percentage**
Less than 5 years	23	26.43%
From 5 to less than 10 years	33	37.93%
From 10 to less than 15 years	14	16.1%
More than 15 years	17	19.54%
Total	**87**	**%100**
Job	**Frequency**	**Percentage**

Nursing	36	41%
Physician	10	11.5%
Technician	26	30%
Administrative	15	4.5%
Total	**87**	**%100**

Table 4.1 presents a comprehensive overview of the demographics of the participants in the study, offering insights into their educational backgrounds, years of experience, and job roles.

Starting with educational qualifications, the data shows that 33% of participants hold a master's degree, 24% have a doctorate, and 31% possess a bachelor's degree. This distribution indicates a highly educated participant group, with a majority holding advanced degrees. The presence of individuals with master's and doctorate qualifications suggests that the study benefits from informed perspectives, which can enhance the depth of insights regarding the effectiveness of smart applications in healthcare.

The analysis of years of experience reveals that 37.93% of participants have between 5 to less than 10 years of experience. Conversely, 26.43% have less than 5 years of experience, suggesting that fresh viewpoints are represented, potentially bringing innovative ideas and a willingness to embrace new technologies. The remaining participants are distributed across the other experience categories, with fewer individuals in the more experienced brackets (14 participants with 10 to less than 15 years and 17 with more than 15 years).

Examining job roles, the data shows that nursing constitutes the largest group at 41%, followed by technicians at 30%, physicians at 11.5%, and administrative staff at 4.5%. The predominance of nursing and technician roles may indicate a focus on frontline healthcare delivery, which is crucial for understanding the practical implications of smart applications in patient care.

Table 4.2 The Extent of Smart Applications Usage by Medical and Administrative personnel

s	**Statements**	**Responses**					**Mean**	**Standard Deviation**
		Strongly Agree	**Agree**	**Neuter**	**Agree**	**Strongly Disagree**		
1	The hospital utilizes smart applications to deliver its services to beneficiaries.	30	42	11	4	0	4.13	1.25
2	All the services provided by the hospital are integrated with smart applications.	18	20	21	18	10	3.21	1.04
3	There is a positive interaction with the smart applications associated with the services offered by the hospital.	24	32	23	8	0	3.83	1.15
4	The hospital primarily relies on smart applications to implement its programs and services.	20	15	29	20	3	3.33	1.05

5	These applications encompass all the services required by beneficiaries.	19	15	22	27	4	3.21	1.03
6	The number of smart applications is increasing, and there is a diversity in the applications offered.	35	26	17	9	0	4.00	1.17
7	Activities and services within the hospital are designed to be based on smart applications rather than traditional methods.	22	29	27	8	1	3.72	1.13
8	Financial support is available for the use of smart applications in the hospital.	12	21	40	10	4	3.31	1.07
9	The hospital has qualified personnel to manage these smart applications.	16	19	36	13	3	3.37	1.09
10	The hospital's upper management actively supports the integration of smart applications in its operations.	18	24	38	5	2	3.59	1.11
	Total Mean	**3.57**						

Table 4.2 provides insights into the extent of smart applications usage among medical and administrative personnel within the hospital, as indicated by the mean scores for various statements. The data reveals a generally favorable perception of smart applications, particularly in their role in service delivery. The highest mean score of 4.13 suggests a strong consensus that the hospital effectively utilizes these technologies to meet the needs of its beneficiaries. This indicates an acknowledgment of the benefits that smart applications bring to service efficiency and patient care.

Moreover, while there is a positive perception of the interaction with smart applications, as evidenced by a mean score of 3.83, other areas, such as financial support and the availability of qualified personnel, scored lower, with means of 3.31 and 3.37, respectively. These scores suggest that while the personnel recognize the importance of smart applications, there are concerns about the support infrastructure necessary for their successful implementation. The overall mean score of 3.57 reflects a cautious optimism; it indicates that while the integration of smart applications is valued, there are significant challenges that need to be addressed to fully realize their potential within the hospital setting.

However, the findings also highlight areas of concern. The mean score of 3.21 for the statement regarding the integration of all services with smart applications indicates that there is room for improvement in achieving comprehensive integration. Similarly, the low mean score of 3.21 for the statement about the applications encompassing all services required by beneficiaries suggests that personnel may feel that not all their needs are being met by the current technological offerings.

The previous results are consistent with the results of the study of Ala et al (2024) and Kumar et al (2024) which indicated that smart applications play a major role in health services in hospitals and play an important role in enhancing health care in hospitals, as they contribute to improving communication and facilitating access to health information, enhancing safety and quality, enabling the provision of remote health services, and improving hospital management in general. These applications are powerful tools for improving the patient's experience and improving the efficiency of health care.

The results of this study are also consistent with the results of Jadi (2020) and Alassafi (2021) which showed that the use of smart applications is widespread in the health sector as smart applications play a

pivotal role in improving the effectiveness of services provided by the Ministry of Health, as these applications provide reliable sources of health information to the public. Individuals can easily obtain medical recommendations, health advice, and warnings about prevalent diseases through these applications, which helps them make informed decisions about their health and the health of their families. In addition, Albarrak et al (2021) showed that smart applications can enhance communication between patients and healthcare providers, as patients can easily book appointments and manage their medical appointments through these applications, saving time and effort.

Table 4.3 The Challenges Faced by Medical and Administrative Personnel in the Utilization of Smart Applications

s	Statements	Responses					Mean	Standard Deviation
		Strongly Agree	Agree	Neuter	Agree	Strongly Disagree		
1	Inability to deal with smart applications well.	11	39	19	16	2	3.47	1.07
2	Weak data protection systems	12	34	24	15	2	3.45	1.05
3	Rapid development in smart applications.	31	35	14	6	1	4.02	1.18
4	Weak Arabization of foreign systems and programs.	16	38	23	10	0	3.69	1.09
5	Weak technological culture among beneficiaries	21	41	15	9	1	3.83	1.13
6	Difficulty of electronic linking between departments.	18	37	21	9	2	3.69	1.08
7	High financial cost of designing and developing applications.	21	37	22	6	1	3.82	1.14
8	Low confidence of beneficiaries in electronic transactions.	12	26	25	16	8	3.21	1.03
9	Lack of qualified human resources to manage smart applications.	13	48	15	9	2	3.70	1.11
10	Lack of training programs on managing smart applications.	18	52	12	5	0	3.95	1.16
	Total Mean	**3.68**						

Table 4.3 outlines the challenges faced by medical and administrative personnel in utilizing smart applications, as indicated by the mean scores for various statements. The total mean score of 3.68 reflects a moderate level of concern regarding these challenges, suggesting that while there are significant obstacles, they are not insurmountable.

One of the more pressing issues highlighted is the inability to deal with smart applications well, which received a mean score of 3.47. This indicates a notable level of difficulty among personnel in effectively using these technologies, which could hinder the overall efficiency and effectiveness of smart applications

in the hospital setting. Similarly, the score of 3.45 for weak data protection systems underscores concerns about the security and privacy of sensitive information, a critical aspect of healthcare technology.

On a more positive note, the statement regarding the rapid development in smart applications received the highest mean score of 4.02. This suggests that personnel recognize and perhaps welcome the advancements in technology, indicating a readiness to adapt and evolve with new tools. However, this rapid development also presents challenges, particularly regarding the weak Arabization of foreign systems and programs (mean score of 3.69) and the difficulty of electronic linking between departments (mean score of 3.69), which may create barriers to effective implementation and user acceptance.

Other significant challenges include a weak technological culture among beneficiaries (mean score of 3.83) and the high financial cost of designing and developing applications (mean score of 3.82). These factors may lead to resistance or hesitance in adopting smart applications, further complicating their integration into everyday practices. Additionally, the lack of qualified human resources (mean score of 3.70) and training programs (mean score of 3.95) highlights a critical need for investment in human capital to manage and leverage smart applications effectively.

The results of the study showed that the most prominent challenges facing the use of smart applications in the health sector are the rapid development of smart applications, the lack of training programs on managing smart applications, the weakness of technical culture among many beneficiaries, the high financial cost of designing and developing applications, and the lack of qualified human resources to manage smart applications. This result is consistent with the results of Alsufyani et al (2020) and Nasr et al (2021) which showed that financial support and the presence of qualified human cadres are among the most important challenges facing the use of smart technologies and applications in the health sector.

This finding is also consistent with the results of Lee & Yoon (2021) which stated that the lack of training of workers to benefit from smart technologies and the continuous change in the technologies used in the health sector limits the full benefit of these technologies in improving the quality of the service provided. On the other hand, the results of this study are consistent with the results Sharma et al (2024) which showed that the confidentiality of data and information, the availability of financial allocations for smart technologies in hospitals, and the inability of many beneficiaries to deal with smart technologies are among the most prominent challenges facing the use of smart applications in the health sector.

Table 4.4 The Overall Level of Workforce Performance

s	Statements	Responses					Mean	Standard Deviation
		Strongly Agree	Agree	Neuter	Agree	Strongly Disagree		
1	Using smart applications speeds up work completion.	41	40	4	1	1	4.37	1.11
2	Smart applications contribute to completing work anytime and anywhere	46	35	6	0	0	4.46	1.13
3	Smart applications reduce beneficiary complaints	40	34	12	1	0	4.30	1.08
4	Smart applications contribute to increasing the number of tasks completed by the employee	46	33	5	2	1	4.39	1.11
5	Smart applications help the employee complete his work with accuracy	43	35	6	3	0	4.36	1.09

6	Smart applications contribute to reducing operating costs.	42	35	8	2	0	4.34	1.06
7	Smart applications save employees' time and effort.	41	36	6	3	1	4.30	1.05
8	Smart applications help reduce the error rate	39	40	8	0	0	4.36	1.09
9	Smart applications contribute to the ease of data exchange between departments	46	36	4	1	0	4.46	1.12
10	Smart applications contribute to reducing work pressure on the employee	39	36	7	4	1	4.24	1.04
	Total Mean	**4.36**						

Table 4.4 presents an assessment of the overall level of workforce performance as influenced by the use of smart applications, with mean scores reflecting personnel perceptions of their effectiveness. The total mean score of 4.36 indicates a strong consensus on the positive impact of smart applications on various aspects of work performance.

The highest mean score of 4.46 is attributed to the statement that smart applications contribute to completing work anytime and anywhere. This suggests that personnel highly value the flexibility and accessibility provided by these technologies, which likely enhances their ability to perform tasks outside of traditional settings. Additionally, the same score of 4.46 for the ease of data exchange between departments highlights the collaborative advantages that smart applications offer, facilitating smoother communication and workflow.

Furthermore, the mean scores for statements such as 4.39 for increasing the number of tasks completed and 4.37 for speeding up work completion demonstrate that personnel perceive smart applications as essential tools for boosting productivity. The ability to complete work with accuracy also scored notably high at 4.36, indicating confidence in the reliability of these applications, which is crucial in a healthcare environment.

Smart applications are also seen as beneficial in reducing operational costs (4.34) and minimizing the error rate (4.36). This reflects an understanding that technological solutions can lead to both financial efficiency and improvements in quality control, ultimately enhancing service delivery.

Moreover, personnel acknowledged the role of smart applications in alleviating work pressure, with a mean score of 4.24, suggesting that these tools help manage workloads more effectively. The consistent high scores across various statements underscore a collective recognition of the value that smart applications bring, enhancing both individual and organizational performance.

Overall, the findings from Table 4.4 indicate that the workforce views smart applications as vital enablers of efficiency and effectiveness in their roles, reinforcing the importance of continued investment in these technologies to maximize performance outcomes.

The previous results showed that smart applications contribute to raising the level of employee performance in terms of completing work quickly and performing work accurately and quickly, and that they save time and effort for employees. The result also showed that the use of smart applications contributes to reducing beneficiary complaint rates, error rates, and reducing operating costs. The results of this study are consistent with the results of Zhang et al (2022) and Quy et al (2022) which showed the importance of smart applications in improving the level of service by saving time and making service easier.

The results of this study are also consistent with the results of Islam et al (2022) which showed the role of smart applications in reducing error rates at work and reducing financial costs and the human element.

Table 4.5 Correlation between Smart Applications Usage and Workforce Performance

S	Sections	Workforce Performance	
		Pearson Correlation	Sig
1	The extent of using smart applications	*0.208	0.000
2	The challenges facing the use of smart applications	*0.165	0.000

**The correlation is statistically significant at α≤0.05*

Table 4.5 presents the correlation between the usage of smart applications and workforce performance, highlighting two key areas: the extent of using smart applications and the challenges faced in their utilization. The findings indicate a statistically significant relationship between these variables.

The Pearson correlation coefficient of 0.208 for the extent of using smart applications suggests a positive correlation with workforce performance. This implies that as the usage of smart applications increases, there is a corresponding improvement in workforce performance. The significance level of 0.000 indicates that this relationship is highly statistically significant, reinforcing the idea that effective integration of smart applications can enhance productivity and efficiency among personnel.

On the other hand, the correlation coefficient of 0.165 for the challenges facing the use of smart applications also shows a positive correlation, albeit weaker than that of the extent of use. This suggests that even as challenges are encountered, there is still a notable connection to workforce performance, although it may indicate that overcoming these challenges is crucial for realizing the full potential of smart applications in enhancing performance. The significance level of 0.000 here, too, highlights that this finding is statistically significant.

5. Conclusion & Recommendations

The research provided a comprehensive understanding of the utilization of smart applications within a hospital setting, particularly concerning their impact on workforce performance and the challenges faced by personnel. The findings indicate a generally positive perception among medical and administrative staff regarding the use of smart applications. A total mean score of 3.57 from Table 4.2 reflects a favorable attitude towards the integration of these technologies, especially regarding their role in service delivery and operational efficiency. However, the presence of significant concerns about comprehensive integration and support systems highlights areas requiring attention.

The challenges delineated in Table 4.3, with an overall mean of 3.68, reveal that while personnel acknowledge the benefits of smart applications, they also face several hurdles. Issues such as weak data protection systems, inadequate training programs, and a lack of qualified personnel are critical factors that can impede the effective use of technology. The acknowledgment of these challenges is essential, as they can directly affect the overall success of smart applications in enhancing performance and meeting organizational goals.

In contrast, Table 4.4 indicates a strong correlation between the use of smart applications and workforce performance, with a total mean of 4.36. This suggests that smart applications significantly enhance productivity, accuracy, and operational efficiency. The positive correlation between the extent of smart applications usage and workforce performance underscores the necessity for organizations to invest in and promote the use of these technologies. The data indicates that as personnel utilize smart applications more,

their performance improves, supporting the idea that these tools are integral to contemporary healthcare operations.

Furthermore, the correlation results in Table 4.5 illustrate the complexity of this relationship. While a positive correlation exists between the extent of use and performance, the challenges faced also correlate positively with performance, albeit to a lesser degree. This duality suggests that addressing the challenges is not just about overcoming obstacles but also about optimizing the benefits derived from using smart applications.

To effectively harness the benefits of smart applications and improve workforce performance, several strategic recommendations can be made. First and foremost, it is crucial to invest in comprehensive training programs tailored to the needs of medical and administrative personnel. Such training should focus not only on the technical aspects of using smart applications but also on building a strong technological culture within the organization. By enhancing users' confidence and competence, organizations can facilitate smoother adoption and integration of these technologies.

Secondly, addressing the identified challenges related to data protection is imperative. Implementing robust data security measures and ensuring compliance with relevant regulations can help mitigate concerns about data breaches and enhance users' trust in the systems. Regular audits and updates to security protocols should be a standard practice to safeguard sensitive information.

Moreover, enhancing communication and collaboration between departments is vital for maximizing the benefits of smart applications. Establishing clear protocols for electronic linking and data sharing can streamline processes and reduce operational inefficiencies. This collaborative approach can also foster a culture of teamwork, where personnel feel supported and empowered to utilize smart applications effectively.

Additionally, it is essential to allocate resources for the recruitment and training of qualified personnel to manage smart applications. Employing specialists who are well-versed in the latest technologies can provide the necessary support for staff, ensuring that the applications are effectively utilized and maintained. This investment in human capital will pay dividends in terms of improved performance and reduced operational challenges.

Finally, the hospital should continuously monitor and evaluate the impact of smart applications on workforce performance. Regular feedback from personnel can provide valuable insights into areas for improvement and help identify new challenges as they arise. Engaging staff in this evaluative process can foster a sense of ownership and responsibility towards the effective use of technology.

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