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Article

A Framework for Antecedents to Health Information Systems Uptake by Healthcare Professionals: An Exploratory Study of Electronic Medical Records

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Abstract: Health information systems (HISs) are essential information systems used by organisations and individuals for various purposes. Past research has studied different types of HIS, such as rostering systems, Electronic Medical Records (EMRs), and Personal Health Records (PHRs). Although several past confirmatory studies have quantitatively examined EMR uptake by health professionals, there is a lack of exploratory and qualitative studies that uncover various drivers of healthcare professionals' uptake of EMRs. Applying an exploratory and qualitative approach, this study introduces various antecedents of healthcare professionals' uptake of EMRs. This study conducted 78 semi-structured, open-ended interviews with 15 groups of healthcare professional users of EMRs in two large Australian hospitals. Data analysis of qualitative data resulted in proposing a framework comprising 23 factors impacting healthcare professionals' uptake of EMRs, which are categorised into ten main categories: perceived benefits of EMR, perceived difficulties, hardware/software compatibility, job performance uncertainty, ease of operation, perceived risk, assistance society, user confidence, organisational support, and technological support. Our findings have important implications for various practitioner groups, such as healthcare policymakers, hospital executives, hospital middle and line managers, hospitals' IT departments, and healthcare professionals using EMRs. Implications of the findings for researchers and practitioners are provided herein in detail.

Keywords: health information technology; health information systems; electronic medical records; electronic health records; technology uptake; healthcare professional users



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1. Introduction

The impact of computers in the healthcare sector brings new innovations to health information technology (HIT) applications, which aim to improve the quality of care [1,2]. An Electronic Medical Record (EMR) is one of the most important HIT applications in healthcare. EMRs are computerised systems that provide an efficient approach to collecting, storing, and displaying health-related information [3,4].

EMRs are developed to support the tasks of healthcare professionals in medical practices. The main functions of this system include but are not limited to providing medical consultation notes, information about vaccinations, details of health-related problems, prescriptions, and renewal, automated reminders for various tasks, and medical appointment alerts [5–7]. In most health informatics research, the electronic health record (EHR) and the EMR are used interchangeably [8]. Herein, the EMR is used as the more common term.

Despite the recognised benefits, the uptake of Electronic Medical Records (EMRs) among healthcare professionals remains inconsistent. Various factors influence the successful adoption and utilisation of EMRs. Organisational factors such as leadership support, adequate training, and technical infrastructure are critical. For instance, studies have shown that strong top management support significantly enhances the likelihood of successful

EMR implementation, as it fosters a supportive environment for healthcare professionals to adopt new technologies [9,10]. Additionally, the presence of an IT support system within the hospital is crucial in addressing technical challenges and reducing resistance to EMR adoption [11].

The perceived complexity and usability of EMRs also play a significant role in their uptake. Healthcare professionals are more likely to adopt EMRs if the systems are user-friendly and align well with their clinical workflows [10]. Factors such as ease of use, response time, and the overall usability of the EMR system are paramount. Systems that are perceived as cumbersome or that disrupt established work patterns are less likely to be embraced by healthcare providers [12]. Therefore, ensuring that EMRs are designed with end-user input and are adaptable to the clinical environment can significantly impact their acceptance and utilisation.

Moreover, individual attributes such as computer literacy, attitudes towards technology, and prior experience with EMRs influence adoption rates. Healthcare professionals who are more familiar with computer systems and who have positive attitudes towards technology are more inclined to use EMRs effectively [11,13]. Training programs that enhance computer literacy and familiarise staff with EMR functionalities can mitigate resistance and promote a positive attitude towards EMRs. Studies have highlighted the importance of continuous professional development and training in ensuring the long-term success of EMR systems in healthcare settings [13,14].

There are various factors that can impact EMR uptake in the healthcare sector [8,15]. For instance, the following factors were found to be drivers of behavioural intentions regarding EMR uptake: performance expectancy, effort expectancy, social influence, and habit. Ref. [16] found that EMR functionality can be strengthened by adding additional features such as a research facility and medical entities dictionary. Moreover, it was found that individual factors such as computer literacy, personal norms, and individual experience could play important roles in the uptake of EMRs by healthcare professionals [17]. As with any other information system, successful implementation of the EMR depends on the users' uptake.

Furthermore, numerous studies have explored various aspects of EMR adoption by healthcare providers in hospitals globally. The global adoption of EMRs has been increasing, with significant variations between countries and regions. Developed countries such as the United States, United Kingdom, and Australia exhibit higher adoption rates compared to developing countries [18,19]. Several barriers hinder the uptake of EMRs, including high costs, lack of technical support, privacy and security concerns, and resistance to change among healthcare providers [20,21]. Government incentives and policies have significantly promoted EMR adoption. For instance, the HITECH Act in the United States provided financial incentives to healthcare providers for EMR adoption [22]. The impact of EMR adoption on healthcare quality has been extensively studied with mixed results. Some studies indicate that EMRs improve patient safety, reduce medical errors, and enhance care coordination [23], while others find limited evidence of quality improvements [24]. Research on the satisfaction and usability of EMRs among healthcare providers shows that factors such as system design, ease of use, and workflow integration influence adoption and user satisfaction [25,26].

Although many studies have dealt with the topic quantitatively and with a confirmatory research approach, there remains a gap in qualitative research that takes an exploratory approach to provide a comprehensive understanding of the antecedents to healthcare professionals' uptake of EMRs in specific contexts, such as Australia. Thus, the present study aims to fill this gap by addressing the following research question:

Research Question. *What are the factors that impact healthcare professionals' uptake of EMR?*

The objective of the current research is to gain an in-depth understanding of various barriers and facilitators to the uptake of EMRs by healthcare professionals. The potential findings of this study can help various practitioner groups; for example, they help hospital executives make a decision on which EMR to deploy and what to do to enhance healthcare

professionals' uptake of EMRs to enable them to gain maximum benefits from these systems. It also helps hospital middle management identify what helps improve healthcare professionals' uptake of EMRs.

The remainder of this paper is structured as follows. Following this introduction, the research background is explained. Next, the research design is introduced, followed by the analysis and results. Finally, a discussion of findings and conclusions is presented.

2. Materials and Methods

EMRs can present health-related information in different structures, and healthcare professionals can analyse more readable information and make better decisions. EMRs can decrease the cost of health services by providing quick access to patient health records such as laboratory results, medical imaging outcomes, and discharge notes [27].

In recent years, EMRs have been developed by an ever-increasing number of health sectors around the world. The adoption of hospital-wide EMR systems is a challenging matter involving a range of organisational and technical issues, including human skills, organisational structure, culture, technical infrastructure, financial resources, and coordination [20].

There are various factors that can impact EMR adoption in healthcare sectors [8]. Ref. [28] found that usefulness and ease of use are the main factors impacting the acceptance of EMR systems in South Africa. Ref. [15] employed the extended unified theory of acceptance and usage technology (UTAUT2) to explain patients' acceptance of EHR systems. The authors found the following factors as drivers of behavioural intention regarding EHR adoption: performance expectancy, effort expectancy, social influence, and habit. Ref. [16] found that EHR functionality can be strengthened by adding additional features such as a research facility and medical entities dictionary. The result of research by [29] showed the predominant role played by individual-level, rational mechanisms and the interplay with organisational expectations, rather than an institutional driver of the continued use of EMR systems. Ref. [30] categorised factors impacting eHealth adoption and acceptance in Saudi Arabia into 6 clusters: organisational, technical, professional, cost-effectiveness, educational, as well as social, behavioural, and cultural. Some studies claimed that individual factors such as computer literacy, personal norms, and individual experience could play important roles in the acceptance of EMRs by healthcare professionals [17]. Ref. [31] showed that ease of use perceived by healthcare providers positively affects the intention to use EMR systems.

Although some interesting cases have been reported [4], the current literature does not yet provide sufficient exploratory insight to explore the uptake of EMRs by healthcare providers in hospitals. Previous studies on the uptake of Electronic Medical Records (EMRs) by healthcare professionals have primarily employed quantitative methods. These studies, such as those using the Unified Theory of Acceptance and Use of Technology (UTAUT), often rely on surveys and structured questionnaires to collect data. While they provide robust statistical analyses, they may lack depth in understanding the contextual factors influencing EMR adoption and often miss nuanced perspectives. Quantitative methods, although valuable for identifying correlations and testing hypotheses, often suffer from limitations like survey fatigue and response bias, potentially leading to incomplete or biased responses. These methods are typically confirmatory, testing pre-defined hypotheses rather than exploring new phenomena, which may overlook emerging trends or factors not previously considered.

In contrast, qualitative methods such as interviews and case studies allow for a deeper exploration of the factors influencing EMR uptake. Studies employing these methods have uncovered rich, detailed insights into the barriers and facilitators experienced by healthcare professionals, revealing the complexities of user interactions with EMRs, organisational support structures, and the sociotechnical environment. However, qualitative research is often criticised for its limited generalisability, resource-intensive nature, and potential subjectivity in data interpretation [32].

The objective of the current research is to gain an in-depth understanding of the barriers and facilitators to the adoption of EMRs by their users through a qualitative, exploratory case study approach to generate an in-depth understanding of EMR adoption in a real-life context. This study addresses the identified gaps in the literature by employing a qualitative exploratory approach. Through 78 semi-structured interviews with healthcare professionals across two large Australian hospitals, we provide a comprehensive framework of factors influencing EMR uptake. Our approach allows for an in-depth understanding of the complex interplay between individual, organisational, and technological factors. By highlighting the methodological approaches and challenges in previous studies, we justify the need for our qualitative exploratory study. Our findings offer significant contributions to both research and practice by uncovering the intricate details of EMR adoption that quantitative studies may overlook.

2.1. Method

An exploratory case study is a research approach applied to explore a contemporary phenomenon which is inseparable from the context in which it exists [33]. This study used an exploratory multiple-case study method.

This study adopted an exploratory case study approach as defined by Yin (2009) [34] to investigate the factors impacting the uptake of Electronic Medical Records (EMRs) by healthcare professionals in two large Australian hospitals. While Yin suggests that “how” and “why” questions are typically suited to case study research, we argue that “what” questions can also be effectively addressed through this method, particularly in exploratory studies. Our research question, “What are the factors that impact healthcare professionals’ uptake of EMR?” seeks to uncover the underlying elements impacting EMR adoption, thus fitting within the exploratory case study framework. By conducting semi-structured interviews, we aim to generate rich, qualitative data that can provide a deep understanding of the contextual factors and complex interactions affecting EMR uptake.

The case study method is particularly suited to our research due to its ability to provide contextual depth and flexibility. The adoption of EMRs is a complex process influenced by various organisational, technological, and individual factors, and the case study approach allows for an in-depth exploration of these contextual nuances. Additionally, this method’s exploratory nature aligns with our objective to identify and categorise factors impacting EMR uptake where existing knowledge is limited. By using multiple data sources, including interviews across different professional roles in two hospitals, we obtain a comprehensive view of the phenomenon. This methodological choice ensures a robust and flexible research design, capable of adapting as new insights emerge during data collection, thereby enhancing the study’s relevance and depth [34].

The research participants for this study were selected from EMR users in two large public hospitals in Australia (two cases), which are called H1 and H2 from now on. The following criteria were used to identify potential hospitals: availability, size of the hospital (being large), and having a comprehensive EMR system in place.

2.1.1. Data Collection

Semi-structured and open-ended interviews were employed for data collection. Participants were given open-ended questions about their experience with EMRs and the obstacles they faced during interaction with EMRs. They were also asked a few questions to collect participant demographic information. Appendix A contains all the open-ended and demographic questions that were asked of the participants during the interview sessions.

Overall, 78 interviews were conducted with participants from 15 distinct roles. Each interview took approximately 30–45 min, and all interviews were audio-recorded on a digital recorder and transcribed.

After answering the questions, the respondents were asked to nominate other potential EMR users, a tactic based on the snowball sampling approach. The sample for this part of the study was chosen using snowball sampling [35]. Snowball sampling is a non-probability

sampling technique where the sample group grows in each step of the data collection like a rolling snowball. Principal project managers were asked to provide an initial list of EMR users (initial pool) in different departments. After that, the researchers used snowball sampling and asked initial participants to nominate other potential EMR users.

2.1.2. Data Analysis

After the interviews were completed, the interview responses were transcribed into the computerised qualitative data analysis software N-Vivo [36]. Thematic analysis was applied to analyse qualitative data collected in interviews. Thematic analysis is one of the most popular approaches in qualitative studies. This approach is based on patterns/themes across the set of data [37,38]. Figure 1 illustrates the steps of thematic analysis employed in this study.

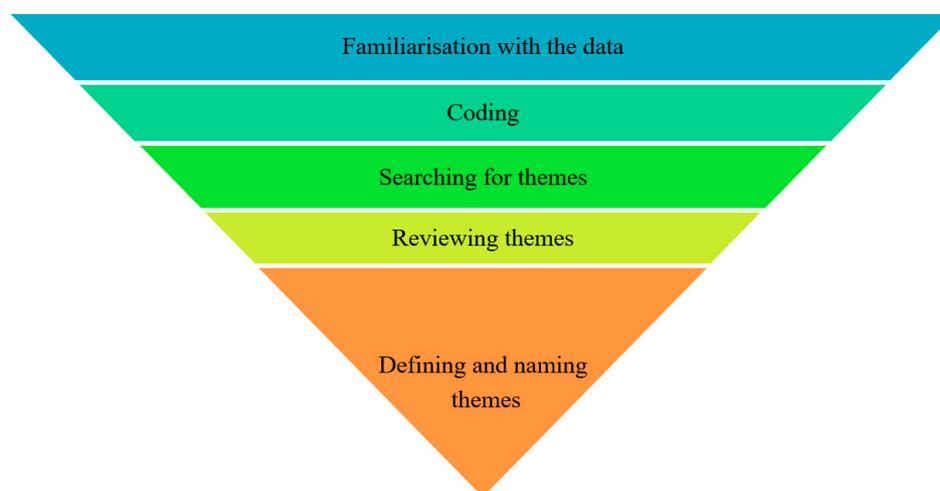


Figure 1. Data analysis model.

The reduction, ordering, categorising, and collation of data extracted from transcripts enabled the authors to achieve an in-depth understanding of factors impacting EMR uptake. They worked together to establish the framework for categorisation and classifying the search goals and comments. Disagreements between authors were resolved through discussion. Since they did not code the content independently, no inter-rater agreement was measured.

2.1.3. Ethics Approval

The study was approved by the Griffith University Research Ethics Committee. Once the initial list of interviewees was identified, the researchers scheduled the interviews at an agreed time and date, and they provided introductory information and the informed consent forms before the day of the interview.

3. Results

The qualitative analysis of 78 interviews conducted across two large Australian hospitals yielded comprehensive insights into the factors influencing the uptake of Electronic Medical Records (EMRs) by healthcare professionals. The participants included a diverse range of hospital staff, categorised into 15 different roles, ensuring a wide representation of perspectives. The data analysis identified a framework of factors that impact the adoption and effective use of EMRs, which have been organised into ten main groups. This section provides a detailed exploration of these categories, supported by direct quotes from the interviewees to illustrate their experiences and perceptions.

The framework developed from the data reveals that the uptake of EMRs is influenced by both perceived benefits and perceived challenges. On one hand, healthcare professionals

recognise the potential of EMRs to improve various aspects of their work, including patient safety, quality of care, and communication efficiency. On the other hand, they also face significant obstacles such as system complexity, hardware/software issues, and concerns over job performance and data security. By understanding these factors, hospital administrators and policymakers can better address the barriers to EMR adoption and enhance the facilitators, ultimately improving the integration of these systems into daily medical practice.

The results are structured to provide a clear and systematic examination of each category within the framework. The subsequent Sections 3.1–3.10 delve into each category, offering definitions, underlying factors, and examples from the interview data. This approach not only highlights the multifaceted nature of EMR adoption, but also underscores the importance of tailored strategies to support healthcare professionals in overcoming specific challenges associated with EMR use. The insights gained from this study are crucial for designing effective interventions and policies that promote the successful implementation and sustained use of EMRs in healthcare settings.

The distribution of different participants' roles in the two hospitals is depicted in Figure 2. This figure provides an overview of the diverse professional backgrounds of the interviewees, which is crucial for understanding the varied perspectives on EMR adoption. In Figure 2, blue represents Hospital 1 and red represents Hospital 2.

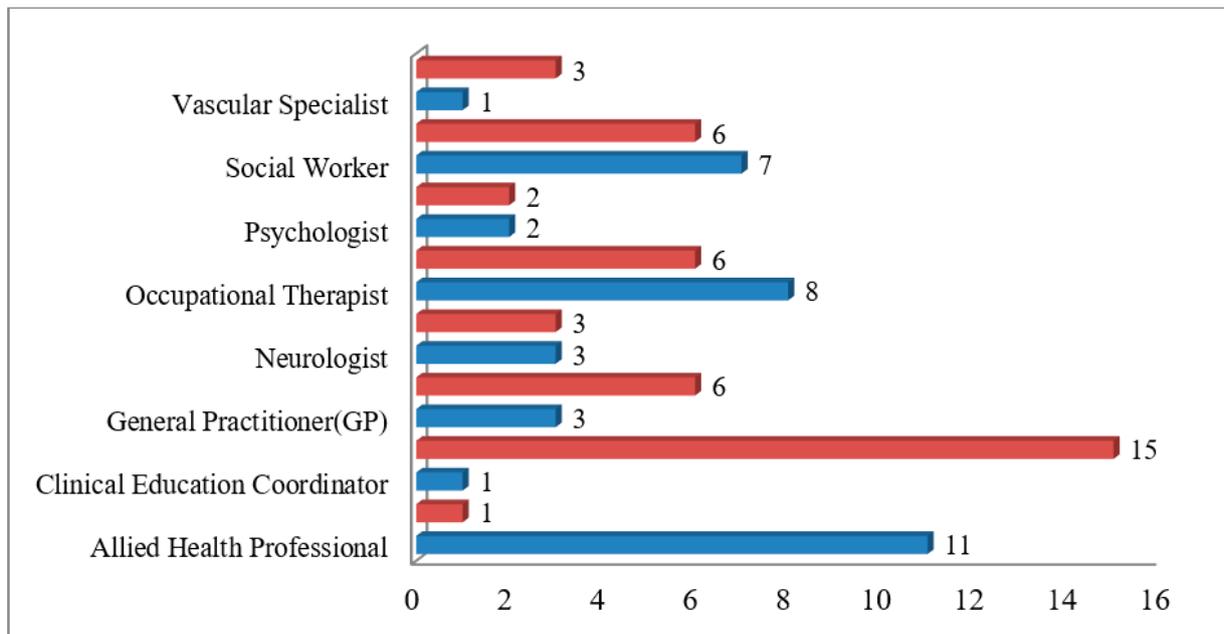


Figure 2. Different participants' roles in the two hospitals.

Additionally, the framework of factors impacting EMR uptake by health professionals is illustrated in Figure 3. This figure categorises the identified factors into ten main groups, providing a comprehensive framework for understanding the drivers of EMR adoption.



Figure 3. The framework for drivers of EMR uptake by health professionals.

3.1. Perceived Benefits

Definition 1. “The degree of benefit healthcare professionals believe they gain from using EMRs, including improvements in patient safety, quality of care, documentation, decision-making, communication, time savings, and professional status”.

The analysis revealed several perceived benefits that healthcare professionals associated with EMR usage, as summarised in Table 1.

Table 1. Summary of healthcare provider perceptions of EMR use (perceived benefits).

Underlying factors	Improving patient safety Improving the quality of care Improving documentation Improving decision-making Improving communication Saving time Improving prestigious status
Example of data extracts	R18_improving patient safety: “EMR has key functions that can improve patient safety because data is entered electronically. It means that written errors and typos are eliminated in this computer-based system”. R26_improving quality of care: “patients’ records in the EMR are more comprehensive than paper records, and specialists can access these records and collaborate together to have better care”.

3.2. Perceived Difficulties

Definition 2. “The degree of different problems that users face when using EMR in their workplace”.

Several difficulties were identified, indicating significant barriers to EMR adoption, as summarised in Table 2.

Table 2. Summary of healthcare provider perceptions towards EMR use (perceived difficulties).

Underlying factors	The complexity of the system Hardware/software problems Time for documentation
Example of data extracts	R5_complexity of the system: “We lose documentation sometimes if it has not been saved. It’s not easy to cut and paste from each program. You need to paste into a Word document from meta-vision (specific program in the hospital) and then into EMR”. Z14_time for documentation: “Data entry takes a long time because we have to convert all charts and images, and I think that this should be improved to save nurses’ time”.

3.3. Hardware/Software Compatibility

Definition 3. “The extent to which the EMR system fits with the adopters’ current values, healthcare policies, prior experience, relevant competencies, or existing IT needs”.

Compatibility issues are a significant concern, as highlighted in Table 3.

Table 3. Summary of healthcare provider perceptions of EMR use (hardware/software compatibility).

Underlying factors	System Integration
Example of data extracts	R44_system integration: “The benefit of the EMR system is connection with decision support systems so that managers can monitor workflow in the whole hospital. We don’t need anyone to enter data into the decision support system so it cuts down time taken on documentation”.

3.4. Job Performance Uncertainty

Definition 4. “The degree to which a user believes that using the system will waste their time and reduce job performance”.

Concerns about job performance uncertainty are summarised in Table 4.

Table 4. Summary of healthcare provider perceptions of EMR use (job performance uncertainty).

Underlying factors	Concern about losing user’s autonomy Overall system uncertainty
Example of data extracts	R15_concern about losing user’s autonomy: “I think that by using EMR we lose control over medical information, because data is shared with others and they can evaluate and modify that information”. R37_overall system uncertainty: “On a few occasions my data has been deleted by EMR. If it cannot be retrieved, this puts me under risk of litigation if evidence of my encounter with a patient is not input into patient charts”.

3.5. Ease of Operation

Definition 5. “The degree of ease associated with using EMRs”.

Ease of operation plays a crucial role in the acceptance of EMRs, as detailed in Table 5.

Table 5. Summary of healthcare provider perceptions of EMR use (ease of operation).

Underlying factors	Use of the system
Example of data extracts	R25_use of the system: “I can easily sort notes by date or type or profession. It can save my time and documentation, so that I can focus on my career”.

3.6. Perceived Risk

Definition 6. “The individual’s perception of the uncertainty of system outcomes and information security”.

Perceived risks associated with EMRs are summarised in Table 6.

Table 6. Summary of healthcare provider perceptions of EMR use (perceived risk).

Underlying factors	Security and privacy concern Reluctance to perceive usefulness
Example of data extracts	R18_security and privacy concerns: “Paper-based medical records are much more secure than computer-based systems. Hackers can attack the system and destroy everything”. R48_psychological risk: “As a department supervisor, I know nurses who are reluctant to see the benefits of the system, so they are likely to do more paper work in the department. The nurses think that they have to spend more time in data entry processes”.

3.7. Assistance Society

Definition 7. Various social supports that help individuals use the EMR system.

The role of social support in EMR adoption is highlighted in Table 7.

Table 7. Summary of healthcare provider perceptions of EMR use (assistance society).

Underlying factors	Colleague support Supervisor support Top-level management characteristics
Example of data extracts	Z11_colleague support: “I do not have such good computer skills as my supervisor and colleagues. They are really helpful in solving my problems”. R12_supervisor support: “I think that the supervisor of each department should not only focus on managing line tasks, but should support their staff in other ways such as with technology-based issues. They should have regular contact with the EMR team to keep up to date with the latest EMR functionalities and changes”.

3.8. User Confidence

Definition 8. “The strength of an individual’s belief in their ability to complete a specific task”.

User confidence is critical for successful EMR adoption, as shown in Table 8.

Table 8. Summary of healthcare provider perceptions of EMR use (user confidence).

Underlying factors	Willingness to change
Example of data extracts	R43_willingness to change: “I believe that the EMR system can improve quality of care by organising medical information. By using the EMR system, doctors can interact with their patients in a timely manner. I am completely happy to use the computer system instead of paper documents”.

3.9. Organisational Support

Definition 9. “Support provided by the organisation, including professional development programs that facilitate the uptake of EMRs”.

The importance of organisational support is detailed in Table 9.

Table 9. Summary of healthcare provider perceptions of EMR use (organisational support).

Underlying factors	Professional development program
Example of data extracts	R28_professional development program: “performance development modules in the hospital can be useful to develop users’ skills with the technology. Training is the first phase of performance development and we should encourage different department to set training sessions”.

3.10. Technological Support

Definition 10. “The technical infrastructure to help individuals use the EMR system, including technical support and training”.

Technological support is essential for the effective use of EMRs, as summarised in Table 10.

Table 10. Summary of healthcare provider perceptions of EMR use (technological support).

Underlying factors	Technical support Technical training
Example of data extracts	R10_technical support: “When I faced any problems related to the EMR system, IT staff members were available by phone to help me to solve that issue. They are on the phone until I am OK with the system”. Participant R49 expressed “Formal technical training can help nurses to boost their computer skills to use EMR and I think that it’s essential for new staff”.

4. Discussion

This exploratory case study has several major implications for researchers and practitioners in the field of EMR adoption. Our findings reveal key factors influencing EMR uptake, which align with and extend the insights from previous studies.

4.1. Comparison with Previous Studies

Adoption Rates: Our study identifies barriers and facilitators to EMR adoption that resonate with global trends. For instance, Jha et al. (2009) and Schoen et al. (2012) [18,19] observed significant variations in EMR adoption rates across different countries and regions, with developed countries like the United States, the United Kingdom, and Australia showing higher adoption rates compared to developing countries. Our findings from the two Australian hospitals corroborate these global trends, highlighting the advanced stage of EMR adoption in developed settings while acknowledging ongoing challenges and barriers.

Barriers to Adoption: The barriers identified in our study, such as system complexity, time-consuming documentation, and concerns about data privacy and security, are consistent with the findings of [20,21]. These studies underscore similar obstacles in various contexts, suggesting that these barriers are universally relevant and need targeted interventions.

Impact on Healthcare Quality: The impact of EMR adoption on healthcare quality has been extensively studied with mixed results. While [23] noted improvements in patient safety, reduced medical errors, and enhanced care coordination, [24] found limited evidence of quality improvements. Our participants reported both perceived benefits, such as improving patient safety and quality of care, and challenges, such as system complexity, aligning with these mixed findings and suggesting that the impact of EMR systems may vary based on specific implementation contexts and user experiences.

Incentives and Policies: Government incentives and policies have been shown to significantly promote EMR adoption. For example, the HITECH Act in the United States provided financial incentives for EMR adoption, as discussed by [22]. It is believed that similar government incentives and policies could influence EMR uptake in Australia, reflecting the positive impact of such measures observed in other contexts. However, our findings did not specifically suggest that policy-driven incentives could enhance EMR uptake in Australian hospitals.

User Satisfaction and Usability: Research by Alharthi et al. (2014) and Kaipio et al. (2017) [25,26] highlighted the importance of system design, ease of use, and workflow integration in influencing EMR adoption and user satisfaction. Our study supports these conclusions, with participants emphasising the need for user-friendly systems, adequate technical support, and effective training programs to facilitate EMR adoption.

4.2. Implications for Future Research

According to our findings, several aspects of EMR uptake require further research: the effectiveness of professional development programs, user willingness to change, concerns about losing autonomy, and the effects of top-level management support. Future research

should also focus on addressing psychological risks and the reluctance to perceive usefulness. Many participants indicated that fear and anxiety due to interaction with technologies like EMRs can be significant barriers. Developing strategies to mitigate these concerns is crucial for promoting EMR adoption.

Additionally, it was observed that working in a hospital that uses the latest medical record technologies can improve the status of users in the health professional society. They felt that using EMRs could save time so that they are more productive healthcare professionals compared to those who use traditional (paper-based) systems.

Some users believe that EMRs can interfere with their control over the conditions and procedures in their work. They had concerns about losing their autonomy to make decisions based on patient information in EMRs, because some information in this system is sharable, and other healthcare professionals can access patient data.

The framework presented herein regarding the drivers of health professionals' uptake of EMRs provides a comprehensive framework to inform health executives and managers. It helps healthcare executives and decision-makers become aware of EMR systems' potential benefits—if taken up properly (i.e., improved patient safety, better documentation technique, improved decision-making, improved communication between healthcare professionals, etc.).

5. Conclusions

This study applied a qualitative research approach to better explore the drivers of health professionals' uptake of EMRs. Ten major categories of factors that impact the user uptake of EMRs were identified, namely, perceived benefits of EMR, perceived difficulties, hardware/software compatibility, job performance uncertainty, ease of operation, perceived risk, assistance society, user confidence, organisational support, and technological support.

The perceived benefits, such as improving patient safety and the quality of care, were consistently highlighted by participants. However, perceived difficulties, such as system complexity and time-consuming documentation, were significant barriers. Hardware/software compatibility issues were also a concern, as some systems did not integrate well with existing workflows. Job performance uncertainty, including fears of losing autonomy and data deletion, further impacted uptake. Ease of operation and perceived risks were critical factors, with users indicating that user-friendly systems are more likely to be adopted. Social support, such as colleague and supervisor support, were essential for overcoming adoption challenges. User confidence and organisational support, including professional development programs, were crucial for successful implementation. Finally, technological support, such as timely IT assistance and training, was necessary to address technical challenges.

These findings suggest that addressing both the facilitators and barriers identified in this study can enhance EMR uptake. Future research should focus on further exploring these factors and developing strategies to mitigate barriers, thereby promoting more effective use of EMRs in healthcare settings.

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Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki and approved by the Griffith University Human Research Ethics Committee (ICT/09/14/HREC, 14 January 2014).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A

The following are the interview questions asked of the participants during the interview session:

1. Select age group
20–29 30–39 40–49 50–59 60 and above
2. Gender
Male Female
3. What is your highest level of education?
Associate’s degree Bachelor’s degree Master’s degree Doctorate Other
4. How long have you used the EMR system?
5. How often do you use EMR?
6. How do you feel about using an EMR system?
7. Please describe the advantages of the EMR system in the hospital.
8. Please describe the disadvantages of the EMR system in the hospital.
9. Have you faced any problems using the EMR system? Please clarify.
10. If any problem occurs, what steps do you take to identify and resolve the problem?
11. What do you expect most from your hospital to improve the existing EMR system?
12. Do you have any other thoughts about your experience with EMR?

References

1. Al-Dossary, H.; Alumran, A.; Al-Rayes, S.; Althumairi, A.; Aljanoubai, H.; Alhuseini, M.; Alkhalidi, O.; Al-Fayez, A.; Alanzi, T. An overview of health information management education in Saudi Arabia. *Inform. Med. Unlocked* **2021**, *23*, 100530. [\[CrossRef\]](#)
2. Holden, R.J.; Karsh, B.-T. A theoretical model of health information technology usage behaviour with implications for patient safety. *Behav. Inf. Technol.* **2009**, *28*, 21–38. [\[CrossRef\]](#)
3. Li, J.-S.; Zhang, X.-G.; Chu, J.; Suzuki, M.; Araki, K. Design and development of EMR supporting medical process management. *J. Med. Syst.* **2012**, *36*, 1193–1203. [\[CrossRef\]](#)
4. Park, S.Y.; Lee, S.Y.; Chen, Y. The effects of EMR deployment on doctors’ work practices: A qualitative study in the emergency department of a teaching hospital. *Int. J. Med. Inform.* **2012**, *81*, 204–217. [\[CrossRef\]](#)
5. Weihua, C.; Akay, M. Developing EMRs in Developing Countries. *Information Technology in Biomedicine. IEEE Trans. Inf. Technol. Biomed.* **2011**, *15*, 62–65. [\[CrossRef\]](#)
6. Champion, T.R.; Waitman, L.R.; Lorenzi, N.M.; May, A.K.; Gadd, C.S. Barriers and facilitators to the use of computer-based intensive insulin therapy. *Int. J. Med. Inform.* **2011**, *80*, 863–871. [\[CrossRef\]](#)
7. Carayon, P.; Smith, P.; Hundt, A.S.; Kuruchittham, V.; Li, Q. Implementation of an electronic health records system in a small clinic: The viewpoint of clinic staff. *Behav. Inf. Technol.* **2009**, *28*, 5–20. [\[CrossRef\]](#)
8. Najaftorkaman, M.; Ghapanchi, A.H.; Talaei-Khoei, A.; Ray, P. A Taxonomy of Antecedents to User Adoption of Health Information Systems: A Synthesis of Thirty Years of Research. *J. Am. Soc. Inf. Sci. Technol.* **2013**, *66*, 576–598. [\[CrossRef\]](#)
9. Hailegebreal, S.; Dileba, T.; Haile, Y.; Abebe, S. Health professionals’ readiness to implement electronic medical record system in Gamo zone public hospitals, southern Ethiopia: An institution based cross-sectional study. *BMC Health Serv. Res.* **2023**, *23*, 773. [\[CrossRef\]](#) [\[PubMed\]](#)
10. Akwaowo, C.D.; Sabi, H.M.; Ekpenyong, N.; Isiguzo, C.M.; Andem, N.F.; Maduka, O.; Dan, E.; Umoh, E.; Ekpin, V.; Uzoka, F.-M. Adoption of electronic medical records in developing countries—A multi-state study of the Nigerian healthcare system. *Front. Digit. Health* **2022**, *4*, 1017231. [\[CrossRef\]](#)
11. Cucciniello, M.; Lapsley, I.; Nasi, G.; Pagliari, C. Understanding key factors affecting electronic medical record implementation: A sociotechnical approach. *BMC Health Serv. Res.* **2015**, *15*, 268. [\[CrossRef\]](#)
12. Ngugi, P.N.; Were, M.C.; Babic, A. Users’ perception on factors contributing to electronic medical records systems use: A focus group discussion study in healthcare facilities setting in Kenya. *BMC Med. Inform. Decis. Mak.* **2021**, *21*, 362. [\[CrossRef\]](#) [\[PubMed\]](#)
13. Alanazi, B.; Butler-Henderson, K.; Alanazi, M.R. Factors influencing healthcare professionals’ perception towards EHR/EMR systems in gulf cooperation council countries: A systematic review. *Oman Med. J.* **2020**, *35*, e192. [\[CrossRef\]](#) [\[PubMed\]](#)
14. Li, C.; Parpia, C.; Sriharan, A.; Keefe, D.T. Electronic medical record-related burnout in healthcare providers: A scoping review of outcomes and interventions. *BMJ Open* **2022**, *12*, e060865. [\[CrossRef\]](#)
15. Tavares, J.; Goulão, A.; Oliveira, T. Electronic Health Record Portals adoption: Empirical model based on UTAUT2. *Inform. Health Soc. Care* **2018**, *43*, 109–125. [\[CrossRef\]](#) [\[PubMed\]](#)

16. Adetoyi, O.E.; Raji, O.A. Electronic health record design for inclusion in sub-Saharan Africa medical record informatics. *Sci. Afr.* **2020**, *7*, e00304. [[CrossRef](#)]
17. Liu, S. The impact of forced use on customer adoption of self-service technologies. *Comput. Hum. Behav.* **2012**, *28*, 1194–1201. [[CrossRef](#)]
18. Jha, A.K.; DesRoches, C.M.; Campbell, E.G.; Donelan, K.; Rao, S.R.; Ferris, T.G.; Shields, A.; Rosenbaum, S.; Blumenthal, D. Use of electronic health records in U.S. hospitals. *N. Engl. J. Med.* **2009**, *360*, 1628–1638. [[CrossRef](#)]
19. Schoen, C.; Osborn, R.; Squires, D.; Doty, M.; Rasmussen, P.; Pierson, R.; Applebaum, S. A survey of primary care doctors in ten countries shows progress in use of health information technology, less in other areas. *Health Aff.* **2012**, *31*, 2805–2816. [[CrossRef](#)]
20. Boonstra, A.; Broekhuis, M. Barriers to the acceptance of electronic medical records by physicians from systematic review to taxonomy and interventions. *BMC Health Serv. Res.* **2010**, *10*, 231. [[CrossRef](#)]
21. Kruse, C.S.; Kristof, C.; Jones, B.; Mitchell, E.; Martinez, A. Barriers to electronic health record adoption: A systematic literature review. *J. Med. Syst.* **2016**, *40*, 252. [[CrossRef](#)]
22. Blumenthal, D.; Tavenner, M. The “meaningful use” regulation for electronic health records. *N. Engl. J. Med.* **2010**, *363*, 501–504. [[CrossRef](#)] [[PubMed](#)]
23. Campanella, P.; Lovato, E.; Marone, C.; Fallacara, L.; Mancuso, A.; Ricciardi, W.; Specchia, M.L. The impact of electronic health records on healthcare quality: A systematic review and meta-analysis. *Eur. J. Public Health* **2016**, *26*, 60–64. [[CrossRef](#)]
24. Black, A.D.; Car, J.; Pagliari, C.; Anandan, C.; Cresswell, K.; Bokun, T.; McKinstry, B.; Procter, R.; Majeed, A.; Sheikh, A. The impact of ehealth on the quality and safety of health care: A systematic overview. *PLoS Med.* **2011**, *8*, e1000387. [[CrossRef](#)]
25. Alharthi, H.; Youssef, A.; Radwan, S.; Al-Muallim, S.; Zainab, A.-T. Physician satisfaction with electronic medical records in a major Saudi Government hospital. *J. Taibah Univ. Med. Sci.* **2014**, *9*, 213–218. [[CrossRef](#)]
26. Kaipio, J.; Lääveri, T.; Hyppönen, H.; Vainiomäki, S.; Reponen, J.; Kushniruk, A.; Borycki, E.; Vänskä, J. Usability problems do not heal by themselves: National survey on physicians’ experiences with EHRs in Finland. *Int. J. Med. Inform.* **2017**, *97*, 266–281. [[CrossRef](#)]
27. Asan, O.; Montague, E. Technology-mediated information sharing between patients and clinicians in primary care encounters. *Behav. Inf. Technol.* **2014**, *33*, 259–270. [[CrossRef](#)]
28. Popela, I.; Zuva, T.; Appiah, M. Factors That Influence the Adoption of Electronic Patients Records Management Systems in South Africa. In Proceedings of the 2019 International Multidisciplinary Information Technology and Engineering Conference, IMITEC 2019, Vanderbijlpark, South Africa, 21–22 November 2019.
29. Gastaldi, L.; Radaelli, G.; Lettieri, E.; Luzzini, D.; Corso, M. Professionals’ use of ICT in hospitals: The interplay between institutional and rational factors. *Int. J. Technol. Manag.* **2019**, *80*, 85–106. [[CrossRef](#)]
30. Alshahrani, A.; Stewart, D.; MacLure, K. A systematic review of the adoption and acceptance of eHealth in Saudi Arabia: Views of multiple stakeholders. *Int. J. Med. Inform.* **2019**, *128*, 7–17. [[CrossRef](#)]
31. Vathanophas, V.; Pacharapha, T. Information Technology Acceptance in healthcare service: The study of Electronic Medical Record (EMR) in Thailand. In Proceedings of the Technology Management for Global Economic Growth (PICMET), 2010 Proceedings of PICMET’10 2010, Phuket, Thailand, 18–22 July 2010; IEEE: New York, NY, USA; pp. 1–5.
32. Jawhari, B.; Ludwick, D.; Keenan, L.; Zakus, D.; Hayward, R. Benefits and challenges of EMR implementations in low resource settings: A state-of-the-art review. *BMC Med. Inform. Decis. Mak.* **2016**, *16*, 116. [[CrossRef](#)]
33. Rowley, J. Using case studies in research. *Manag. Res. News* **2002**, *25*, 16–27. [[CrossRef](#)]
34. Yin, R.K. *Case Study Research: Design and Methods*; Sage: Newcastle upon Tyne, UK, 2009; Volume 5.
35. Biernacki, P.; Waldorf, D. Snowball sampling: Problems and techniques of chain referral sampling. *Sociol. Methods Res.* **1981**, *10*, 141–163. [[CrossRef](#)]
36. Gibbs, G.R. *Qualitative Data Analysis: Explorations with NVivo*; Open University: Milton Keynes, UK, 2002.
37. Braun, V.; Clarke, V. Using thematic analysis in psychology. *Qual. Res. Psychol.* **2006**, *3*, 77–101. [[CrossRef](#)]
38. Boyatzis, R.E. *Transforming Qualitative Information: Thematic Analysis and Code Development*; Sage: Newcastle upon Tyne, UK, 1998.

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