

Exploring Facilitators to the Implementation of Electronic Health Records in Saudi Arabia

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Abstract

The introduction of IT was one of the key priorities for policy-makers in healthcare organisations over the last two decades, due to the potential benefits of this technology to improve healthcare services and quality. However, about 50% of those projects failed to achieve their intended aims. This was as a result of several factors, and included the cost of these projects. The Saudi MoH was planning on implementing EHRS in around 2200 PHCs nationwide. It was acknowledged that this project may face hurdles, which might result in the failure of the project, if implementation facilitators were not first determined. According the Saudi MoH, previous EHRS implementation in the PHCs failed as a consequence of several barriers, such as poor infrastructure, lack of connectivity and lack of interoperability. However, the facilitators to the successful EHRS implementation in the Saudi PHCs not understood.

Objective:

To determine the facilitators that enhance the success of the implementation of the EHRS in the PHCs in SA.

Method:

A mixed methods approach was used with both qualitative and quantitative methods (Qualitative using semi-structured interviews and quantitative with a closed survey). The purpose of the utilization of exploratory mixed-methods was to identify a wide range of facilitators that may influence EHRS implementation. The data were obtained from two different perspectives (PHCs practitioners and project team members), 351 practitioners from 21 PHCs participated in the online based, while 14 key informants at the Saudi MoH who were directly involved in the EHRS implementation in the PHCs agreed to be interviewed face to face.

Results:

The findings from both studies revealed several facilitators. Among these facilitators, financial resources were found to be the most influential factor which assisted in overcoming some barriers such as software selection. The size of the PHCs was the second facilitator to successful implementation. This was despite the scale of the project. The perceived usefulness was another facilitator identified in both the interviews and survey. More than 90% of the participants thought that the EHRS was useful and could contribute to improving the quality of healthcare services. While high level of satisfaction was expressed toward the EHRS usability and efficiency, low levels of satisfaction were recorded toward organisational factors such as user-involvement, training and support. Hence, the system usability and efficiency were documented to be other facilitators of successful EHRS implementation in the Saudi PHCs

Conclusion:

The findings of the present study suggest that sufficient financial support is essential to enhance the success of the EHRS implementation, despite the scale of the project. Also, effective leadership and project management were found core factors to overcome many obstacles and thus ensure the success of large-scale projects

Introduction

Since the 1960s, Information Technology (IT) has been responsible for performance enhancement and improvement of healthcare services [1–4]. The implementation IT in the last few decades of the twentieth century has led to a revolution in the way work is carried out and the way in which information is categorised and documented. The speed and precision with which the IT revolution was brought about made the governments of developed countries (where this revolution originated) immediately adopt these advanced, fast and efficient systems [4, 5]. As a result, the implementation of the Electronic Health Record Systems (EHRS) has become a priority for both developed and developing countries [5, 6].

Various researchers have argued that EHRS implementation is very complicated due to the shortage of experience in implementation and the associated issues [7–11]. Although, the barriers to EHRS implementation have been described, many of them remain unresolved [12]. Therefore, it has been suggested that further research and investigation is necessary to overcome these barriers [12]. According to Keshavjee, Bosomworth [13], Greenhalgh, Stramer [14], Lorenzi, Smith [15], and Pare, Sicotte [16], around fifty percent of EHRS implementation projects around the world have failed. Others have estimated that the proportion of unsuccessful IT projects in the healthcare setting could be as high as seventy percent [17]. In addition, according to Gagnon, Desmartis [18], the implementation of EHRS in Primary Healthcare Centres (PHCs) remains a greater challenge than its implementation in secondary care, such as hospitals.

Across disciplines, at all levels, and throughout the world, it is recognised that the provision of healthcare is becoming ever more complex [19], particularly in developing countries due to infrastructure issues, organisational workflow issues and cost challenges [20]. Due to this complexity, the introduction of ICT in healthcare organisations poses many challenges [20]. According to Sanchez, Savin [19], one of the obstacles to EHRS implementation is the large number of healthcare practitioners working in these organisations, complicating the process of EHRS implementation.

Knowledge about the usefulness and benefits of EHRS, as well as the implementation costs and other barriers, is considered scant in developing countries [21]. Despite the fact that research on the impact of EHRS and its potential benefits has been conducted in developed countries, knowledge about the system's impact is still conflicting [21]. Moreover, implementation in developing countries requires greater effort than in developed countries, because the readiness of the healthcare organisations is lower with respect to aspects such as IT and infrastructure [22, 23].

Methods

Research Ethics and Governance

Ethics approval was received from Research Ethical committee at School of Health Science, Swansea University. Under this ethical approval, data collected via online-based questionnaire and semi-structure interviews are in accordance with the UK Policy Framework for Health and Social Care Research (UK Policy Framework for Health and Social Care Research - Health Research Authority (hra.nhs.uk) to ensure that the research was conducted to the highest standards of quality in research, and that it complied with all relevant legislation. Initially, the participant information sheets for the questionnaire-based research explained the reasons for the study and why the participant had been approached. Participants were told that they could withdraw at any time, even if they had agreed to participate initially. Furthermore, the participants were told that no benefits would be offered in return for their participation. The participants were informed that their participation in the study was valued and that it may help make the process of EHRS implementation within PHCs more efficient and effective. All the participants were told that the data gathered would be fairly processed and analysed and then published. The privacy and anonymity of the participants was assured. We indicated to the participants that they would come to no mental or physical harm during the process of gathering data. In the final stage, our contact details were provided so that the participants could make contact if they had any concerns regarding the process and the subsequent treatment of the information gathered.

Research design and data collection

A Mixed methods approach was used using both qualitative semi-structured interviews (see appendix 1 for interview guide) and a quantitative close-ended survey (see appendix 2 for survey). The purpose of the utilization of the initial semi-structured interviews was to explore and identify possible facilitators which may have an influence EHRS implementation and to use this information to design a more focused questionnaire for the quantitative survey study. We wanted to obtain different perspectives regarding EHRS implementation and as such recruited both PHC practitioners and project team staff. It was felt that examining the facilitators from PHCs practitioners was expected to provide information about those factors that were more related to personnel, such as end-user satisfaction. On the other hand, factors related to the organisation

such as cost, training, support and technology such as usability and efficiency would be better obtained from project team perspective. To achieve the objectives of this study, we took into account the main factors influencing EHRS implementation as determined by previous literature during the creation of the questionnaire as well as findings obtained throughout the semi-structure interviews.

Qualitative data were analysed using a thematic analysis approach using NVivo10. Quantitative data were statistically analysed using SPSS V.22. Initially, descriptive statistics were performed using Median, rank, and total agreement. Then, non-parametric tests were used to determine if any differences existed between groups, where Mann-Witney U test used for two groups and Kruskal-Wallis test used for three or more groups.

Population and sampling

To reach the most appropriate subjects for this study (taking into consideration their involvement in the project implementation and knowledge they held about EHRS implementation in PHCs in SA), non-probability, purposive, snowball sampling was used [24, 25]. For the qualitative purposes all project team members ($n = 53$), were invited to the semi-structure interviews, However, only 14 accepted to participate. The sampling strategy applied for quantitative study was a multi-stage cluster sampling technique [26, 27]. The Saudi MoH divided SA into thirteen regions [28]. Therefore, at Stage One we utilised the same division adopted by the Saudi MoH, with regions converted to clusters (see Table 1) [28]. In the second stage, simple random sampling based on the geographical location of each province was used (Bryman, 2012; Thompson, 2012). At Stage Three, a total of 21 out of 2259 PHCs were randomly selected within the five chosen clusters. The sample ($n = 491$) was drawn from the selected 21 PHCs, across the five selected regions.

Table 1
Main regions in Saudi Arabia and the number of PHCs in each province

NO	Region	Geographical location	Number of PHCs	Selected in this study	Number of selected PHCs
1	Riyadh	East	435	Yes	6
2	Gassim	Centre	159	Yes	4
3	Makkah	West	355	Yes	5
4	Almadinah	West	154	No	
5	Alsharqiah	East	248	No	
6	Albaha	South	101	Yes	3
7	Asir	South	317	No	
8	Najran	South	65	No	
9	Hail	North	100	No	
10	Alshamaliyah	North	45	No	
11	Jazan	South	155	No	
12	Tabuk	North	73	No	
13	Aljouf	North	52	Yes	3
Total	13		2259		21

Results

Fourteen project team members at the Saudi MoH who were directly involved in the EHRS implementation in the PHCs agreed to be interviewed face to face. On the other hand, 351 practitioners from 21 PHCs participated in the online-based survey. This equated to a response rate of 71.5%.

Questionnaire results

The questionnaire data were collected from 351 participants across five different regions of the Kingdom of Saudi Arabia. The largest number of the respondents, 103 (29.3%), were residents of the capital city, Riyadh (see Table 2).

Table 2
Participant distribution based on geographical location

Region	Frequency	Percent
Riyadh	103	29.3
Gassim	61	17.4
Aljouf	69	19.7
Albaha	30	8.5
Makkah	88	25.1
Total	351	100.0

All participants worked in healthcare and administrative roles. As can be seen in Table 3, 149 (42.4%) were in an administrative role such as managers, secretaries and receptionists; 104 (29.6%) worked in a nursing role; thirty-two (9.1%) were physicians; and thirty (8.5%) were pharmacists. Four (1.1%) participants did not declare their occupation.

Table 3
Participant distribution based on occupation

Occupation	Frequency	Percent
Administrator	149	42.4
Physician	32	9.1
Nurse	104	29.6
Lab technician	11	3.1
Pharmacist	30	8.5
Radiologist	9	2.6
Dentist	12	3.4
Total	347	98.9

Age was measured via six categories, as illustrated in Table 4 below. The majority of participants, 192 (54.7%), were between twenty-five and thirty-four years of age. A detailed breakdown of the age categories is provided in Table 4. Four (1.1%) participants did not declare their age.

Table 4
Participant distribution based on age

Age Group	Frequency	Percent
18 to 24	3	.9
25 to 34	192	54.7
35 to 44	123	35.0
45 to 54	23	6.6
55 to 64	4	1.1
65 to 74	2	.6
Total	347	98.9

Participants were asked to specify their gender. Participants were mostly male ($n = 261$; 74.4%). Out of 351 participants, only eighty-one (23.1%) were female. Nine (2.6%) participants did not declare their gender.

The participants' experience of using a personal computer at home varied, with most participants, 129 (36.8%), stating that they had experience ranging between ten to fifteen years. Only eighteen participants (5.1%) had less than one year's experience with using a personal computer (see Table 5). Four (1.1%) participants did not declare their experience with using a personal computer at home.

Table 5
**Participant distribution based on their experience
with using a personal computer**

Length of experience	Frequency	Percent
Less than 1 year	18	5.1
1 to 5 years	29	8.3
5 to 10 years	109	31.1
10–15 years	129	36.8
More than 20 years	62	17.7
Total	347	98.9

The participants' time spent working in their current work role was measured via five categories. The majority of participants, 105 (29.9%), had one to five years' experience. A detailed breakdown of participant's time in their current position is provided in Table 6. Five (1.4%) participants did not declare their experience with using a personal computer at home.

Table 6
**Participant distribution based on experience in
their current position**

Length of experience	Frequency	Percent
Less than 1 year	19	5.4
1 to 5 years	105	29.9
5 to 10 years	100	28.5
10 to 15 years	82	23.4
More than 20 years	40	11.4
Total	346	98.6

Perceived usefulness of the EHRS

The participants expressed a very high level of satisfaction with the usefulness of an EHRS. It was evident from the participants' responses across all the items that they were satisfied with the usefulness of the implemented EHRS. Based on the questions in the second section of the questionnaire related to the benefits of using the EHRS, such as medication error reduction, cost reduction, improved patient safety and quality of care, there was a high level of agreement with all items, ranging from a high of 93.7% to a low of 87.3%. Table 7 shows that the items with the highest level of endorsement were: 1) "EHRS reduces costs through decreased paperwork, improved safety, reduced duplication of testing and improved health" (93.6%); 2)"EHRS help to promote legible documents" (93.1%); 3) "Sharing electronic information with patients and other clinicians is more secure when using the EHR system" (92.7%); and, 4), "The EHR system helps to do streamlined coding" (92.7%). Those items with a lower level of endorsement were: 14) "Using the EHR system helps to provide safer care" (88.7%); and 15) "Information from the EHRS enables me to make better decisions about patient care" (88.3%); 16) "Using the EHR system helps to effectively diagnose patients" (88.2%) and; 17) "Using the EHR system helps to reduce medical errors" (87.3%).

Table 7
Degree of endorsement for each of the seventeen questions relating to perceived usefulness of EHRS

Items		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Median	Total agreement	Rank
EHRS reduces costs through decreased paperwork, improved safety, reduced duplication of testing and improved healthcare	N	5	4	4	87	105	5.00	192	1
	%	2.4	2.0	2.0	42.4	51.2		93.6	
EHRS help to promote legible documents	N	4	6	4	94	95	4.00	189	2
	%	2.0	3.0	2.0	46.3	46.8		93.1	
Sharing electronic information with patients and other clinicians is more secure when using the EHR system	N	6	4	5	91	99	4.00	190	3
	%	2.9	2.0	2.4	44.4	48.3		92.7	
The EHR system helps with streamlined coding	N	4	6	5	97	93	4.00	190	4
	%	2.0	2.9	2.4	47.3	45.4		92.7	
EHRS enable quick access to patient records for more coordinated and efficient care.	N	8	5	3	95	94	4.00	189	5
	%	3.9	2.4	1.5	46.3	45.9		92.2	
Using the EHR system improves patient and healthcare professionals' interaction and communication as well as healthcare convenience	N	5	5	6	101	88	4.00	189	6
	%	2.4	2.4	2.9	49.3	42.9		92.2	
The EHR system allows me to spend more time on other aspects of patient care	N	6	6	5	94	94	4.00	188	7
	%	2.9	2.9	2.4	45.9	45.9		91.8	
EHRS help to provide accurate information	N	5	7	5	100	88	4.00	188	8
	%	2.4	3.4	2.4	48.8	42.9		91.7	
EHRS enable safer and more reliable prescribing	N	4	6	8	88	99	4.00	187	9
	%	2.0	2.9	3.9	42.9	48.3		91.2	
EHRS help to have complete documentation	N	6	8	6	92	93	4.00	185	10
	%	2.9	3.9	2.9	44.9	45.4		90.3	
EHRS provide accurate, up-to-date and complete information about patients at the point of care	N	5	8	7	106	79	4.00	185	11
	%	2.4	3.9	3.4	51.7	38.5		90.2	
EHRS improve end-user productivity and efficiency	N	6	9	7	90	92	4.00	182	12

Items		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Median	Total agreement	Rank
	%	2.9	4.4	3.4	44.1	45.1		89.2	
EHRS improve the privacy and security of patient data	N	6	6	11	88	93	4.00	181	13
	%	2.9	2.9	5.4	43.1	45.6		88.7	
Using the EHR system helps to provide safer care	N	4	8	11	93	88	4.00	181	14
	%	2.0	3.9	5.4	45.6	43.1		88.7	
Information from the EHR system enables me to make better decisions about patient care	N	5	8	11	99	82	4.00	181	15
	%	2.4	3.9	5.4	48.3	40.0		88.3	
Using the EHR system helps to effectively diagnose patients	N	5	9	10	96	83	4.00	179	16
	%	2.5	4.4	4.9	47.3	40.9		88.2	
Using the EHR system helps to reduce medical errors	N	6	7	13	96	83	4.00	179	17
	%	2.9	3.4	6.3	46.8	40.5		87.3	

Positive Attitudes towards use of the EHRS

Based on the responses to the fourteen items representing positive attitudes toward EHRS implementation and use, it was clear that there was a high level of positive endorsement. The highest level of endorsement was 97.5%, and the lowest 79.6%. Looking at the items individually, those with the highest level of endorsement were 1) "Overall, I prefer using the EHR system to the paper-based system" (97.5%); 2) "The EHR system is more efficient than a paper-based system" (95.1%); and 3) "Using EHRS leads to better adherence to policies and procedures" (92.6%). The items with the lowest level of endorsement (but still having more agreement than disagreement) were: 13) "The EHR system takes into account the specific needs of my care area(s)" (81.9%); 14) "Overall, the introduction of the EHR system has been effective" (80%) and; 15) "I'm committed to the successful use of the EHR system" (79.6%).

In terms of EHRS usability, efficiency and information quality, Table 2 below a high level of agreement towards all items representing EHRS usability: "The EHR system is easy to use" (86.2%); "I am physically comfortable while using the EHR system equipment and hardware" (87.2%). Furthermore, a high level of agreement was also recorded with items representing EHRS efficiency: "The EHR system is more efficient than a paper-based system" (95.1%). Table 8, also illustrated the level of agreement towards information quality items. High agreement was also found with "I can depend on the accuracy of the EHR system" (93.6%); and "Information almost never gets lost in the EHR system" (83.3%).

Table 8

Responses and endorsement to fourteen statements on positive attitudes toward the use of the EHRS scale

Items		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Median	Total agreement	Rank
Overall, I prefer using the EHR system to the paper-based system	N	1	2	2	91	107	4	198	1
	%	.5	1.0	1.0	44.8	52.7		97.5	
The EHR system is more efficient than a paper-based system	N		4	6	80	113	4	193	2
	%		2.0	3.0	39.4	55.7		95.1	
I can depend on the accuracy of the EHR system	N	1	6	6	104	85	4	189	3
	%	.5	3.0	3.0	51.5	42.1		93.6	
Using EHRS leads to better adherence to policies and procedures	N	3	5	7	108	81	4	189	4
	%	1.5	2.5	3.4	52.9	39.7		92.6	
The EHR system facilitates the communication of patient information among members of our healthcare team.	N	2	4	13	87	99	4	186	5
	%	1.0	2.0	6.3	42.4	48.3		90.7	
I am physically comfortable while using the EHR system equipment and hardware	N	4	8	14	90	88	4	178	6
	%	2.0	3.9	6.9	44.1	43.1		87.2	
The EHR system has improved my practice	N	4	6	21	78	96	4	174	7
	%	2.0	2.9	10.2	38.0	46.8		84.8	
I feel the use of the EHR system has improved the quality of patient care	N	2	7	21	99	75	4	174	8
	%	1.0	3.4	10.3	48.5	36.8		85.3	
The EHR system is easy to use	N	3	7	18	104	70	4	174	9
	%	1.5	3.5	8.9	51.5	34.7		86.2	
I feel the use of the system has improved patient care outcomes	N	5	5	25	84	86	4	170	10
	%	2.4	2.4	12.2	41.0	42.0		83.0	
Information almost never gets lost in the EHR system	N	5	11	18	84	85	4	169	11
	%	2.5	5.4	8.9	41.4	41.9		83.3	
The EHR system takes into account the specific needs of my care area(s)	N	6	10	21	90	78	4	168	12
	%	2.9	4.9	10.2	43.9	38.0		81.9	
Overall, the introduction of the EHR system has been effective	N	8	9	24	79	85	4	164	13
	%	3.9	4.4	11.7	38.5	41.5		80.0	
I am committed to the successful use of the EHR system	N	12	7	23	86	77	4	163	14

Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Median	Total agreement	Rank
%	5.9	3.4	11.2	42.0	37.6		79.6	

Interview results

The participants were occupied in five different positions (see Table 9): General Manager ($n = 3$), Head of Department ($n = 3$), Deputy Head of Department ($n = 1$), Software Developer ($n = 1$), and Analyst ($n = 5$).

Table 9
Participant abbreviation description

Position	Code used
General Manager	GM
Head of Department	HD
Deputy Head of Department	DHD
Software Developer	SD
Data Analyst	DA

The analysis of qualitative data illustrated six factors that assisted the project team during EHRS implementation in PHCs in SA. These facilitators include e-government, the characteristics of PHCs in SA, financial resources leadership and management, user willingness, and perceived usefulness of the EHRS.

E-government trend in SA

There is a move by the Saudi MoH towards digital transformation. This trend is supported directly by the higher authority in SA, which is also highlighted in the Saudi Vision 2030

"The main orientation of SA is transforming all government services into electronic transactions. This is an important factor which helped and encouraged the Ministry to implement EHRS in all sectors." (GM 1)

Financial recourses (FR)

The Saudi MoH is characterised by an abundance of financial resources provided by the Saudi government, and the participants agreed upon this unanimously. Overall, FR has a very positive impact on EHRS implementation projects. All the participants reported that financial resources contributed positively and facilitated the success of many previous projects, in particular EHRS implementation projects, due to the country's ability to fund electronic transformation in all sectors and services. For instance, the participants said:

"The role of FR is definitely positive; this country has more access to financial resources." (DA 3)

"The financial resources are the most important factor that contribute to the success of the project." (DA 1)

"The main factor which helps us to implement EHRS is financial support." (SD 1)

Characteristics of PHCs

PHCs in SA are very similar to each other in terms of the healthcare provided and business workflow. The business process, structure and workflow are considered to be the same in all PHCs in SA. This facilitates software selection and other processes of EHRS implementation.

"If you have a look at the PHCs, they all offer the same services and the same standards; there is no difference between them." (HD 1)

"The PHCs in the Kingdom are similar, have the same characteristics and work in the same field." (GM 2)

Moreover, PHCs in SA are distinguished by their small size and number of staff compared to other healthcare sectors in SA. The small size of Saudi PHCs allows greater flexibility to implement new projects and assist in overcoming challenges such as training.

"The small size and number of staff in PHCs is ideal for the training process. Services provided by the PHCs are easy when compared with hospital services, and that helps in the implementation of the system and training." (HD3)

Leadership and management

Management and leadership have been recorded as instrumental in the success of an EHRS implementation project.

"Leadership and management have an important role and are essential to the success of any project. The most important thing that affects such projects is the support from leaders and managers." (DA 1)

In this context, strong leadership has a very positive impact on EHRS implementation projects and contributes significantly to the success of any project, particularly when support comes from senior management and others who have authority and influence at the ministry level. Concurring with this view, one of the general managers claimed that the success of EHRS implementation projects is fifty percent dependent on strong support and leadership at the senior manager level. Due to its importance and great influence on the success or failure of EHRS implementation projects, leadership has been discussed at all conferences, meetings and workshops held at the Saudi MoH.

"Support from senior management is one of the most important facilitators of successful EHRS implementation." (HD 1)

"EHRS implementation projects generally rely 50% on management and leadership." (GM 1)

One of the benefits of strong leadership in EHRS implementation projects is that it ensures there is no disruption or delay. In addition, it prevents complacency in relation to the completion of these projects and minimises any errors as represented in the comment below:

"It certainly helps in the success of the system by providing adequate budgets, careful follow-ups and supervision, and gives strong commands to ensure that there is no leniency or delay in the implementation of any project." (HD 3)

Furthermore, the participants highlighted the positive role played by senior managers in driving the development wheel, especially in relation to participating in the implementation of an EHRS in PHCs. HD2 said, "No doubt, the senior management team are the foundation, and if they don't involve, the project may fail". The highest authority in the Ministry, represented by the Minister and his deputies, were involved in the EHRS implementation project.

"There was high-level participation of the Ministry in this project, and they have a big role in this project." (DA 2)

Perceived usefulness of an EHRS

The saving of time and effort, cost and error reduction and disease control benefits of an EHRS were considered as the most important factors that encourage senior managers to implement it.

"Senior management became aware of the role of IT and the extent of savings that could be achieved with the EHRS, whether in terms of money, time or effort. Senior management are also aware that the EHRS will help to reduce errors." (GM 3)

EHRS end-user willingness to use the system

End-user willingness plays an important role in EHRS implementation in Saudi PHCs.

"One of the main facilitators is the willingness in users themselves." (DHD1)

Discussion

Financial resources (FR)

The results illustrated that financial resources (FR) had a very high positive impact on facilitating the implementation of large-scale EHRS in the PHCs and contributing to overcome many challenges. The findings showed that the Saudi MoH did not face any financial constraints during the implementation of the EHRS projects. Thus, the influence of this factor has been examined against some of the main factors found to have a direct relationship with FR. Consequently, the factor most influenced by FR was software selection, where 93.5% of project team agreed that FR assists in the selection of high-quality software. It was perceived that FR could have a beneficial effect on software selection, allowing more flexibility to select the best vendors to implement EHRS in PHCs and then enhance the system interoperability. Although, preparing adequate infrastructure is very costly [29], it was another factor that significantly influenced by the provision of the FR in a positive way. The provision of training and technical support has previously been reported as a barrier to implementing an EHRS [30]. Ninety percent of the participants agreed that FR has a very positive impact on the provision of training.

Although findings of this study illustrated that FR was one of the main facilitators to the implementation of the EHRS in Saudi PHCs, others found that the cost of implementation was one of the main barriers, and the Saudi healthcare organisations struggle to support their project due to FR shortages [31–33]. Likewise, internationally, the cost of EHRS implementation is classified as a barrier to the success of the projects [e.g. 4, 30, 34–42].

Characteristics of PHCs

The PHC workflow and business structure which is unified to all PHCs in SA is another facilitator of EHRS implementation. This unification is due to the CM system adopted by the Saudi MoH. In this context, this unification facilitates software selection, where one system can be implemented in all PHCs in SA. In addition to software selection, training courses also can be unified due to the similarities in PHC healthcare function, workflow and business structure.

Furthermore, the findings illustrate that the size of the PHCs in SA was reported as a facilitator to the EHRS implementation. Similarly, the size of the healthcare organisation has been recognised as an influential factor [43, 44]. In this regard, the results revealed that the project team benefited from the small size of the PHCs. In contrast, the findings of previous research show that larger healthcare organisations such as hospitals are more flexible and have a higher level of readiness than PHCs or other small healthcare organisations [45]. Others argued that EHRS adoption is lower in small practices compared to large practices [46, 47].

Usability

EHRS usability was also one of the facilitators to implementing a large-scale EHRS. These findings are in agreement with those by Ludwick and Doucette [42] who documented a positive relationship between the usability of the EHRS and the adoption rate. Others argued that usability issues can act as constraints to the implementation of IT in healthcare organisations [30, 41, 48–51]. Moreover, system usability is directly associated with end-user satisfaction [48, 52].

Accordingly, EHRS end-users recorded very high levels of satisfaction with system usability. Compared with previous literature, these findings are in contrast with those presented by Cresswell, Worth [53], which recorded dissatisfaction with system usability.

Feedback statements reflect the importance of involving EHRS end-users in implementation. In addition, the EHRS end-users identified a few usability issues such as number of screens and switching between languages (Arabic and English). Therefore, it is highly recommended that EHRS end-users are involved, and that consideration is given to their feedback and recommendations, either during software selection or when system enhancement is taking place to improve the system usability. While numerous studies have documented adverse effects on the quality of care, medication errors, EHRS end-user errors, and patient safety resulting from usability issues [48, 50, 54], this study wasn't able to evaluate the relationship between usability issues and consequent factors such as medication errors. Therefore, further research is needed to determine this relationship in PHCs settings.

Leadership and management

Strong leadership and appropriate project management play a key role in the success of large-scale projects. Effective leadership at the senior management level can contribute to the success of the implementation of a large-scale project, fifty percent of the project success can rely on strong and effective leadership and management. However, leadership and management issues have been documented in previous literature as one of the barriers to EHRS implementation in SA [33]. In some cases these issues may lead to the failure of EHRS projects [33, 55].

Perceived usefulness

Perceived usefulness was found to be a facilitator to EHRS implementation in this study. Previous literature revealed that the EHRS was not useful and was considered to be a barrier to the EHRS implementation [56–59]. Benefits such as data accessibility, time saving, cost reduction and improved productivity were the things that end-users like about the EHRS implemented in PHCs in SA. The findings also show that EHRS end-users gave positive feedback about data accessibility, accuracy, improved productivity and time saving as a result of the system. Although these findings differ from those of several published studies [60–65], which argue that EHRS decreases staff productivity, they are consistent with those of and Lorenzi, Kouroubali [11], Cheriff, Kapur [66].

Our findings also consistent with those of Gagnon, Nsangou [41], and Kruse, Kothman [44], Jha, DesRoches [67], Gagnon, Desmartis [68], who also found that cost reduction constitutes a major facilitator of EHRS implementation. In addition, the findings illustrated that a higher perceived usefulness of an EHRS increases the end-user's willingness to use the system, which has been recorded as another facilitator to EHRS implementation. In addition to the above benefits, the EHRS contributed positively to patient outcomes. On the other hand, when examining the relationship between perceived usefulness of the EHRS with training and support, the findings show no relationship. These findings are in disagreement with those of Carr, Zhang [69], who documented a relationship between perceived usefulness of an EHRS with training and support.

Conclusion

This study is the first investigation to explore wide range of facilitators to implement large-scale EHRS in the PHCs. Consequently, this study provides several recommendations to decision-makers and all other EHRS implementation project team to facilitate the implementation of a large-scale EHRS. Firstly, policymakers need to consider providing sufficient budget for smooth implementation, particularly when decisions are being made regarding software selection. Secondly, centralised or semi-centralised management were found to be more effective in implementing a large-scale EHRS to unify decisions, policies and procedures. Finally, at a technological level, selecting a beneficial, efficient and easy to use EHRS can enhance EHRS end-user acceptance, which may then facilitate the success of EHRS implementation projects.

Abbreviation

EHRS	Electronic Health Record System
PHC	Primary Health Care
MoH	Ministry of Health
SA	Saudi Arabia
GM	General Manager
HD	Head of Department
DHD	Deputy Head of Department
SD	Software Developer
DA	Data Analyst
FR	Financial Recourses
SPSS	Statistical Package for the Social Sciences

Declarations

Ethical approval consent to participate

Ethics approval was received from Research Ethical committee at School of Health Science, Swansea University. Consequently, the research was conducted in accordance with the UK Policy Framework for Health and Social Care Research (UK Policy Framework for Health and Social Care Research - Health Research Authority (hra.nhs.uk) to ensure that the research was conducted to the highest standards of quality in research, and that it complied with all relevant legislation. In the case of questionnaire-based studies, returned questionnaires were considered as implied consent from the participant to use the data for publication as explained in the assurance letter. On the other hand, interviewing professionals on their perception on the intervention was deemed low risk and therefore a waiver of written consent was granted. This was completed prior to carrying out the research with each individual participant. The data collected included audio recordings, interview notes, digital files, transcripts, information in the questionnaires and digital data in SPSS. These data were stored in a hard drive that was protected by a password.

Consent for publication

Consent for publication Not applicable, as no identifiable information is published in this manuscript.

Availability of data and material (ADM)

The datasets generated and/or analysed during the current study are not publicly available due copywrite and ownership. All primary data collected for this research belong to the researchers. In addition, the dataset includes other data which will be used for another manuscript, but are available from the corresponding author on reasonable request.

Competing of interest

The authors declare that they have no competing of interests

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Authors' contributions

Haitham A. Alzghabi: Conceptualization, methodology, data collection, validation, analysis, and writing.

Hayley A. Hutchings: Conceptualization, supervision, reviewing and editing.

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Appendix

Appendix 1 and 2 are not available with this version.