

Digital Transformation of Service Delivery in Punjab's Health Sector - A Case Study of Hospital Information Management System

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Abstract

The purpose of this paper is to investigate the efficacy and challenges associated with digital transformation in the health sector in Punjab. To this extent, the Hospital Management Information System (HIMS) intervention in Tehsil Head Quarters (THQ) Hospital is examined as a case study and in-depth interviews are conducted with users to assess their experiences and satisfaction levels. The paper employs a mixed-methods approach, including a case study design using both quantitative and qualitative data. The HIMS project is evaluated using the OECD evaluation framework and includes self-administered questionnaires and in-person interviews with staff members at the hospital. Results are categorized under the "Technological" and "Non-Technological" headings with each heading further divided into four sub-themes. Overall results indicate that the success of a digital intervention is a complex phenomenon that hinges upon multiple technological and non-technological factors. The paper found that poor planning and mismanagement issues overshadowed the success of HIMS. To design better service delivery-related digital transformation interventions in the health sector, it is recommended that stakeholders should ensure extensive business requirement documentation, iterative modelling, integration of standalone systems, provision of recurring training and capacity-building workshops, a robust project exit strategy and mid-term evaluations to ensure adherence to project timelines and objectives.

Keywords: Digital transformation; service delivery; hospital information management system.

Introduction

The success of management information systems in healthcare is linked to the increasing use of digital technologies and healthcare providers are transforming the way they deliver services, providing better, more efficient, and more effective care to patients (Kivinen & Lammintakanen, 2013). Development agencies have recognized the potential of digital transformation and are advocating for its widespread adoption in the healthcare sector. This paper aims to explore the effectiveness of digital transformation initiatives in the health sector in Punjab, Pakistan through the case study of the Hospital Information Management System (HIMS) which was implemented in various Tehsil headquarters hospitals (THQs) across the province in 2016. The project had 13 objectives (Appendix A) that were aimed at reforming the service delivery mechanism in THQs. The project, however, was subject to several cost and scope revisions due to delays in the release of funds, procurement bottlenecks, and incomplete hospital infrastructure, among other reasons.

Digital Transformation of Service Delivery within the Health Sector

Faujdar et al. (2020) assert that digital transformation interventions are crucial in the healthcare sector to address the needs of marginalized populations in developing countries. Pakistan's IT sector has experienced a steady increase in both development and non-development budgets, but the country's global ranking in the UN E-Government Development Index (2022) remains notably low, with a rank of 150 out of 193 countries. This can primarily be attributed to the challenges in implementing and managing digital transformation initiatives in the healthcare sector (Serrano et al., 2018). DeLone and McLean (1992), as well as van der Meijden et al. (2003) point to different dimensions of success for information systems which include system quality, usage behaviours, and user satisfaction levels. Ray and Mukherjee (2007) found that there are various challenges to the implementation of digital transformation initiatives, including lack of awareness, low literacy, low technological literacy, connectivity issues, and absence of inter-departmental

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and intra-departmental integration of systems. Results of previous research efforts (Shrivastava et al., 2020; Radhikaashree et al., 2018; Cortes & Cortes, 2011) suggest that successful implementation of digital transformation initiatives requires a phased approach, careful strategic planning, grass root analysis, capacity building of stakeholders, process engineering, and tangible management policy with a well-defined scope, process reform, infrastructure, technology, finance, partnership, and people.

Sipanoun et al. (2022) ventured beyond the technological factors and undertook research to comprehend the encounters and viewpoints of all pertinent individuals involved in the usage of HIMS, within the context of a paediatric hospital. They found that non-technological factors, such as human characteristics, have profound and far-reaching consequences on the success of a Hospital Information System (HIS). The authors concluded that providing customized information and support that matches the unique needs and circumstances of users can be challenging, but it is crucial to ensure that users remain satisfied, engaged, and able to benefit from these resources over the long term. Khajouei et al. (2018) have put forth similar ideas and have suggested that to improve the planning of HIS implementation, it is important to have a greater comprehension of non-technical factors. Dehnavieh et al. (2018) examined the strengths and operational challenges of District Health Information Systems (DHIS) in 11 countries. The strengths, as suggested by results, included the technical features of the software, effective data management, flexible applications, networking to enhance stakeholder satisfaction, data management development and access to information, and economic benefits. Operational challenges included issues related to funding, communication infrastructure, data availability, training, standardization of deployment processes, neglecting criteria and clinical guidelines, data security, stakeholder communication, and the need for a pilot system.

The health sector in Pakistan faces multiple challenges which include but are not limited to rural inaccessibility to healthcare, manpower shortage, low insurance penetration, inadequate public sector investment, and inconsistent quality standards (Government of Pakistan, 2022). Shaikh et al. (2016) suggest building capacity by training public officials, developing an integrated ICT infrastructure, bridging the digital divide, and formulating a comprehensive digital transformation roadmap to improve the administrative system. Additionally, they suggest implementing a holistic strategy and strict enforcement to usher in an era of digital health in Pakistan, which would require a collaborative effort from all stakeholders. The user acceptance model for HIS proposed by Handayani et al. (2017) in the context of Indonesia can also provide important lessons to the policy-makers in Pakistan. The experience of Shaukat Khanum Memorial Cancer Hospital and Research Centre, a private healthcare facility, with in-house development and implementation of HIMS offers invaluable lessons for the planners and managers of development interventions in the health sector in Pakistan. Sultan et al. (2014) analysed qualitative improvements in different healthcare functions of the hospital and asserted that HIMS has the potential to improve the quality of healthcare and reduce errors in Pakistan's hospitals. The authors further suggest that these digital transformation systems can do more than just go paperless; they can also enhance information management and patient care quality.

Problem Statement and Research Gap

The literature on digital transformation interventions in the health sector and their impact on service provision is primarily being done by international organizations, but there is a lack of research on this topic in Pakistan. This paper is motivated by the need to deliver quality and accessible healthcare services in Punjab, and the potential of digital transformation to revolutionize service delivery and to address the gap in the body of knowledge, the paper aims to explore the impacts, efficacy, challenges and issues that affect the digital transformation intervention in health sector in Punjab. The paper will specifically contemplate whether the HIMS intervention is successful in bringing positive improvements to service delivery in the health sector. The paper will further explore the issues and challenges that impeded the effectiveness of HIMS and reflect on how HIMS could be more productive and efficient from a policy perspective.

Methods

The paper under consideration employs a convergent mixed methods approach where it utilizes qualitative research to gather end-user opinions and experiences, and descriptive research to assess the impact

of personal characteristics on usage attitude. A case study design is employed and the methodology used involves an exploratory approach within a qualitative framework, employing an inductive approach to collect and analyze data. The Organization for Economic Cooperation and Development's (OECD) evaluation framework is used to evaluate the HIMS project. The framework comprises six evaluation criteria which are used to make evaluative judgments.

The research population consists of 131 Tehsil Headquarters Hospitals where the HIMS software was implemented. Due to time constraints, the THQ Raiwind hospital was chosen as the sampling frame, with a total of 69 staff members completing the questionnaire, to generate quantitative data, and 10 of them being interviewed in detail to gain better insights into their experiences and to generate qualitative data. All interviews were conducted in person, and due to participants' unwillingness to have their responses recorded, the interviewer took notes on paper. Leading questions were avoided during the interviews to prevent researcher bias, and probes were used to keep the discussions focused on relevant details. A purposive sampling technique was used to select staff members based on their contact with HIMS and patient volume in their respective departments.

The questionnaire (Appendix-C) used for this paper comprises three parts: demographics, user experiences, and satisfaction levels, with the questions in the third part only being answered by those concerned with the underlying project objective. The question-respondent mapping is delineated in Appendix B. Based on the literature reviewed, table 1 delineates the two major identified themes namely; technological issues and non-technological issues. Each theme is further divided into four sub-themes.

Table 1. Themes and Sub-Themes

Technological Issues	Non-Technological Issues
Operational Functionality Modelling (OFM)	Communication and Coordination Issues (C&C)
Software Complexity (SC)	Negative Attitudes (NA)
Software Shortcomings (SS)	Data Non-Utilization (DNU)
Lack of Robust Technical Support Mechanism (LTS)	Lack of Robust Operations & Maintenance (LROM)

Source: Literature Reviewed

As delineated in table 2, the sub-themes are used to answer the facets of OECD evaluation framework. Relevance is answered by the OFM sub-theme. Coherence is answered by studying the Annual Development Programme for the province of Punjab and finding other interventions that are directly or indirectly linked to the data generated by HIMS. Effectiveness is answered by ascertaining if the project attained its objectives. Efficiency is answered by the SC, SS and DNU sub-themes. Impact is primarily answered by questions that asked the hospital staff to rate system improvement (in terms of time savings) as a result of HIMS implementation and other questions that asked respondents that if they believed HIMS made them efficient and productive. Furthermore, DNU sub-theme will also be considered to determine the impact of HIMS intervention. Sustainability is answered by the LTS, NA and LROM sub-themes.

Table 2. Evaluation Criteria to Sub-Theme Mapping

Evaluation Criteria	Answering Sub-Theme(s)
Relevance	OFM
Coherence	Ongoing Interventions that Depend of HIMS data
Effectiveness	Attainment of Project Objectives
Efficiency	SC, SS, DNU
Impact	Time Savings, Increased Productivity / Effectiveness
Sustainability	LTS, NA, LROM

Source: Researchers' own design.

Table 3 delineates the survey questionnaires to sub-theme mapping matrix used to answer the sub-themes. The code UE is used to refer to the User Experience portion of the questionnaire and the code SL is used to refer to the Satisfaction Level portion of the questionnaire.

Table 3. Research Questionnaire to Sub-Theme Mapping

Sub Theme	Related Questions
Operational Functionality Modelling (OFM)	UE4, UE5, UE 6, UE7, SL9
Software Complexity (SC)	UE2, UE3, UE5
Software Shortcomings (SS)	UE4, UE6
Lack of Robust Technical Support Mechanism (LTS)	UE11, UE12
Communication and Coordination Issues (C&C)	UE8, UE9, UE10, UE11
Negative Attitudes (NA)	N/A (Observed During Research Visit)
Data Non-Utilization (DNU)	SL14
Lack of Robust Operations & Maintenance (LROM)	UE10, UE11, UE12

Source: Researchers own design.

Results

Descriptive Results

The technological sub-themes of the research were answered by 16 Clerks, 9 Consultants, 18 Medical Officers and 26 Nurses. The ratings of these respondents are delineated in table 4.

Table 4. Summary Statistics for Technological Sub-Themes

Sub-Theme	Designation	Mean	Min	Max	SD
OFM	Clerk	1.800	1.200	2.600	.438
	Consultant	1.333	1.200	2.200	.332
	Medical Officer	1.289	1.000	1.800	.268
	Nurse	1.231	1.000	2.000	.231
	Total	1.391	1.000	2.600	.381
SC	Clerk	1.750	1.333	2.667	.413
	Consultant	1.704	1.333	2.000	.200
	Medical Officer	1.370	1.000	1.667	.194
	Nurse	1.321	1.000	1.667	.240
	Total	1.483	1.000	2.667	.331
SS	Clerk	2.281	1.500	3.500	.657
	Consultant	1.167	1.000	2.000	.354
	Medical Officer	1.222	1.000	1.500	.256
	Nurse	1.327	1.000	2.000	.314
	Total	1.500	1.000	3.500	.594
LTS	Clerk	1.344	1.000	1.500	.239
	Consultant	1.722	1.000	2.000	.363
	Medical Officer	1.639	1.500	2.000	.230
	Nurse	1.115	1.000	1.500	.215
	Total	1.384	1.000	2.000	.345

Source: Responses of Hospital Staff.

The summary statistics indicate that satisfaction level with HIMS varies significantly across different user groups. Clerks appear to be the most satisfied with the software's functionalities and features, while consultants, medical officers, and nurses are largely dissatisfied with them. Nurses and medical officers find the software more complicated than consultants and clerks, while the perceived ease of use does not seem to be influenced by the educational level of respondents.

The nurses and medical officers reported significant software shortcomings, while the clerks and consultants were relatively more satisfied with the software features. This trend is consistent with the operational functionality modelling results. The lack of a robust technical support mechanism is a significant

concern for nurses and clerks, who are highly dissatisfied with the technical support provided by the HIMS software. Consultants and medical officers are relatively more satisfied with the technical support mechanism, but they still perceive a lack of robustness. Results suggest that improving technical support mechanisms could enhance user satisfaction across all user groups, as these findings suggest.

The non-technological sub-themes of the research were answered by varying numbers of respondents. The C&C and LROM sub-themes were answered by 16 Clerks, 9 Consultants, 18 Medical Officers, and 26 Nurses. The DNU sub-theme was answered by only the concerned respondents which comprised 9 Consultants, and 18 Medical Officers. The ratings of the respondents are delineated in Table 5.

Table 5. Summary Statistics for Non-Technological Sub-Themes

Sub-Theme	Designation	Mean	Min	Max	SD
C&C	Clerk	1.797	1.750	2.000	.101
	Consultant	1.833	1.750	2.000	.125
	Medical Officer	2.264	1.750	2.500	.234
	Nurse	1.760	1.750	2.000	.049
	Total	1.909	1.750	2.500	.254
DNU	Clerk	.	.	.	.
	Consultant	1.667	1.000	2.000	.500
	Medical Officer	1.000	1.000	1.000	.000
	Nurse	.	.	.	.
	Total	1.222	1.000	2.000	.424
LROM	Clerk	2.292	2.000	2.667	.167
	Consultant	2.481	2.000	2.667	.242
	Medical Officer	2.426	2.000	3.000	.275
	Nurse	2.064	1.667	2.333	.164
	Total	2.266	1.667	3.000	.264

Source: Responses of Hospital Staff

On the non-technological front, the results provide important insights into hospital staff's perceptions of various aspects of HIMS. Medical officers were the most satisfied with communication and coordination, while consultants, clerks, and nurses were relatively dissatisfied. Consultants were relatively more satisfied with data utilization, while clerks and medical officers expressed concerns. However, respondents across designations believed that the data generated by HIMS was largely non-utilized for informed decision-making. The respondents also believed that HIMS did not have a robust operations and maintenance strategy. The implementation of HIMS did not significantly improve time or productivity and effectiveness for most respondents, although clerks relatively rated time improvements and efficiency higher.

Analysing mean scores for user experiences and satisfaction by gender and designation variables revealed that overall, clerks had a better experience and were more satisfied with the functioning of HIMS. Medical officers had a lower satisfaction level but similar experiences. Nurses had a better satisfaction level than their experience, and female consultants ranked user experience higher than their satisfaction level. In addition, the categorized results for improvements in productivity and effectiveness found that across designations, clerks relatively believed that HIMS enabled them to work more efficiently. However, they did not believe that the usage of HIMS made them highly productive. Respondents from other designations did not believe that usage of HIMS made them significantly productive and efficient.

Table 6 delineates the mean ratings on each project objective of HIMS. Mean rating 1 denotes that the objective was not attained. A mean rating of 1.1 – 3.9 denotes that the objective was partially attained. A mean rating of 4 – 5 denotes that the objective was fully attained. Objective 1 of the project corresponded to

two software modules, therefore, objective 1 has been broken into 1A and 1B for the purposes of evaluation. The results show that objective 9 was not attained, objectives 1A, 1B, 2, 3, 4, 5, 6, 7, 8, 10, and 13 were partially attained, and objective 12 was fully attained.

Table 6. Project Objective Attainment Matrix

Variable	Observations	Mean	Std. Dev
Objective 1A	13	1.769	1.166
Objective 1B	27	1.556	0.506
Objective 2	26	1.192	0.402
Objective 3	27	1.370	0.492
Objective 4	3	3.333	1.155
Objective 5	27	2.074	0.829
Objective 6	7	1.286	0.488
Objective 7	69	1.029	0.169
Objective 8	69	1.725	0.684
Objective 9	16	1.000	0.000
Objective 10	4	1.250	0.500
Objective 11	53	1.566	0.500
Objective 12	60	4.183	0.390
Objective 13	27	1.222	0.424

Source: Responses of Hospital Staff

Qualitative Results

The communication and coordination issues played a crucial role in hindering the effectiveness of HIMS. The majority of the respondents reported that the system was implemented without prior notice and did not accurately model departmental processes. A clerk from the pathology department, however, believed that HIMS accurately modelled his department's processes. The respondents also identified a lack of holistic requirements gathering and insufficient training as significant coordination shortcomings.

“The clinical notes are not what we usually need. I do not know where the project team gathers requirements from but certainly not us. I have been transferred to three different hospitals since 2017 and none of them were neither provided training nor consulted”

The objectives of this project included the most critical initiatives, which were non-trivial. The prime affectees of this intervention were the people, processes, and systems. The people, results indicate, are rather dissatisfied with the system. The dissatisfaction could have stemmed from the resistance towards change. The nurse interviewed in the Paediatrics department claimed to be a technological novice, however, she had a smartphone and was using it without any apparent difficulty.

“I am a 55-year-old woman. My whole life I have done things manually. Now all of a sudden, I have to do things on a computer. It is really hard to learn computer at my age”

During the interviews, several respondents alluded to the complexity of patient registration, including unnecessary questions about allergies and medical history, as well as a complicated process for viewing clinical notes. Additionally, the system did not have a triage feature and the lab orders were not fully digitized. Moreover, the system was not integrated with the Queue Management System, which required patients to be searched using their CNIC at each point of contact instead of their patient profile moving seamlessly between them. Qualitative data further reveals that HIMS failed to achieve its objective of providing meaningful reporting and oversight dashboards.

“The data collected from HIMS should be analysed to calculate patient workload of the doctors, predict epidemiological trends and identify the need for additional staff”

Almost half of the hospital staff members at THQ Raiwind strongly disagreed with the statement that there was a robust technical support mechanism in place for HIMS. According to hospital staff members, having a designated IT person stationed at the hospital would have been helpful, particularly after the implementation period when the support staff was laid off. The staff members found it less frustrating to use

the system when the support team was available, and they expressed dissatisfaction with the technical support mechanism during in-depth interviews.

During field visit, it was found that HIMS was discontinued for six months in THQ Raiwind, but after the Primary & Secondary Healthcare Department issued a warning letter to the hospital administration, the system resumed usage. Overall, the respondents' casual and negative attitudes towards HIMS suggested a lack of incentive to use the system.

Furthermore, the results illustrate that HIMS intervention suffered from poor planning and mismanagement, resulting in inaccurate functionality modelling and technological issues. Poor operations management, including the lack of training and a feedback mechanism, was also a major contributor to the project's shortcomings. Despite four revisions, the project was largely ailing during its gestation period, largely due to the non-exhaustive requirements gathering process that expanded the project to cover all THQs.

Discussion

Discussion on the Results

Overall, the results have largely been on the lower end. However, the system was not as poor as the respondents claimed. The end-users' negative attitudes and resistance to change contributed to a focus on the system's shortcomings rather than its potential benefits. Despite the project's non-trivial objectives, affecting people, processes, and systems, the respondents' lack of responsibility for the system's failure indicated a moral hazard. The nurse in paediatrics acknowledged having difficulty learning the system but had no difficulty using her smartphone, indicating a dichotomy in end-users' attitudes toward technology. The majority of respondents raised concerns about the software's functionality, but the researcher observed that HIMS was not as inaccurate as the responses suggested. Respondents may have felt this way due to the lack of consultation during the implementation process and inadequate training provided to end-users.

In addition to these operational challenges, the poorly defined exit strategy, no real-time technical support for end-users after the gestation period and the inter-departmental tussle over project shortcomings led to the closure of the project on an as-is basis and ultimately a dip in users' rating of system improvement in the post-project completion period. A robust O&M plan with a post-project completion period mechanism should have been mentioned in the PC-I document to ensure project sustainability. The literature on digital health interventions shows that success stories were achieved through consistency in policy, which was not the case with HIMS. Rather than improving the existing system, the department decided to develop a new one that added nothing significant to what HIMS offered.

Based on the results, the project's relevance is rated as moderately relevant due to inaccuracies in functionality modeling and non-integration of different hospital departments. The project's coherence is rated as highly coherent due to the usefulness of the data generated by HIMS for other interventions. Effectiveness is rated as moderately effective, with one objective fully attained, 11 partially attained, and one not attained. Efficiency is rated as moderately efficient due to software complexities and failures to deliver on some objectives. The impact is moderately positive in terms of time savings and staff productivity and the project is deemed not sustainable due to in-built resistance to change, negative attitudes, and the inability of the concerned authorities to provide technical support and perform O&M of HIMS, resulting in its phasing out. Overall, the project may be ranked as Partially Successful in improving service delivery.

The study further found that non-integration of different departments, inaccurate clinical notes and pre-configured templates, and multiple points of contact with patients were some of the operational issues that emerged during the implementation of HIMS. Software complexity issues faced by the hospital staff due to lack of training and software shortcomings such as session timeout issues and lack of an appointment scheduling feature were also impediments to success. Results suggest that some of the perceived software shortcomings may not be actual shortcomings but rather internet connectivity issues.

HIMS could have been more productive and efficient from a policy perspective if the project had a robust operations and maintenance strategy. The project managers should involve the end-users during the implementation phase, provide adequate training, and establish a mechanism for regular feedback.

Integration of all the entity units, software standardization, and attenuation of software shortcomings are an integral part of the success equation.

Limitation

The research had limitations due to lack of accessibility and time constraints which resulted in a small sampling frame for Tehsil Headquarters Hospitals (THQs). Time management was difficult and responses to research questionnaires were based on hospital staff present during the research visit. The results should be generalized with caution. Future researchers should include all THQs in the province of Punjab to obtain representative and large data samples for more conclusive results.

Suggestions for Further Studies

The results raise some ideas for future researchers. Future studies should focus on determining if there exists a causality between extensive business requirement documentation and simple and user-friendly systems. Furthermore, empirical evidence must be sought to highlight the importance of data analyses for making informed decisions, and the integration of standalone systems to deliver better results. A comparative study between successful and non-successful digital transformation initiatives would contribute in no small measure towards better understanding different dynamics of digital transformation such as recognition of end users as key actors, recurring training and capacity-building workshops, mid-term evaluations, and defining a well-defined project exit strategy.

Acknowledgments

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declaration of interest statement

Researchers have no financial or personal conflict of interest concerning the studied topic.

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Appendices

Appendix A. Project Objectives

Sr. No.	Project Objective
1.	Patient registration and saving of repeat visits to patient profile.
2.	Triage and vital statistics to be recorded for patients in ER and OPD.
3.	Clinicians to have clinical notes entry provision along with frequently used templates pre-configured to address repetition and tackle oversight.
4.	Provision for digitizing lab orders and entering lab tests' results.
5.	Legible digitized prescriptions for patient will be printed.
6.	Digitization of pharmacy transactions.
7.	Access of HIMS on mobile phones.
8.	Departmental/Functional categorization of OPD, IPD, ER, Lab and Pharmacy.
9.	Appointment scheduling for the patients.
10.	Billing module will be functional for pathology and radiology billing.
11.	Provision for recording patients' clinical and other In-Patient information.
12.	Blood Bank module for donor profiling and blood stock management
13.	Variety of reports for staff, management and decision makers.

Appendix B.

Questionnaire-Respondent Mapping

Construct	Question Code	Measurement Problem	Respondent
Demographics	DM1	Respondent's gender	Consultant, Medical Officer, Nurse, Clerk
	DM2	Respondent's age	
	DM3	Respondent's education level	
	DM4	Respondent's monthly income	
User Experience	UE1	System improvement (In terms of time savings)	Consultant, Medical Officer, Nurse, Clerk
	UE2	Fewest steps to accomplish a task	
	UE3	Using HIMS successfully every time	
	UE4	Effective Working	
	UE5	Greater Productivity	
	UE6	HIMS does everything that is expected	
	UE7	Accurate modelling of processes	
	UE8	Input from hospital	
	UE9	Extensive consultation with end-user	
	UE10	Adequate hardware and network resources	
	UE11	Training	
	UE12	Technical support mechanism	
Satisfaction Level	SL1	Satisfaction with patient registration module	Clerk
	SL2	Satisfaction with the saving of repeat visits to patient profile module	Consultant, Medical Officer
	SL3	Satisfaction with triage and vital statistics recording module	Nurse
	SL4	Satisfaction with clinical notes' entry provision and pre-configured frequently used templates	Consultant, Medical Officer
	SL5	Satisfaction with digitized lab module	Clerk
	SL6	Satisfaction with digitized prescriptions	Consultant, Medical Officer
	SL7	Satisfaction with digitized pharmacy transactions	Clerk
	SL8	Satisfaction with access of HIMS on mobile phone	Consultant, Medical Officer, Nurse, Clerk
	SL9	Satisfaction with departmental/functional categorization of OPD, IPD, ER, Lab and Pharmacy	Consultant, Medical Officer, Nurse, Clerk
	SL10	Satisfaction with appointment scheduling	Clerk
	SL11	Satisfaction with the billing module for pathology and radiology billing	
	SL12	Satisfaction with recording patients' clinical and other In-Patient information module	Consultant, Medical Officer, Nurse
	SL13	Satisfaction with Blood Bank module for donor profiling and blood stock management	Medical Officer, Nurse, Clerk
	SL14	Satisfaction with the reports	Consultant, Medical Officer

Appendix C. Research Questionnaire for Studying the Effectiveness & Efficacy of Hospital Information Management System in Public Hospitals in Punjab

PART – I (Demographics)

1. What is your gender?

Male	Female
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2. What is your age?

21-30	31-40	41-50	51-60
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3. What is your educational level?

12 Years of Education	14 Years of Education	16/17 Year of Education	18 & Above Years of Education
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4. What is your monthly income level?

Less than PKR. 20,000	Between PKR 20,000 and PKR 50,000	Between PKR 50,000 and PKR 75,000	Between PKR 75,000 and PKR 100,000	Greater than PKR 100,000
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PART – II (User Experience)

Please select the most suitable answer for the following statements:

1. To what extent do you think the system (in terms of time savings) has improved after implementation of HIMS?

0 - 10%	11 - 20%	21 - 30%	31 - 40%	>40%
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Reason: _____

2. HIMS requires the fewest steps possible to accomplish what I want to do.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
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Reason: _____

3. I can use HIMS successfully every time.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
-------------------	----------	-----------	-------	----------------

Reason: _____

4. Using HIMS enables me to do my work effectively.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
-------------------	----------	-----------	-------	----------------

Reason: _____

5. Using HIMS enables me to be more productive and saves the time it usually takes to interact with patients.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
-------------------	----------	-----------	-------	----------------

Reason: _____

6. HIMS does everything I would expect it to do.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
-------------------	----------	-----------	-------	----------------

Reason: _____

7. HIMS accurately models the processes that are followed in our department.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
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Reason: _____

8. In the software development phase, the project planning team sought input from our hospital.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
-------------------	----------	-----------	-------	----------------

Reason: _____

9. I believe HIMS was developed after extensive consultation with the end users.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
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Reason: _____

10. Our hospital has adequate hardware and network resources available for usage of HIMS.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
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Reason: _____

11. Training was provided to us before rolling out of HIMS.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
-------------------	----------	-----------	-------	----------------

Reason: _____

12. There is a robust technical support mechanism in place.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
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Reason: _____

PART – III (Satisfaction Level)

To what extent do you agree with the following statements:

1. I am satisfied with the patient registration module of HIMS. (Answer only if you're a Clerk)

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
-------------------	----------	-----------	-------	----------------

Reason: _____

2. I am satisfied with the saving of repeat visits to patient profile module of HIMS. (Answer only if you're a Consultant, Medical Officer)

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
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Reason: _____

3. I am satisfied with the triage and vital statistics recording module of HIMS. (Answer only if you're a Nurse)

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
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Reason: _____

4. I am satisfied with the clinical notes' entry provision module and the pre-configured frequently used templates in HIMS. (Answer only if you're a Consultant, Medical Officer)

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
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Reason: _____

5. I am satisfied with the digitizing lab orders and entering lab tests' results module of HIMS. (Answer only if you're a Clerk in Pathology Department)

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
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Reason: _____

6. I am satisfied with the digitized prescriptions that are printed using HIMS. (Answer only if you're a Consultant, Medical Officer)

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
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Reason: _____

7. I am satisfied with the digitization of pharmacy transactions module of HIMS. (Answer only if you're a Clerk)

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
-------------------	----------	-----------	-------	----------------

Reason: _____

8. I am satisfied with the access of HIMS on mobile phone.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
-------------------	----------	-----------	-------	----------------

Reason: _____

9. I am satisfied with the departmental/functional categorization of OPD, IPD, ER, Lab and Pharmacy.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
-------------------	----------	-----------	-------	----------------

Reason: _____

10. I am satisfied with the appointment scheduling module of HIMS. (Answer only if you're a Clerk)

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
-------------------	----------	-----------	-------	----------------

Reason: _____

11. I am satisfied with the billing module for pathology and radiology billing in HIMS is satisfactory. (Answer only if you're a Clerk in Pathology or Radiology Department)

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
-------------------	----------	-----------	-------	----------------

Reason: _____

12. I am satisfied with the recording of patients' clinical and other In-Patient information modules in HIMS. (Answer only if you're a Consultant, Medical Officer, Nurse)

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
-------------------	----------	-----------	-------	----------------

Reason: _____

13. I am satisfied with the Blood Bank module for donor profiling and bloodstock management in HIMS. (Answer only if you're a Medical Officer, Nurse, Clerk)

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
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Reason: _____

14. I am satisfied with the variety of reports in HIMS. (Answer only if you're a Consultant, Medical Officer)

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
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Reason: _____