

Evaluating Hospital Information Systems (HIS) Quality Using the DeLone & McLean Models and TOE Framework: Evidence from Healthcare Context.

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■ Abstract:

There is no doubt that hospital information systems HIS have an important role in improving healthcare efficiency and decision-making, yet their evaluation in some developing and fragile country contexts, like Libya, remains almost limited, especially in public healthcare systems. Therefore, the aim of this study was to assess the quality of HIS at the Libyan hospital of Diabetes and Endocrinology by attempting to integrate the DeLone and McLean IS success model with the TOE framework. This case study adopted a quantitative study approach in which data were obtained from 44 healthcare professionals, administrators, and IT staff via a structured questionnaire consisting of 46 items. Some statistical analyses and regression-based path were conducted in order to assess the system performance dimensions and contextual influences. The results of the study indicated that while HIS provided substantial organizational benefits, particularly, in efficiency and decision support, system quality, service quality, and user satisfaction were only perceived as moderate. Technological and organizational factors significantly affected HIS performance, whereas environmental influences were almost limited. This study offers empirical evidence from Libya, confirms the relevance of established IS success models in developing healthcare settings, and provides practical recommendations for sustainable digital health development.

- **Keywords:** Hospital Information Systems (HIS) Quality, DeLone and McLean Models, TOE Framework, Digital Health System, Public Healthcare Context

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■ المستخلص:

لا شك أن نظم معلومات المستشفيات (HIS) تعتبر من أهم الأدوات الأساسية المستخدمة في تعزيز كفاءة الرعاية الصحية و التي من شأنها يمكن أن تؤدي إلى ودعم اتخاذ القرار، بالرغم من أن دراستها و تقييمها في سياقات الدول النامية والهشة، على سبيل المثال ليبيا، مازال يعتبر نسبياً محدوداً، و لا سيما في ظل وجود أنظمة الرعاية الصحية العامة. حيث كان الهدف من هذه الدراسة هو لتقييم جودة نظم معلومات المستشفيات في مستشفى السكري والغدد الصماء أبين النفيس بم صلاح الدين بطرابلس، ليبيا، و ذلك من خلال استخدام نموذج نجاح نظم المعلومات المعروف ب DeLone McLean & و إطار التكنولوجيا المنظمة البيئية المعروف باسم TOE.

حيث اعتمدت هذه الدراسة البحثية على استخدام منهجاً كمياً قائماً على دراسة حالة، و تم جمع البيانات من 44 من الكوادر العاملين الصحيين والإداريين وموظفي تقنية المعلومات في المستشفى و ذلك عن طريق استخدام استبانة منظمة احتوت على 46 فقرة . ايضاً تم استخدام التحليلات الإحصائية الوصفية وتحليل المسار القائم على الانحدار لتقييم أبعاد أداء النظام والتأثيرات السياقية. و اظهرت نتائج الدراسة أن نظم معلومات المستشفيات تحقق فوائد تنظيمية بشكل واضح و ملموس، و لا سيما فيما يتعلق بتحسين الكفاءة ودعم اتخاذ القرار، إلا إن مستويات جودة النظام وجودة الخدمات ورضا المستخدمين ظهرت بمستويات متوسطة. كما اوضحت تلك النتائج أن العوامل التكنولوجية والتنظيمية كان لها تأثير معنوي واضح في أداء نظم معلومات المستشفيات، في حين ظل تأثير العوامل البيئية محدوداً من منظور العاملين بالمستشفى.

لذلك فإن هذه الدراسة يمكن أن تقدم دليلاً تجريبياً من السياق الليبي، وتؤكد صلاحية و ملاءمة نماذج نجاح نظم المعلومات المعتمدة في بيئات الرعاية الصحية بالدول النامية، فضلاً عن تقديم توصيات عملية لدعم التنمية المستدامة للصحة الرقمية.

● الكلمات المفتاحية: الصحة الرقمية بم جودة نظم معلومات المستشفيات، نموذج DeLone McLean & و إطار TOE ، النظام الصحي الرقمي، الرعاية الصحية العامة.

1. Introduction

Internationally, many healthcare institutions very often draw on information systems in order to optimize service quality, improve financial resources, and or support decision-making policies. For instance, hospital information systems HIS which adopt clinical, administrative, and financial data are central to modern healthcare systems in developed countries. However, despite the fact that there are significant investments in HIS, especially in public hospitals, HIS system quality and success still remains inconsistent,

particularly, in developing countries with transitional economies.

Clearly enough in developing countries, HIS adoption often faces challenges such as limited infrastructure, lack of technical expertise, organizational resistance, and weak regulatory settings. Libya, with its public healthcare systems, has implemented HIS in order to improve efficiency and transparency systems, yet, systematic evaluations of system quality and success are limited, with most existing efforts emphasizing deployment over post-implementation performance and value realization.

More importantly, information systems IS research emphasizes that implementing technology alone does not ensure success. Instead, outcomes depend on system quality, information outputs, service support, user engagement, organizational readiness, and environmental factors. The DeLone and McLean IS Success Model offers a framework to assess IS outcomes, while the (TOE) framework explains how contextual factors can influence adoption and performance.

This study, is therefore, fills a key gap by evaluating the HIS system at the Diabetes and Endocrinology Hospital, Tripoli, Libya, using the DeLone and McLean model alongside the TOE framework. This study will provide a holistic view of internal success factors and external contextual constraints, offering some empirical evidence from a largely underrepresented setting in the global HIS research.

1.1 Research Objectives

General objective

This study aims to evaluate Hospital Information Systems (HIS) and examine their impact on organizational performance in a Libyan public hospital from an Information Technology perspective.

Specific Objectives

1. To evaluate the quality of HIS system in terms of information quality, and service quality.
2. To assess the level of HIS adoption and the level of user satisfaction among hospital staff.

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3. To examine IT infrastructure availability and the effectiveness of technical support.
4. To analyze how HIS quality dimensions affect overall hospital performance.
5. To identify any technical, organizational, and environmental factors that may affect the successful implementation of HIS.

1.2 Research Questions

1. What is the current status of hospital information systems HIS in Libyan public hospitals?
2. How do system quality, information quality, and service quality affect the use of HIS?
3. What relationship exists between HIS utilization and hospital performance?
4. What information technology related challenges constrain effective HIS implementation?

2. Literature Review

2.1 Hospital Information Systems in Developing Countries

The key role of hospital information systems (HIS) is to support clinical, administrative operations and/or strategic functions in healthcare organizations. Previous research in developing countries, has indicated that HIS adoption yields mixed results due to infrastructural limitations, workforce gaps, and governance challenges (Heeks, 2006; Ojo, 2017). Despite the fact that HIS can improve data accessibility and reporting accuracy, sustainability and system optimization still remain critical issues in this area.

In public healthcare contexts, the implementation of HIS is more often policy driven rather than user-led, creating mandatory use environments in which system acceptance may not exactly reflect the user satisfaction, thereby highlighting the importance of post implementation evaluation (Handayani et al., 2018).

2.2 DeLone and McLean IS Success Model in healthcare settings.

The DeLone and McLean IS Success Model is very often applied to assess

the IS effectiveness. This model views IS success through six dimensions, namely, system quality, information quality, service quality, system use, user satisfaction, and net benefits (DeLone & McLean, 2003; 2016).

Previous research studies in healthcare contexts demonstrate that Information quality strongly influences user satisfaction due to the critical nature of clinical data (Aldosari, 2014). System quality strongly influences system use, especially with regards to reliability and usability (Petter et al., 2009). Net Benefits represent the ultimate reflection of IS success in efficiency, coordination, and decision-making improvements (Aqil et al., 2009). However, many scholars argue that that the model may not on its own address these contextual challenges in developing countries, which highlights the need for other complementary frameworks.

2.3 Technology–Organization–Environment (TOE) Framework

The role of TOE framework is to explain IS adoption and performance via three main contextual dimensions; these are technological, organizational, and environmental factors (Tornatzky & Fleischer, 1990). Research in healthcare IS indicated that TOE has been widely applied to account for variations in system readiness and effectiveness (Oliveira & Martins, 2011). The first technological context consists of infrastructure, system compatibility, and security.

The second contextual dimension, i.e., organizational context involves management support, training, and financial resources. The third dimensional context is the environmental context which includes regulatory frameworks, national policies, and external pressures.

Empirical Studies reveal that in developing countries, technological and organizational factors often have stronger influence than environmental factors, where national digital health strategies may be fragmented or weak (Ojo, 2017; Musa et al., 2021).

2.4 Integrating DeLone & McLean with TOE in HIS Evaluation

Recent in IS recommends integrating outcome-based success models, like the DeLone & McLean with context-oriented frameworks such as TOE to achieve a more comprehensive HIS evaluation (Ifinedo, 2011; Al-Hakami et al., 2020). This integration helps researchers to explain how contextual readiness

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affects system quality, service delivery, and realized benefits.. However, despite this theoretical advancement, empirical studies applying such models in public healthcare systems especially in Libya remain extremely limited. Therefore, this study is dedicated to address directly this gap.

3. Research Methodology

3.1 Research Design

This research study is a quantitative case in nature to assess HIS success in a Libyan public hospital, allowing for in-depth analysis of IS performance within constrained organizational contexts, especially when environmental constraints appear to be significant.

3.2 Research Framework and Hypotheses

Building on prior literature, eight hypotheses were developed to examine the relationships among system quality, information quality, service quality, system use, user satisfaction, net benefits, and TOE contexts.

Accordingly, based on the DeLone and McLean IS Success Model and the TOE framework, the following hypotheses are formulated:

H1: System Quality has positive impact on System Use.

H2: Information Quality has positive impact on User Satisfaction.

H3: Service Quality has positive impact on User Satisfaction.

H4: System Use has positive impact on Net Benefits.

H5: User Satisfaction has positive impact on Net Benefits.

H6: Technological Context positively affects System Quality.

H7: Organizational Context positively affects Service Quality.

H8: Environmental Context positively affects HIS Net Benefits.

3.3 Data Collection Instrument

Data of this study were obtained through a structured questionnaire adapted from previous validated instruments in some previous HIS and IS success research studies (DeLone & McLean, 2003; Petter et al., 2008). The questionnaire consisted of four sections: demographic and professional information, DeLone & McLean constructs measured with multiple items,

the TOE contextual factors, and Perceived challenges and barriers. All these items were calculated using a five-point Likert scale.

3.4 Sample and Data Collection

The subjects of the study included 44 respondents consisting of physicians, nurses, administrators, and IT staff. Therefore, this multi-stakeholder approach ensured both technical and operational perspectives and participants were voluntarily selected based on their direct involvement with the daily HIS hospital uses.

3.5 Data Analysis Techniques

The study data were analyzed using descriptive statistics in order to summarize perceptions, multiple regression and path analysis to test the hypotheses and the coefficient of determination (R^2) to assess the explanatory power. Therefore, this analytical approach is in consistent with previous HIS evaluation studies in some developing healthcare settings. Moreover, respondents participation was voluntary assuring their confidentiality and anonymity and study data were collected solely for academic research purposes and analyzed in aggregate form.

4. Findings

4.1 Respondents Profiles and Contextual Adequacy

Table 1: Background Information of the Respondents: (N = 44)

Variables	Category	Frequency (n)	Percentage (%)
Gender	Male	19	43.2
	Female	25	56.8
Age group	< 30 years	6	13.6
	30–39 years	10	22.7
	40–49 years	16	36.4
	≥ 50 years	12	27.3
Professional role	Physician	5	11.4

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Variables	Category	Frequency (n)	Percentage (%)
	Nurse	10	22.7
	Administrator	13	29.5
	IT Staff	14	31.8
	Other	2	4.6
Years of professional experience	< 5 years	10	22.7
	5–10 years	19	43.2
	> 10 years	15	34.1
Years of HIS experience	< 2 years	12	27.3
	2–5 years	26	59.1
	> 5 years	6	13.6
Hospital type	General Hospital	44	100.0

Table 1 shows the analysis of 44 valid responses obtained from a general public hospital in Libya. These respondents highly demonstrate a knowledgeable and experienced workforce, which supports the reliability of the study findings. Females appear to account for 56.8% of the respondents and males were 43.2%, which is consistent with typical healthcare gender distribution environments.

Over 63% of participants were aged 40 years or above, and more than three quarters had over five years of professional experience, and around 73% had used the HIS for more than two years indicating substantial familiarity with clinical, administrative processes and HIS operations and system performance.

The professional distribution was well distributed across IT staff accounted for (31.8%), administrators (29.5%), nurses (22.7%), and physicians (11.4%), ensuring that both technical and end-user perspectives were captured. Overall, these characteristics indicate the sample well suited to assess HIS success from organizational and technological standpoint.

4.2 Evaluation of HIS Success Using the DeLone & McLean Model

Table 2 : Means and standard deviations for the main constructs of DeLone & McLean IS Success.

Construct	No. of Items	Mean	SD	Interpretation
System Quality	5	3.34	0.79	Moderate
Information Quality	5	3.57	0.73	Moderately High
Service Quality	5	3.51	0.76	Moderate
System Use & Intention	4	3.63	0.71	Moderately High
User Satisfaction	4	3.29	0.82	Moderate
Net Benefits	5	3.74	0.69	High

Table 2 above shows the means and standard deviations for the study constructs. The descriptive findings indicate moderately positive views of HIS performance and variations across all dimensions were observed.

As illustrated above, System quality ($M = 3.34$) was reported at a moderate level of agreement, which indicates that while the basic functional requirements are met, limitations still remain in system integration, flexibility, and system reliability. Moreover, information quality achieved a moderately high score of ($M = 3.57$), which demonstrates user confidence in the accuracy, completeness, and relevance of HIS system outputs. Service quality was also rated as moderate level of ($M = 3.51$), suggesting that the IT support services exist but lack consistency in responsiveness, user assistance and problem resolution.

System use and intention to use measured as a relatively high mean ($M = 3.63$), implying that HIS use is embedded in routine hospital activities, partly driven by task dependency and organizational needs. User Satisfaction achieved a moderate level of ($M = 3.29$), indicating that continued use does not necessarily equate to positive user experience. Net benefits achieved the highest mean score ($M = 3.74$), emphasizing the perceived improvements in efficiency, coordination, reporting, and managerial decision-making.

On the whole, these results suggest that organizational benefits are being realized in spite of technical and service-related limitations, a pattern which is commonly observed in public sector HIS implementations in developing countries.

4.3 TOE Framework Assessment of HIS Readiness

Table 3: Descriptive statistics for TOE framework constructs.

TOE Dimension	No. of Items	Mean	SD	Interpretation
Technological Context	5	3.41	0.77	Moderate
Organizational Context	4	3.22	0.81	Moderate
Environmental Context	1	3.05	0.88	Moderate–Low

Table 3 shows the analysis of the TOE framework dimensions indicating uneven readiness across contexts. The technological context was reported slightly higher than other dimensions with ($M = 3.41$), which indicates acceptable infrastructure availability, basic system security, and network functionality. The organizational context clearly received a moderate level of agreement with ($M = 3.22$), which reflects some barriers associated with staff training, financial sustainability, and internal governance structures. The environmental context achieved the lowest mean score with ($M = 3.05$), pointing to weak external support regarding the current national policies, existing regulatory frameworks, and institutional coordination. On the whole, these findings suggest that HIS success in Libya is largely driven by internal hospital level efforts with limited support from the broader policy and regulatory environment.

4.4 Barriers to Effective HIS Adoption.

The data obtained indicated that respondents were able to identify some key obstacles concerning effective HIS use, some of these include system downtime and infrastructure instability, insufficient user training, resistance to organizational change, and limited technical support capacity. These findings also revealed that mean scores were reported above the neutral point representing a widespread agreement about these challenges could constrain effective HIS utilization and thereby slow progression toward more advanced digital health solutions

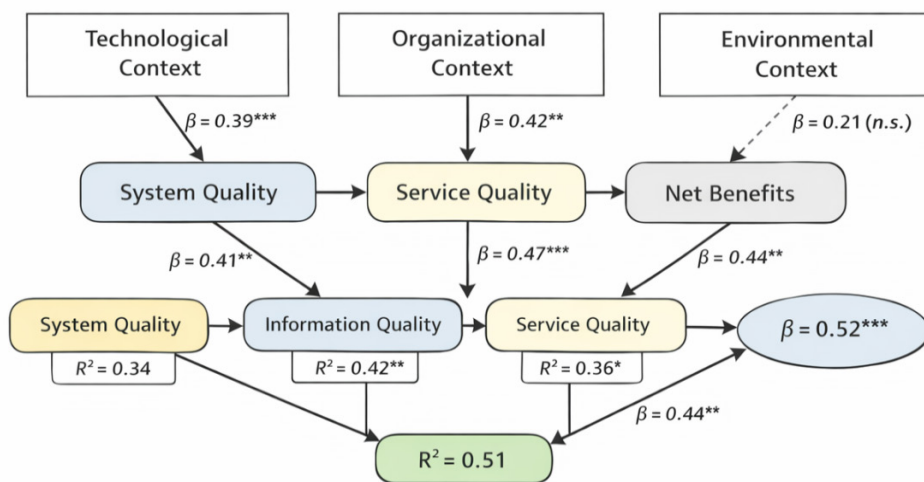


Figure 1 Integrated Structural Model

As illustrated in Figure 1, the integrated structural model presents some significant statistical relationships which are consistent with the theoretical underpinnings.

TOE Effects on HIS Success Dimensions:

- 1.. The technological context had significant impact on system quality reported at ($\beta = 0.39, p < 0.001$), which supports the role of reliable infrastructure and technical readiness.
2. The organizational context had significant impact on service quality, which was observed at ($\beta = 0.42, p < 0.01$), emphasizing the importance of management support, staff training, and resource availability.

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3. The environmental context did not have any significant impact on net benefits estimating at ($\beta = 0.21, p = 0.091$), which suggests that external policies currently used have almost limited practical impact on HIS outcomes

Internal relationships within the DeLone & McLean Model are as follows:

-System Quality $\rightarrow \rightarrow$ System Use: $\beta = 0.41, p < 0.01$

-Information Quality $\rightarrow \rightarrow$ User Satisfaction: $\beta = 0.47, p < 0.001$

-Service Quality $\rightarrow \rightarrow$ User Satisfaction: $\beta = 0.36, p < 0.05$

Seemingly, these results therefore support the causal relationship proposed by DeLone and McLean, especially in stressing the paramount importance of information quality and service support in influencing users' attitudes.

Determinants of Net Benefits.

System use arose as the strongest predictor of net benefits at ($\beta = 0.52, p < 0.001$), which was followed by user satisfaction at ($\beta = 0.44, p < 0.01$).

This theoretical model explains 51% of the variance in net benefits, which confirms explanatory power for organizational IS research outcomes in complex healthcare settings.

4.6 Regression Analysis Findings

For the purpose of the study, multiple regression analysis was carried out to examine the hypothesized relationships.

Table 4: shows the standardized regression coefficients (β), t-values, and significance levels.

Hypotheses	Path	β	t-value	p-value	Result
H1	System Quality \rightarrow System Use	0.41	2.89	0.006	Supported

Hypotheses	Path	β	t-value	p-value	Result
H2	Information Quality → User Satisfaction	0.47	3.21	0.002	Supported
H3	Service Quality → User Satisfaction	0.36	2.54	0.015	Supported
H4	System Use → Net Benefits	0.52	3.87	<0.001	Supported
H5	User Satisfaction → Net Benefits	0.44	3.12	0.003	Supported
H6	Technological Context → System Quality	0.39	2.68	0.010	Supported
H7	Organizational Context → Service Quality	0.42	2.94	0.005	Supported
H8	Environmental Context → Net Benefits	0.21	1.73	0.091	Not Supported

4.7 Model Explanatory Power

The regression models showed moderate to substantial explanatory power:

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- System Use: $R^2 = 0.34$
- User Satisfaction: $R^2 = 0.46$
- Net Benefits: $R^2 = 0.51$

These values indicate that the proposed model accounts for a meaningful to substantial proportion of variance, which is appropriate given the complexity of organizational and environmental complexities in public healthcare systems.

5. Discussion

5.1 Hypothesis Testing

The findings of hypothesis testing showed strong empirical support for the DeLone & McLean IS Success Model within the Libyan public hospital setting.

System and Information Quality Effects

System Quality had a significant impact on System Use (H1), confirming that reliability, ease of use, and system integration are key determinants of HIS adoption. Information Quality showed the strongest impact on User Satisfaction (H2), stressing that accurate relevance of information are more important than technical sophistication in shaping user perceptions in healthcare environments.

Role of Service Quality

Service Quality had a positive impact on User Satisfaction (H3), indicating the importance of timely IT support and technical competence. This findings is therefore consistent with descriptive findings, which indicated moderate yet inconsistent perceptions of IT service performance.

Drivers of Net Benefits

It is clear that both System Use (H4) and User Satisfaction (H5) significantly predicted Net Benefits, with System Use being the strongest determinant. This finding indicates that HIS benefits in Libyan public hospitals are primarily driven by actual system usage and task-dependent, implying a context of mandatory adoption rather than voluntary use.

TOE Framework Effects

The findings of the study revealed that technological context had a strong impact on system quality (H6), which indicated that infrastructure and technical resources are the considered the major determinants of HIS performance. Likewise, the organizational context was found to have significant impact on service quality (H7), which reflects the vital role of management support, staff training, and financial resource availability. However, the environmental context did not seem to have any significant impact on net benefits (H8), which suggests that national policies and regulations currently used have almost very limited influence on HIS outcomes at the hospital level. Overall, these findings support the integrated DeLone & McLean model and TOE framework thereby confirming that HIS success is driven by interdependent technological, organizational, and user related factors, while environmental factors remain weak.

5.2 System, Information, and Service Quality

Based on the findings obtained, system quality received a moderate rating level of agreement, indicating the existence of some common limitations in interoperability, flexibility, and infrastructure stability in public hospital settings (Saghaeiannejad et al., 2015; Ibrahim et al., 2016). Consistent with the model of DeLone & McLean, system quality remains a significant determinant of system use and overall performance.

Information quality was perceived as a higher rating demonstrating user confidence in the accuracy, completeness, and relevance of HIS outputs. This finding supports prior healthcare research studies which reported that information quality was the strongest predictor of user satisfaction (Ojo, 2017; Nuryanti et al., 2021; Kabir et al., 2022).

Service quality received a moderate rating that revealed inconsistent IT support and limited user guidance. These findings emphasize the importance of organizational support structures in shaping effective service quality outcomes (Pitt et al., 1997; Maebood Mojdehi et al., 2020)

5.3 System Use and User Satisfaction

Despite the moderate level of user satisfaction, the relatively high level of System Use, indicates a mandatory use environment typical of public

hospitals. This pattern therefore, aligns with previous research studies in healthcare IS settings, showing that system use is often driven by institutional requirements rather than voluntary implementation (Tilahun & Fritz, 2015; Farzandipour et al., 2016).

Furthermore, User Satisfaction appears to be strongly dependent on more perceived information and service quality than on system use alone, which is consistent with the study finding of Seddon's (1997) respecification of IS success and observations from the Middle East and Asia hospitals (Saghaeiannejad et al., 2015; Kabir et al., 2022).

5.4 Net Benefits and Organizational Performance

It is evident that Net Benefits achieved the highest ratings, indicating that HIS positively supports efficiency, coordination, reporting, and managerial decision-making. Although only moderate system and service quality, sustained system use enabled tangible organizational improvements, which is similar to other research findings from public hospitals in Ethiopia, Malaysia, and Iran (Tilahun & Fritz, 2015; Ibrahim et al., 2016).

5.5 TOE-Related Organizational and Contextual Effects.

The data showed that technological readiness had a significant impact on system quality, which suggests that adequate infrastructure and technical reliability are essential elements for effective HIS performance (Ahmadi & Ibrahim, 2015; Demirel, 2024). Similarly, the organizational context had a strong effect on service quality, indicating the important role of management support, staff training, and financial resources (Norton et al., 2019; Silvanus, 2020). In contrast, the environmental context did not show any significantly influence on Net Benefits, reflecting weak national-level digital health governance. This challenge is similarly reported in other developing healthcare systems (Negash et al., 2018; Mboera et al., 2021).

5.6 Challenges and Readiness for Advanced Digital Health Systems

Some key barriers were observed such as resistance to change, inadequate training, and infrastructure constraints, which reflect challenges widely reported in research studies in low-resource HIS settings (Yusof et al., 2008; Abouzahra, 2011). Although HIS currently delivers measurable organizational

benefits, readiness for more advanced digital health solutions remains limited, consistent with findings from systematic reviews on health IT effectiveness (Kruse & Beane, 2018; Ismail et al., 2020).

6. Conclusion

This study evaluated Hospital Information Systems (HIS) in a Libyan public hospital using an integrated DeLone and McLean IS Success Model and the (TOE) framework. The findings of the study revealed that HIS adoption has produced clear net benefits, especially in improving administrative efficiency, decision support and managerial decision-making, and information availability. These results confirm that HIS produces tangible organizational value despite the resource-constrained healthcare environments that may exist. However, the study also revealed that system quality, service quality, and user satisfaction remain at moderate levels, indicating HIS success is functional rather than optimal performance. Technical shortcomings, inconsistent IT support, and partial system integration, constrain user experience and reduce national policy and regulatory frameworks constrain sustainability and scalability. From a TOE perspective, technological readiness slightly exceeds organizational and environmental readiness, indicating structural imbalances in HIS adoption.

Overall, the study concluded that success in HIS in Libya can be driven more by necessities and perceived benefits rather than by system excellence. Additionally, long term success will require coordinated improvements across technical infrastructure and organizational capacity as well as human resource development, and national digital health governance. Finally, the integrated DeLone & McLean model with the TOE framework can offer a clear evaluation lens for HIS in healthcare settings in some developing countries, like Libya.

7. Recommendations

Based on the obtained empirical findings , the following recommendations are proposed across technical, organizational, and policy dimensions:

7.1 Technical Recommendations

- To improve the system integration and interoperability in order to enable seamless data exchange between clinical and administrative units as well as diagnostic units.

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- To upgrade the existing hardware system, network infrastructure, and power backup systems in order to reduce downtime and improve system reliability.
- To enhance the current data security, backup, and recovery mechanisms in order to ensure sensitive health data.
- To implement continuous system evaluation and performance monitoring in order to identify technical and usability issues.

7.2 Organizational and Managerial Recommendations

- To establish structured and ongoing HIS training programs designed for different group users such as physicians, nurses, administrators, and IT staff.
- To enhance top management support by embedding HIS objectives into hospital strategic plans and performance indicators.
- To assign sustainable financial resources for system maintenance, upgrades, and user support rather than focusing only on initial implementation.
- To develop clear HIS usage policies, national guidelines and standard operating procedures in order to promote consistent and effective system performance.

7.3 Human and Change Management Recommendations

- To address resistance to change through user engagement, participatory system design, and feedback mechanisms.
- To raise digital health awareness and IT literacy among healthcare professionals in order to improve acceptance and satisfaction.
- To designate HIS champions or super-users within departments in order to provide peer support and assist information sharing.

Overall, This study provides a practical guidance for improving HIS, policy-relevant information for decision makers and national digital health governance, and theoretical support for an integrated IS evaluation framework in a developing country healthcare setting, like Libya. It also offers a baseline foundation for advancing sustainable digital health development in Libya.

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