

"The Impact of Implementing E-Management on Service Quality in Water Establishments in Lebanon: A Case Study of the South Lebanon Water Establishment (Sidon Department)"

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Abstract

The public sector sector has experienced a substantial shift over the last couple of decades to incorporate digital technology into its operations to make them more modern. Electronic administration (e-administration) processes are essential in critical utility fields such as the water sector, to enhance service delivery. The aim of this study is to explore the effects of the introduction of e-administration on the perceived service quality at South Lebanon Water Establishment (SLWE) in Sidon.

The descriptive-analytical research method was used. Primary data was collected from a convenience sample of 150 active subscribers from a target population of around 54,000 subscribers in the first quarter of 2024 through a structured questionnaire. The Statistical Package for the Social Sciences (SPSS) was used for data analysis.

The descriptive statistics showed that subscribers were of positive inclination and preparedness towards the use of the digital channels, giving a mean score of 3.55 for the e-administration use. Overall dimension averages in terms of perceived service quality of the SERVQUAL framework were high. Assurance was found to be the highest (mean = 4.01), followed by responsiveness (mean = 3.90), reliability (mean = 3.87), empathy (mean = 3.86), and tangibles (mean = 3.76).

The results of the Pearson correlation analysis showed that the use of e-administration and service quality were moderately positively correlated, and statistically significant ($r = 0.486$, $p < 0.001$), confirming the primary hypothesis. Moreover, the results indicated that e-administration had significant positive correlation with all the five individual factors of SERVQUAL. Empathy showed the highest association ($r = 0.491$, $p < 0.001$), followed by tangibles ($r = 0.482$, $p < 0.001$), assurance ($r = 0.454$, $p < 0.001$), responsiveness ($r = 0.452$, $p < 0.001$), and reliability ($r = 0.411$, $p < 0.001$).

Considering these results, the enhancement of the digital infrastructure continued in this establishment and the creation of support mechanisms for various groups of users for inclusive and sustainable service delivery is recommended.

Keywords: Electronic Administration, Service Quality, SERVQUAL model, water sector, South Lebanon Water Establishment.

1. Introduction

1.1 Theoretical Context

The process of transformation of operational and administrative structure of public and private sector organizations around the globe with the emergence of Information and Communication Technology (ICT) has been truly remarkable. This technological development has helped the emergence of the concept of electronic administration as a new management paradigm. Digital technologies are used by the public organizations to enhance public service quality, to minimize paper intensive processes and to optimize administrative processes (Al-Hujran et al., 2021; AlMulhim, 2023). E-administration has thus

become not just a choice public institution can make, but a strategic necessity in order to meet performance requirements and expectations of citizens in the modern world (United Nations, 2022).

Municipal water utilities are closely related to the public health, daily life and sustainable development among public services. As the administration of water institutions becomes more complex, the technical problems related to bills processing, customer records, technical complaints, etc. as well as customer communication become more complex. Therefore, digital administration channels in water utilities are essential to enhancing the operational capacity and trust by the public.

1.2 Statement of the Problem

In the midst of the modernization programs implemented in public utility companies in Lebanon, there are still many water companies that struggle in relation to the speed they deliver water services, the efficiency of their operations and their responsiveness to subscriber queries. Moreover, the level of implementation of e-administration in Lebanese government institutions is not uniform. There is a limited amount of empirical evidence on the impact that these digital platforms have on subscribers' perceptions of the quality of the public service. This study aims to address these concerns by conducting a survey of the sidon Water Department of the South Lebanon Water Establishment (SLWE) to determine the perceptions of the digital platforms and processes used by subscribers in 2024.

The main research question which guided this inquiry is: What is the impact of implementing e-administration on the quality of services at South Lebanon Water Establishment Sidon Water Department? For a structured analysis, the main question is broken down into a number of specific sub-questions. What is the perceived quality of the services provided at SLWE with consumers? Second, what is the connection between implementation of e-administration and perceived service tangibles? Thirdly, what impact does the introduction of e-administration have on service reliability perception? Fourth, how can the implementation of e-administration help to improve the service responsiveness perception? Fifth, what effect does the implementation of e-administration have on perceived service assurance? Lastly; what impact does the implementation of e-administration have on or boost perceived service empathy?

1.3 Structural Roadmap

The authors believe that e-administration in public utilities is linked to positive relationships between the user's service quality assessments and each of the five main dimensions of the SERVQUAL framework. This argument is presented by first going through literature and theoretical framework of e-administration and service quality as used in the SERVQUAL model. It then provides a description of the research design which involves sample characteristics, variables and statistical models. This is followed by descriptive and bivariate statistical results presented, including detailed text description of all tables processed. In the discussion section, the empirical results are then set in the context of the public administration related literature. Finally, the paper provides a summary, limitations of the research, and suggested future research directions.

2. Theoretical Framework & Literature Review

2.1.1 What is E-Administration?

In the case of electronic administration, ICT tools are used to support planning, organizing, directing and controlling organizational processes to increase operational efficiency and the quality of public services (Al-Hujran et al., 2021). Digitalization of existing manual processes is not the only aspect of what is referred to as e-administration, but rather part of a re-engineering of administrative processes that combines human and technical as well as organizational elements (Vial, 2019). The integration provides a benefit by accelerating decision making, better interdepartmental communication and better transparency of data (Wirtz et al., 2019).

With the mass commercialization of the internet in the late 1990s, the process of e-administration has increased in pace. Public entities started moving from a simple database application to an interactive transactional platform, enabling citizens to have access to public services from a distance (United Nations, 2022). New technologies such as cloud, big data analytics and automated ticketing have also begun to improve public services delivery and cut costs and increase transparency, allowing for reduced time spent on manual and paper-based processes (Mamakou & Cohen, 2023).

2.2 The SERVQUAL Model and Service Quality

Service quality is referred to as whether the service fulfills or exceeds customer expectations (Parasuraman et al., 1985). Services are intangible, heterogeneous, and produced and consumed at the

same time, unlike physical products, making it difficult to measure them objectively. Service quality plays a significant role in public administration as it influences public trust, equity and civic satisfaction (Shareef et al., 2021).

Parasuraman, Zeithaml and Berry developed the SERVQUAL model for systematically measuring the service quality. This is a service quality framework which contains 5 dimensions. The tangibles dimension is the look of people, communication materials, technological equipment and physical infrastructures. Reliability has to do with the organization's ability to provide the promised service in an accurate, consistent and dependable manner. Responsiveness reflects the eagerness of staff to help the user and provide timely, timely services. Assurance looks at the knowledge of staff, courtesy of staff and competence of staff, and these aspects contribute to user safety and trust. Lastly, empathy is a demonstration of “special” care and treatment for users.

2.3- Linking E-Administration with Service Quality in Water Utilities

Digital service quality is the manifestation of traditional service quality concepts in the electronic environment, which is the ease, efficiency, security, and reliability by which digital platforms provide public services (AlMulhim, 2023). The integration of e-administration tools can have an impact on all five SERVQUAL dimensions for the water utilities. Modern service delivery channels include enhanced digital interfaces and strong technical networks in terms of tangibles. As far as reliability is concerned, automation minimizes the chances of human error in transactions, leading to uniform billing and documentation. Digital communication can help speed up the processing of requests and response time for any inquiries regarding responsiveness. In the assurance aspect, secure payment systems and clear digital records foster confidence and trust in user data. Last but not least, in terms of empathy, citizens can finalize a transaction on a flexible schedule, in line with their own preferences.

Studies on e-government shows that in general, the use of e-tools is positively associated with the perception of public services, but empirical studies on e-government to municipal water departments in the administrative context of Lebanon are limited. This research seeks to fill this gap by evaluating the relationships at the Sidon Water Department of the SLWE.

3. Data and Methodology

The data source and sample characteristics are discussed below. The data source and sample characteristics are described below.

The study used descriptive – analytical approach to explore the relationship between e-administration and service quality. Primary data was collected in Q1 2024. The target population consisted of the registered subscribers of the Sidon Water Department of the South Lebanon Water Establishment (SLWE), about 54,000. Because of resource and time limitations the author used a convenience sampling technique. Subscribers who visited the department's headquarters or who used its service options in the digital realm were invited to participate. 150 completed questionnaires were collected and analysed on the SPSS program.

3.1 Measurement of Variables

In this research, the variables are operationalised so as to be measurable quantitatively. The independent variable is e-administration implementation and use, which is measured by a ten item scale based on user readiness, confidence, system integration, perceived ease of use and complexity. Perceived service quality is the dependent variable and is measured on a 29 item scale based on the acclaimed SERVQUAL dimensions (six items for tangibles, six items for reliability, eight items for responsiveness, five items for assurance, and eight items for empathy). Each item is measured on a 5-point likert scale from strongly disagree, to strongly agree. Furthermore, demographic factors such as gender, age, education, occupation and duration of subscription are used as control variables to account for potential baseline differences in the perceptions of the subscribers.

4 Research Hypotheses

This study has five sub-hypotheses, supported by a primary hypothesis. The main hypothesis (H1) suggests that there is a significant connection between the implementation of e-Administration and service quality. The first sub-hypothesis (H1.1) suggests that there is a statistically significant relationship between e-administration and tangibles. The second sub-hypothesis (H1.2) suggests that there will be a statistical relationship between e-administration and reliability. The third sub-hypothesis (H1.3) suggests that there is a statistically significant relationship between responsiveness and e-administration. The fourth sub-hypothesis (H1.4) suggests that there is a statically significant

relationship between e-administration and assurance. Lastly, the fifth sub-hypothesis (H1.5) suggests that there is a statistically significant relationship between e-administration and empathy.

4.1 Statistical Model

SPSS was used to analyze the data. Sample demographics and item distributions were examined using standard descriptive statistics, such as frequencies, percentages, arithmetic means, and standard deviations. Pearson product-moment correlation coefficients (r) The linear relationships hypothesized in the first hypothesis was tested by the two methods and the significance level was set at $p < 0.01$

5. Results (Findings)

The results of the statistical analysis of the subscribers survey are presented in this section ($N=150$). The text starts with a description of the respondents demography, item level descriptive statistics for e-administration use, item level descriptive statistics for the five dimensions of the SERVQUAL model and finally, the hypothesis testing results.

6. Electronic Administration

6.1 Concept of E-Administration

Over the past few decades, there has been an enormous improvement in the administrative procedures of public and private organizations with the introduction of the Information and Communication Technology (ICT). This technological transformation has led to the development of electronic administration (e-administration), which is a new administration style using electronic tools to carry out various organizational tasks and functions so as to optimize the performance of the institution and enhance the quality of services provided to users (Al-Hujran et al. 2021).

In general, e-administration is understood as the application of ICT in the planning, organizing, directing, and controlling functions of organizational activities in order to modernize the performance of the activities and make them administration efficient. It is one of the supports of the digital transformation approaches adopted by modern organizations to keep pace with the changes in technology and meet the needs of their clients (AlMulhim 2023).

It is important to note that e-administration is not only about using computers or the internet to perform administrative tasks. It is the complete re-engineering of workflows, processes, and structures to accommodate the modern digital environment and to ensure integration between human and technological resources and organizational resources (Vial 2019). e-Administration helps to enhance the communication and information flow between different departments within the organization and provides accurate and timely information. This in turn, improves managerial decisions and the quality of public service provision (Wirtz et al. 2019).

6.2 Development and Source of E-Administration

The development of e-administration can be traced back to the ongoing evolution of ICT in the second half of the twentieth century. At first, organisations made use of electronic computers merely for data storage and easy processing. These applications have grown over the years and are now used to handle complex information directories and organisational processes (Vial 2019).

Commercialization of the internet in 1990's led to paradigm change in public service delivery. Organizations were now able to provide public services electronically without requiring a person to physically visit them. This change also led to the emergence of new ideas like electronic government (e-government), digital administration and smart services (United Nations 2022).

In recent years, e-administration has been further improved by the incorporation of advanced technology, such as cloud computing, artificial intelligence (AI) and big data analytics. These innovations allow public institutions to provide public services faster, more flexibly and more cost effectively, and promote increased transparency and accountability of the institutions (Wirtz et al. 2019). Digital transformation is part of the United Nations' emphasis on tools and instruments that can be used for enabling public sector modernization, and boosting citizens' trust in public services (United Nations 2022).

6.3 Objectives of E-Administration

E-administration is a strategy that aims to achieve several strategic objectives collectively that improve the performance of institutions and enhance public administration service delivery using ICTs in the process of administration (AlMulhim 2023; United Nations 2024).

- First: Improving Service Quality. Digital systems contribute to the administration; they also speed up the delivery of services and provide reliable communication channels, which has a positive impact on the perceived quality of the services to be provided (Mamakou and Cohen 2023; Ilieva et al. 2024).
- Second: Increasing Administrative Efficiency. E-administration should increase the efficiency of the use of human and material resources to reduce the repetition of activities, administrative delays, and procedures and improve productivity and the overall performance of the institutional (AlMulhim 2023).
- Third: Promoting Transparency. Electronic systems are used to establish and keep digital, permanent records, to document and monitor administrative activity. This helps to improve the process, while also providing transparency and accountability of public departments (United Nations 2022).

Fourth: Supporting Decision Making. E-administration offers comprehensive databases and real-time information inputs, which allow for the analysis of an organisational problem, and informed and evidence-based decision-making (Wirtz et al. 2019).

Fifth: Lowering the cost of operation. The elimination of print-based processes will create cost savings in the print cost, paper storage, administrative travel, and other associated cost savings that will lead to a more cost effective institutional operation (AlMulhim 2023).

6.4 Characteristics of E-Administration

The use of E-administration has several important aspects which set it apart from the conventional administration:

Digital networks allow for real-time processing of transactions and information, which can help to speed up service delivery and enhance the user experience (Mamakou and Cohen 2023).

2. Accuracy: Automated processing removes human mistakes that may occur when dealing with information and in manual data entry, leading to more accurate administrative results and aiding in administrative decision-making (AlMulhim 2023).
3. Integration: E-administration is about the linkage of various departments and structural units via the use of shared databases and information systems, so they can work together (Vial 2019).
4. Flexibility: E-administration can be adaptable to speedy changes or association of innovations, can improve services consistently to satisfy the subscriber's demands (United nations 2022).
5. Transparency: Digital processes record the process of every step; clear and verifiable documentation of processes can be realized resulting in increased transparency of the institution and trust among clients (Wirtz et al. 2019).

Information Accessibility: Employees and subscribers can easily access important information and services through electronic portals, enhancing the convenience and usability of services (Mamakou and Cohen 2023).

The Water Sector and E-Administration.

It is an important component of the National Water Programme. . For water utilities around the globe, electronic administration is an essential asset to enhance performance. The water industry is one of the essential public services that needs to accurately and efficiently allocate resources and deliver services to subscribers. With the introduction of e-administration, these utilities have modernized, with the optimized management of the databases and the introduction of automated billing systems, digital payment channels, and systems for resolving complaints and inquiries (United Nations 2022). In addition, e-administration has a positive effect on improving the direct communication between subscribers and utilities, offering them the necessary information in real time, which leads to better communication transparency and customer satisfaction (AlMulhim 2023).

6- 5 Conclusion on Electronic Administration

To sum up, e-administration is a main avenue for modernizing public utility institutions and has many capabilities that can be used to enhance their performance and improve the service delivery. Its significance in the water utility industry is growing more and more critical as the need for better service and more efficient work processes continues.

7. Service Quality

Service Quality is presented in the following sections, combining definitions and contextual applications in the public and digital sectors.

7.1 The Concept of Service Quality

One of the basic concepts in management and marketing literature is service quality, because it is one of the most important factors in the assessment of service organizations' performance and their ability to satisfy needs and expectations of the beneficiaries. This concept has garnered much attention from researchers because it is directly related to customer satisfaction, loyalty and improvement of the organization's corporate image (Parasuraman et al., 1985). Service quality is a concept that is understood and discussed in various ways, but it remains a central tool for measuring a service organization's performance.

Service quality is the extent to which beneficiaries' expectations of a service before their consumption are met by the service they receive after their consumption. The level of perceived performance is linked to recipients' perception of service quality, with a high level of perceived performance equating with a high level of service quality and a low level of perceived performance equating with low level of service quality (Parasuraman et al., 1988).

Zeithaml et al (2020) defines service quality as the overall general perception of the recipient of the service as excellent and the degree which the service fulfills the recipient's various needs and requirements. An ongoing, and a dependent, evaluation process, which relates to what the beneficiaries have gone through before and what they will go through after.

In public institutions, the quality of service is an important one as it is related to the effectiveness and fairness of public/government institutions in serving the needs of citizens equally and transparently so as to achieve public satisfaction and strengthen citizens' trust in the public/government institutions (Shareef et al., 2021).

This lesson focuses on the role of service quality. This lesson highlights the importance of service quality.

The role of service quality in service institutions becomes more and more significant as the means to build trust in service institutions, corporate image and the efficiency of service actions, respectively. The quality of service has the power to enhance the relationship between the beneficiaries and the organisation and hence the level of satisfaction and institutional trust. Recent studies have found that improving the quality of service is crucial to the success of electronic services, laying the foundation for citizens' uptake and continued usage of digital services (Mamakou & Cohen, 2023).

7.2 Quality Control in Public Services and E-Service Quality

In recent years, public institutions have become more and more interested in enhancing the quality of services to citizens as a result of digitization and technological changes that have established new standards to assess the performance of public institutions (United Nations, 2022). They strive to enhance the quality of their services by implementing measures that aim to simplify administrative procedures, establish new communication links with the citizens and make the services provided to the beneficiaries easier and faster to access, with less effort (Al-Hujran et al., 2021). In addition, the speed of transaction is not sufficient in determining the quality of services provided in public institutions anymore, but also transparency, the spirit and quality of services, fairness, ease of access to information and the ability to respond effectively to the needs of citizens (Shareef et al., 2021).

As a result of the increasing adoption of Information and Communication Technology (ICT) this concept of traditional service quality has been transformed in the digital world to electronic service quality, or e-service quality. E-service quality is the capacity of an organization to deliver efficient, convenient, friendly, dependable and safe e-services that satisfy the needs of beneficiaries and give them satisfaction with the e-services delivered (Al-Hujran et al., 2021).

The quality of E-service is influenced by a number of factors:

- The ease of navigation/use of electronic systems.
- The quickness in which requests and enquiries are responded to.
- Correctness of the information given.

The reliability of electronic systems.

Data privacy and protection.

- Continuous service availability.

This quality of e-services is essential for the success of electronic management (e-management) and electronic government (e-government) initiatives, in order to ensure the sustainability of beneficiaries' use of digital services (AlMulhim, 2023).

Students will learn how to use the SERVQUAL model for measuring service quality. The SERVQUAL model is one of the most popular models used to measure service quality in administrative and service studies. It is developed by Parasuraman et al. (1985) & (1988) and it is a measure of the gap between what consumers/beneficiaries expect and what they receive/perceive from the service. The model has five basic dimensions: tangibles, reliability, responsiveness, assurance, and empathy, which are believed to be the core dimensions of service quality. Model has been extensively used and successfully tested in research on public and public online services, and therefore is applicable to measure the service quality.

7.3 Dimensions of Service Quality (Detailed Breakdown)

In both traditional and electronic administration environments, the five dimensions of service quality (Parasuraman et al., 1988) are relevant:

Tangibles (Tangibility): Refers to the physical, technical and visual aspect of providing the service, such as the buildings, facilities, technological infrastructure, equipment, communication media, and the appearance of the staff. From the perspective of e-administration, tangibility is defined by the characteristics of digital portals, ease of access, availability of technical equipment, and technological readiness of the systems used for the provision of services (AlMulhim, 2023).

Reliability: The ability of the institution to deliver services as promised in time, in quantity, correctly, repeatedly and right the first time. This dimension affects the satisfaction level a lot as it has a direct link with the beneficiaries' trust in the credibility of the organization and the reliability of the systems employed (Zeithaml et al., 2020).

Responsiveness: is willing and has a tendency to respond to user requests, questions, transactions, complaints and requests efficiently and rapidly. It also matters more for electronic services since beneficiaries demand immediate or “real-time” responses through digital channels (Shareef et al., 2021).

Assurance – Competence, knowledge, professional behaviour of its employees, and the credibility of its procedures in instilling trust, confidence and security in its beneficiaries. Assurance extends to information security, robust data privacy measures, and the reliability of the platforms in digital environments (Al-Hujran et al., 2021).

Empathy: Providing special, one to one care and one to one attention to the beneficiaries, acknowledging their differences, and trying to provide them with different care. It enhances the utility provider – subscriber relationship by showing a high degree of sensitivity to the different requirements (Zeithaml et al., 2020).

7.4. The Water Sector has a Service Quality of

As a public utility sector affecting citizens' life, water supply quality improvement is also one of the principal strategic aims of the governments. Water sector service quality refers to a variety of elements including access to services, the accuracy of billing, the time taken to respond to network faults, and responsiveness of customer service to complaints and enquiries, as well as the time taken to provide administrative information to subscribers (United Nations, 2022).

The water sector has undergone modernization thanks to the implementation of e-administration; this includes automation of administrative processes, the introduction of new electronic payment methods, the enhancement of customer databases, and communication. These are all factors that have helped to improve the quality of the services and contribute to increases in customer satisfaction (AlMulhim, 2023).

7.5 Link Between E-Administration and Service Quality

Based on modern literature, the adoption of electronic administration is a key factor contributing to improving the quality of services provided to beneficiaries. Incorporating ICT streamlines processes, increases accuracy, reduces transaction times, enhances information security, and establishes flexible communication networks. These positive impacts directly translate into the five dimensions of the SERVQUAL model (Parasuraman et al., 1988). The specific effects based on previous empirical research (AlMulhim, 2023; Pham et al., 2023; Mensah et al., 2022; Shahzad et al., 2022) are outlined below:

SERVQUAL Dimensions	Impact of Electronic Administration (E-Administration)
Tangibles (Tangibility)	E-administration contributes to developing the technological infrastructure, improving digital platforms, and modernizing service delivery channels, thereby enhancing the perceived physical and technological aspects of the service.
Reliability	E-administration increases operational accuracy, reduces administrative errors, and improves the consistency of service delivery, thereby strengthening service reliability.
Responsiveness	E-administration enables organizations to deliver services more rapidly and process requests, inquiries, and complaints with greater efficiency.

SERVQUAL Dimensions	Impact of Electronic Administration (E-Administration)
Assurance	E-administration enhances beneficiary trust by securing information, protecting data, and improving employee efficiency in delivering electronic services.
Empathy	E-administration facilitates the delivery of more personalized, flexible, and convenient services tailored to the diverse needs of beneficiaries.

Given that the use of e-administration has contributed positively to improving these five dimensions in various studies, this present study hypothesized that it has the same positive effect on the five dimensions of service quality at the Sidon Water Department.

8. Field Study and Statistical Results

8.1 Research Model and Hypotheses

Based on the adapted SERVQUAL model and related literature, the following main hypothesis is formulated:

The use of electronic administration in the Saida Water Department has a positive contribution to increasing the five dimensions of service quality (tangibles, reliability, responsiveness, assurance, and empathy). This is empirically tested below.

8.2 Demographic Analysis of South Lebanon Water Utility Customers

The demographic characteristics of the study sample (150 customers of the Saida Water Department) revealed a wide dispersion of personal and professional characteristics.

Demographic Category	Variable	Frequency	Percentage (%)
Gender	Male	64	42.7%
Gender	Female	86	57.3%
Age Group	20-29 years	16	10.7%
Age Group	30-39 years	36	24.0%
Age Group	40-49 years	59	39.3%
Age Group	50 years and above	39	26.0%
Educational Level	Secondary and below	17	11.3%
Educational Level	Bachelor's Degree	75	50.0%

Demographic Category	Variable	Frequency	Percentage (%)
Educational Level	Master's Degree	43	28.7%
Educational Level	Doctorate	15	10.0%
Profession	Employee	84	56.0%
Profession	Self-employed	31	20.7%
Profession	Unemployed	35	23.3%
Customer Duration	10 years and below	34	22.7%
Customer Duration	11 to 20 years	45	30.0%
Customer Duration	21 to 30 years	32	21.3%
Customer Duration	More than 30 years	39	26.0%

Females represented 57.3% of the sample, and the 40-49 age group had the highest percentage (39.3%). Half of the sample possessed a bachelor's degree (50.0%), and the largest customer duration bracket was 11-20 years (30.0%). Employees formed the dominant professional category (56.0%).

8.3 Statistical Metrics of Electronic Management User Engagement

The status of Electronic Management Use and Readiness for Digital Transformation indicated a highly favorable general trend towards digital transformation.

Statement	Mean Score	Standard Deviation	Engagement Category (Inferred)
I think I would like to use electronic services frequently	4.63	0.52	Positive
I prefer using electronic management in my official transactions	4.47	0.72	Positive
I feel confident in using electronic management services	4.37	0.78	Positive
I believe the institution's electronic services were easy to use	4.08	0.79	Positive

Statement	Mean Score	Standard Deviation	Engagement Category (Inferred)
I imagine that most people will learn to use electronic applications and services quickly	3.91	0.83	Positive
I find that the various functions in the available electronic management are well integrated	3.69	0.84	Positive
Use of electronic management (Total/Average)	3.55	0.43	Neutral
I need technical support to use electronic services	2.93	1.07	Negative
I need a lot of things before I can use electronic management in my transactions	2.67	1.01	Negative
I find electronic services unnecessarily complex	2.55	0.94	Negative

Statement	Mean Score	Standard Deviation	Engagement Category (Inferred)
I find it very difficult to use electronic services	2.22	0.88	Negative

The desire to use electronic services ranked first (Mean = 4.63). Negative statements showed a significant decrease, confirming the clarity and suitability of the implemented systems.

8.4 Statistical Analysis of Customer Perceptions Regarding Service Tangibility

The "Tangibles" dimension showed a positive general trend regarding the physical and technical aspects of the establishment.

Survey Item	Arithmetic Mean	Standard Deviation
Tangibility (Total)	3.76	0.83
The management of the institution seeks the continuity of services.	4.05	0.90
The institution takes the initiative to adopt new ideas and methods to develop work.	3.77	1.00

Survey Item	Arithmetic Mean	Standard Deviation
The general appearance of the institution's offices reflects the ability to provide services.	3.70	0.93
Customer service offices are compatible with the nature of the desired services.	3.70	0.91
The institution has modern electronic technologies available (website, social media, etc.).	3.68	0.93
The institution's management strives to avoid problems before they occur.	3.63	1.03

8.5 Statistical Metrics of Institutional Reliability and Customer Trust

Respondents showed a generally positive attitude towards the reliability of the services provided.

Reliability Factor Statement	Arithmetic Mean	Standard Deviation
The institution's transactions are characterized by credibility in providing services.	3.95	0.95
I trust that my transactions will be completed.	3.93	0.99
Management provides accurate documentation systems and records that enable reviewers to obtain a document when needed.	3.89	0.90
Reliability (Overall)	3.87	0.77
Employees handle tasks professionally and respect the wishes of citizens.	3.84	0.91
The institution is capable of fulfilling promises (service delivery times, payment, transaction receipt dates, etc.).	3.76	1.03
The institution has appropriate facilities for everyone, including those with special needs.	3.35	0.98

8.6 Statistical Metrics of Customer Responsiveness in Electronic Management

The overall value of the "Responsiveness" dimension was generally positive.

Statement	Arithmetic Mean	Standard Deviation
Responsiveness (Overall)	3.90	0.89
Electronic management reduces the loss and damage of transactions.	4.37	0.78
The organization's management is ready to guide and direct citizens.	4.02	0.90
Employees answer citizens' questions and inquiries quickly.	3.97	0.94
I get the necessary explanations and clarifications about laws and work mechanisms.	3.94	0.93
I receive services immediately and my transactions are completed quickly.	3.88	1.03

Statement	Arithmetic Mean	Standard Deviation
Service availability times are defined.	3.87	0.94
I feel that employees cooperate in fulfilling services.	3.85	1.00
I feel that employees work with enthusiasm and pleasure when completing citizens' requests.	3.73	1.07

8.7 Statistical Indicators of Customer Trust and Service Assurance

Respondents had a high level of agreement regarding security, reliability, and professional conduct.

Statement	Arithmetic Mean	Standard Deviation
Assurance (Overall)	4.01	0.83
The performance of the employees is characterized by politeness and tact.	4.05	0.81

Statement	Arithmetic Mean	Standard Deviation
I believe that information is stored securely.	4.05	0.96
I trust the information provided by the employees.	4.02	0.85
The organization cares about following up on the success of the services provided.	4.01	0.99
I feel safe in dealing with the organization.	3.93	0.94

8.8 Statistical Analysis of Institutional Empathy and Citizen Satisfaction

Results revealed a positive trend regarding the level of care and individualized attention provided.

Survey Statement	Arithmetic Mean	Standard Deviation
Empathy (Overall)	3.86	0.92
Employees understand the problems of citizens and try to solve them.	4.01	0.89

Survey Statement	Arithmetic Mean	Standard Deviation
Employees seek to identify the needs of citizens.	3.93	0.93
The institution works on monitoring and developing the quality of service application.	3.91	1.01
The institution seeks to adopt new, more effective methods to facilitate citizen transactions.	3.90	1.06
The institution deals neutrally (without discrimination) with citizens.	3.88	1.11
The institution constantly seeks to study the needs of citizens.	3.87	1.07
Management seeks to reduce the effort to understand citizens' needs and determine their priorities.	3.77	1.12
The institution works to provide services outside of official working hours.	3.57	1.15

8.9 Hypothesis Testing: Correlation Between E-Management and Service Quality

The statistical results show a relationship between implementing electronic management and service quality.

Main Hypothesis: There is a statistically significant relationship between the implementation of electronic management and overall service quality.

- Correlation Coefficient: .486
- Significance Level: $p < .01$ ($p = .000$)
- Result: The first main hypothesis is accepted. The more developed an electronic management application is, the better the services provided to subscribers.

Sub-Hypotheses Testing (H1.1 to H1.5):

Sub-Hypothesis	Dimension	Pearson Value (r)	Significance	Result
H1.1	Tangibility	.482	$p < .01$ (.000)	Accepted: Establishes a link between improving physical/technical conditions and digital tools.
H1.2	Reliability	.411	$p < .01$ (.000)	Accepted: E-management improves transaction credibility, document

Sub-Hypothesis	Dimension	Pearson Value (r)	Significance	Result
				accuracy, and promise fulfillment.
H1.3	Responsiveness	.452	$p < .01$ (.000)	Accepted: E-management speeds up administrative work and reduces transaction loss.
H1.4	Assurance	.454	$p < .01$ (.000)	Accepted: Enhances subscriber security, data confidentiality, and service delivery professionalism.
H1.5	Empathy	.491	$p < .01$ (.000)	Accepted: Digital systems free staff to focus on understanding citizen needs impartially.

8.10 Discussion of Results

The outcome of the field study reveals a strong congruence of the beneficiaries' views on the contribution of electronic management to the improvement of the quality of services delivered by the Saida Water

Department (as part of the South Lebanon Water Establishment). Readiness For Digital Transformation: Overall, subscribers are accepting and prepared to engage in electronic channels. The high indicates that they are technically enthusiastic, have high levels of confidence and can be used easily, indicating that e-platforms are fit for a range of levels of digital literacy.

. Affect of the Service Quality Dimensions (SERVQUAL):

- o Empathy ($r = 0.491$): This was the highest correlated. Digital transformation didn't take the place of HR but enabled them to focus on citizen issues and needs in a more impartial manner.
- o Tangibles ($r = 0.482$): The physical appearance of the establishment is strongly associated with increased electronic channels and continuity of enhanced work practices.
- o Assurance ($r = 0.454$): Digital instruments have a strong connection with the trust that the subscriber will have in the confidentiality and secure storage of data.
- o Responsive ($r = 0.452$): Acknowledges that the importance of e-management in reducing loss/damage of paper based transactions and minimizing transaction times.
- o Reliability ($r = 0.411$): Enhanced document integrity and delivery time for services. The relatively low correlation also reflects the continued need for the provision of physical infrastructure for certain groups (such as special needs).

The findings of the study confirm the main hypothesis and the direct and measurable impact of digital transformation in critical services, like water, on the perceived quality of the service provided to beneficiaries, leading to higher satisfaction and operational sustainability.

8.11 Conclusion

Based on the above, it is evident that service quality is one of the key dimensions used to assess the performance of a service provider. The SERVQUAL is an appropriate scientific model to measure service quality in service establishments, as it involves five dimensions: Tangibles, Reliability, Responsiveness, Assurance, and Empathy. The literature and current field study data confirm that the

introduction of electronic management has a direct, positive impact on improving these dimensions, reflecting positively on the quality of services offered in sectors such as the water sector.

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