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The Role of Information and Communication Technology in Improving the Quality of Postal Service - A Field Study: Algeria Post Institution in Djelfa – Algeria

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Abstract:
This study investigates the impact of Information and Communication Technology (ICT) on the quality of postal services at Algérie Poste, based on a field survey of 576 customers. Employing quantitative methods and regression analyses, the study finds that all ICT dimensions—including hardware, internet network, software applications, and data management—have a significant positive effect on service quality. These results emphasize the necessity of continuous technological upgrades and personnel training to improve customer satisfaction and operational efficiency. The findings contribute important insights into the strategic role of ICT in modernizing postal services and enhancing service delivery.

Keywords:
Information and Communication Technology, Postal Service Quality.

Introduction

The rapid development in information and communication technology (ICT) represents a fundamental axis in reshaping public services, especially postal services which play a vital connecting role between institutions and users. In Algeria, the Algeria Post Corporation faces significant challenges related to improving the quality of postal services amid fast technological changes and increasing customer demands. It has become essential to adopt advanced technological solutions to enhance service speed and accuracy, and to ensure more effective interaction with customers, thereby opening new horizons for the overall development of the sector.

This field study aims to understand the effectiveness of integrating ICT in improving the quality of postal services within the institution. This technology comprises a set of tools and systems including modern hardware, advanced software, integrated databases, and advanced communication networks, alongside developing the human competencies capable of efficiently managing and operating these technologies. It is expected that this will positively reflect on service quality in terms of performance speed, processing accuracy, and positive responsiveness to customer requests, which in turn raises customer satisfaction levels and strengthens their trust in the institution.

Study Problem

Despite the efforts made to implement ICT in the postal sector, the central question remains: To what extent does the application of ICT impact the improvement of postal service quality at the Algeria Post Institution in Djelfa? This question seeks to explore the relationship between technological developments and the quality of services perceived by users, and the extent to which the institution succeeds in utilizing these technologies to achieve a qualitative leap in service levels.

Research Hypotheses

- There is a statistically significant effect of the level of ICT usage on the perceived improvement in postal service quality by customers.
- Each dimension of ICT (hardware and equipment, databases, software, networks) has a varying degree of impact on the quality of services provided.

Importance of the Study

The study of the role of ICT in improving postal service quality is increasingly important given the profound changes in the postal services sector in Algeria, particularly at Algeria Post. Technology is no longer a mere supportive tool but a

fundamental pillar for improving organizational performance, accelerating service delivery, and enhancing accuracy. The digitization of postal transactions and the use of intelligent systems serve as key drivers for service innovation, contributing to increased client satisfaction and trust in the institution. Moreover, ICT plays a pivotal role in facilitating administrative and logistical operations, reducing errors, and improving communication between various branches of the institution and customers.

Study Objectives

- To analyze the impact of using ICT on the quality of postal services at the Algeria Post Institution in Djelfa from the customers' perspective.
- To determine the different dimensions of ICT (hardware, human resources, software, databases, networks) and their contribution to improving postal service quality.
- To propose practical recommendations to enhance the employment of ICT to raise the efficiency and quality of postal services in the institution.

Research Methodology

In line with the nature and objectives of the study and to address the research problem and hypotheses, a descriptive-analytical approach was adopted in the theoretical part to present concepts related to ICT and service quality. In the applied part, a field study was conducted via questionnaires (both paper-based and electronic) directed at a sample of customers of the Algeria Post Institution. Statistical analysis of the collected data was carried out using the SPSS software.

Theoretical Framework

1. **Information and Communication Technology (ICT)**

1.1 Definition of Information and Communication Technology Several definitions of ICT have been presented by various scholars and organizations:

- P. Drucker, the father of modern management, pointed out the current challenges related to information and stated: "For the past fifty years, Information Technology has been directed towards data — obtaining, storing, transmitting, and presenting it" (Shahrazad, 2012).

- The Macmillan Dictionary of Information Technology defines ICT as: "The possession, processing, storage, and broadcast of spoken, visual, material, and digital information by a combination of computers and both wired and wireless communications, based on microelectronics" (Sairfi, 2009).
- UNESCO defines ICT as: "The collection of scientific, technological, engineering knowledge and administrative methods used in handling, processing, and applying information" (Latifa, 2018).
- Michel Paquin describes ICT as: "The tools used for the production, processing, storage, transmission, and retrieval of information, whether in the form of digital data, texts, images, or sound."
- Mohamed Fathi Abdel Hadi defines ICT as: "The search for the best means to facilitate and exchange information efficiently and make it available quickly" (Sara et al., 2021).
- The Organisation for Economic Co-operation and Development (OECD) defines ICT as: "A new technical-economic model affecting the management and monitoring of production and service systems in the economy. It relies on interconnected discoveries in computing, electronics, software engineering, control systems, and remote communication, significantly reducing the costs of storing, processing, exchanging, and distributing information" (Boutin, 2003).

2.1 Means of Information and Communication Technology According to Ilyas (2021), ICT employs a variety of tools, including:

- **Videotext**: A visible text or "image" system designed to deliver data, information, and messages to offices and homes at relatively low costs. It supports services like news feeds and library and information services, especially for document acquisition and processing.
- **Hardware**: Devices that store and preserve data, primarily computers of various types, sizes, speeds, and data capacities.
- **Electronic Data Interchange**: Document exchange between computers via electronic means, directly from one computer to another.
- **Internet**: Also referred to as the network of networks, electronic web, or virtual space.

- **Intranet and Extranet**: Intranet is a private network within an organization that functions similarly to the Internet but is restricted to employees only. Extranet connects organizations with external partners for work-related access.
- **Telephone**: Despite being over a century old, the telephone remains a critical communication tool with advancements like electronic and laser technologies facilitating information transfer.
- **Telex**: A device that allows direct sending of written text from a keyboard to a receiving center, created to speed communication of textual data through private networks.
- **Fax**: Equipment that copies documents and sends them over telephone lines to distant locations, capable of sending handwritten, photographic, or textual documents worldwide quickly.

3.1 **Components and Requirements of ICT**

ICT requires a set of components and infrastructure working together for efficiency:

- Computers: Including desktops, laptops, and servers.
- Operating Systems: Such as Windows and others.
- Organizational Software Applications: Including applications like Microsoft Office and others used in organizations.
- Data Storage and Management: Programs used for managing databases, including storage networks.
- Communications and Networks: Hardware and software related to networking and communication.
- Internet and Intranet: All physical, software, and administrative equipment supporting web services.
- Consulting and Systems Integration: Consultation services concerning development, change management, training, and software integration (Bukhari, 2020).

ICT essentially consists of two main components:

- Cognitive Component: Known as Software, representing the intangible "soul" of the technology, without physical form.
- Physical Component: Hardware, including electronic devices that house the cognitive component, acting as the intermediary between software and users. Examples include computers, ATMs, and mobile phones (Alouti, 2008).

4.1 Advantages and Disadvantages of ICT

4.1.1 Advantages:

- Providing timely and appropriate information to improve decision-making.
- Formulating and implementing organizational strategy.
- Enhancing output quality and reducing errors.
- Achieving competitive advantages.
- Improving productivity and operational efficiency (Naima et al., 2017).
- Expanding internet services in healthcare, education, commerce, and communications, enhancing human freedom and academic cooperation.
- Enriching resources and information accessibility across various life areas including travel, tourism, and electronic discussion forums.
- Facilitating government operations and oppositional forces' communication and organization.
- Revolutionizing commerce through electronic trade and widespread availability of goods and services.
- Playing a vital role in electronic journalism for information dissemination and cultural exchange.
- Supporting promotion and sale of books and access to government literature.

4.1.2 Disadvantages:

- Persistent social and knowledge disparities, often creating "information rich" and "information poor" groups.
- The emergence of a virtual world that sometimes manipulates historical facts.

- Negative psychological effects on children and adults due to extended internet use.
- Violations of individual and organizational privacy through unauthorized access to sensitive information.
- Seen as threats to national security and the advent of information wars and cybercrimes.
- Health hazards from electromagnetic waves emitted by technology.
- Intellectual property issues due to widespread copying and imitation.
- Facilitation of destructive activities like drug trafficking, sex trade, and child exploitation (Mansour, 2020).

Despite these drawbacks, ICT continues to contribute significantly to productivity growth, economic development, educational advancements, scientific research, communication inventions, and societal awareness. However, careful use and regulatory measures are essential to minimize negative environmental and social impacts like privacy loss, job displacement, and electronic waste pollution.

2. Concept of Service Quality

2.1 Definition of Service Quality:

Service quality can be defined as "the degree to which the service meets the consumer's expectations." Service quality management focuses on employee performance, which includes aspects difficult to measure directly, such as speed, accuracy, and politeness in service delivery. Companies like Federal Express, Lad's End, Disney Avis, and Ritz Hotels emphasize staff performance, behavior, and training. Federal Express's motto is "People, Service, Profit" (Abdel Aal et al., 2009). Quality is simply defined as "freedom from defects" (Abdel Aal et al., 2009). Quality pioneers have variously defined it as:

- Related to value (Feigenbaum, 1983).
- Conformance to standards (Crosby, 1979).
- Fitness for use (Juran, 1989).
- Excellence (Peters and Waterman, 1982).
- Meeting or exceeding customer expectations (Parasuraman et al., 1985).

- Customer satisfaction (Peters, 1989).

Hence, quality of service is "a measure of the degree to which service performance matches customer satisfaction."

2.2 **Dimensions and Requirements of Service Quality**

Several dimensions identified in prior studies and adopted in this research include:

2.2.1 **Tangibility**:

While services are fundamentally intangible, many are associated with physical cues used by customers to judge quality, usually visible only at the service delivery site. These cues include physical facilities, tools, equipment, and staff appearance.

2.2.2 **Reliability**:

Refers to the consistency and dependability with which the expected service is delivered correctly the first time. Reliability involves meeting or exceeding quality standards consistently, which greatly influences customer perception.

2.2.3 **Responsiveness**:

The willingness and readiness of service providers to help customers and provide prompt service. Key attributes include preparedness, timely service delivery, and communication to customers showing care.

2.2.4 **Assurance**:

The competence and courtesy of service providers in instilling confidence and trust in customers, especially regarding security and data protection.

2.2.5 **Empathy**:

The degree to which service providers understand and cater to individual customer needs with care and attention, often based on intuition and knowledge about customers.

2.3 **Requirements for Implementing Service Quality**:

Achieving quality requires adopting an organizational culture focused on quality, continuous improvement, combating corruption, data availability, public awareness of rights and duties, employment of ICT, and staff motivation and innovation encouragement, alongside attention to service facility cleanliness, security, and aesthetics.

4.2 Contribution of ICT to Service Quality Improvement

The traditional service delivery model, especially in public services, is increasingly inadequate to meet timely customer needs. A newer, technology-driven, flexible model emphasizing e-services is necessary. Modern institutions rely heavily on data and information as key success factors. Digitization of administration is essential to achieve superior service quality.

Advantages of ICT in service organizations include:

- Streamlining procedures and eliminating bureaucratic hurdles.
- Making service data widely accessible, reducing search time.
- Extending services to a larger clientele (e.g., public service).
- Improving communication between institutions and clients about updates and regulations (e.g., Algeria Post).
- Saving time lost traveling between administrative departments and avoiding bureaucracy.
- Providing access to some electronic services outside of public office hours and holidays (many services offered by Algeria Post through digital platforms).

5 Applied Aspect:

5.1 Institution Under Study:

Algérie Poste is a public institution with an industrial and commercial nature and is considered the main operator for postal and financial services across the entire national territory, with approximately 4063 offices equipped with the latest technologies. It was established under Law No. 03/2000, which separated the postal sector from telecommunications, and offers a variety of postal and financial services to about 40 million subscribers through offices, automated windows, and electronic applications.

The institution is characterized by wide geographic coverage, a state-controlled monopoly, and a pursuit of profitability to support its continuous development. It relies on updating its technological infrastructure and recruiting qualified human resources to enhance its social and economic performance. Its services target

meeting the needs of various segments of society and contributing to sustainable development.

5.2 Study Population:

The study population is a fundamental element that must be defined by the researcher prior to beginning the study. Since this study involves a case study of Algérie Poste, the study population includes all customers of Algérie Poste, covering all elements that enable the measurement process and extraction and analysis of all results related to the study.

5.3 Study Sample:

The researcher adopted purposive sampling due to the large size and difficulty of fully enumerating the study population. Purposive sampling is used when it is impossible to count the entire population, whereby the researcher selects certain elements that, based on prior experience, can provide an acceptable and representative sample of the population. The chosen sample size was 576 customers of Algérie Poste, and questionnaires were distributed in both paper and electronic forms.

Here is the English translation of the statistical methods and results section you provided:

5.4 Statistical Methods Used in the Study

5.4.1 Statistical Treatments

- **Normality Test (Kolmogorov-Smirnov):** This test is used to verify whether the data follow a normal distribution, to decide whether to use parametric or non-parametric tests. If the distribution is normal, parametric tests are applied.
- **Cronbach's Alpha:** Used to measure the reliability of the study; values range from 0 to 1. A value below 0.6 indicates weak reliability, 0.6 to 0.7 is acceptable, 0.7 to 0.8 indicates good reliability, and values above 0.8 indicate excellent reliability.
- **Simple Linear Regression Analysis:** Examines the causal relationship between two variables X and Y, aiming to predict the value of Y based on X, following the equation $Y=\alpha+\beta XY = \alpha + \beta XY=\alpha+\beta X$.
- **Multiple Regression Analysis:** Tests the validity of the model and identifies the independent variables that most affect the dependent variable.

5.4.2 Reliability Test:

The reliability coefficient for the first axis (Information and Communication Technology) was 0.927, which is excellent. The components (hardware, internet network, software and applications) had reliability values of 0.824, 0.863, and 0.809 respectively, which are high, except for the data dimension which had a moderate reliability of 0.652. The second axis (Service Quality) had a reliability coefficient of 0.927 as well, with dimensions (tangibility, reliability, responsiveness, assurance, empathy) having values of 0.801, 0.785, 0.776, 0.712, and 0.807 respectively, all high. The overall reliability of the study was 0.959, indicating very high stability and 95.9% certainty of obtaining the same results if the process is repeated.

5.4.3 Normality Test:

Table 1: Normality Test Results for Study Axes

Axis	Kolmogorov-Smirnov Statistic	Sig.	Shapiro-Wilk Statistic	Sig.
Information and Communication Technology	0.061	0.162	0.844	0.060
Service Quality	0.038	0.235	0.783	0.423
Overall Study	0.053	0.253	0.877	0.613

Source: Prepared by the researcher based on SPSS output

All study axes follow a normal distribution (sig > 0.05), allowing the use of parametric tests for hypothesis testing.

6. Effect of Information and Communication Technology on Service Quality

Before testing the third hypothesis, the model's validity was verified through ANOVA for regression:

Table 2: Simple Regression of Information and Communication Technology Effect on Service Quality

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Squares	F value	Significance (F)
Regression	1	244.377	244.377	764.204	0.000*
Error	574	183.554	0.320		
Total	575	427.931			

Significant at α = 0.05 (F critical = 3.85).

Source: Prepared by the researcher based on SPSS output

This indicates the model is valid for testing the hypothesis.

Simple Regression of ICT's Effect on Service Quality

Table 3: Simple Regression Analysis for ICT Effect on Service Quality

Independent Variable	β	Correlation (R)	Calculated T	R^2	Significance (T)	Effect
Information & Communication Technology	0.887	0.756	27.644	0.571	0.000	Significant

Source: Prepared by the researcher based on SPSS output

Calculated T value (27.644) > critical T (1.96) at α=0.05 with a significance of 0.000, indicating a statistically significant effect of ICT on service quality at the 5% level. R=0.756 shows a positive correlation, and R^2=57.1% shows that ICT explains 57.1% of the variance in service quality. β=0.887 means a one-unit change in ICT leads to 0.887 unit change in service quality.

Thus, the first hypothesis is accepted.

7. Effect of Each ICT Dimension on Service Quality

Model validity was confirmed through ANOVA:

Table 4: Multiple Regression Analysis of ICT Dimensions Effect on Service Quality

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Squares	F value	Significance (F)
Regression	4	207.120	51.780	430.877	0.000*
Error	571	68.619	0.120		
Total	575	275.739			

Significant at α=0.05, F critical=2.38.

Source: Prepared by the researcher based on SPSS output

Multiple Regression Results

Table 5: Multiple Regression Results for ICT Dimensions Effect on Service Quality

Independent Variable	β	Correlation (R)	Calculated T	R^2	Significance (T)	Effect
Hardware Components	0.182	0.867	6.288	0.751	0.000	Significant
Internet Network	0.129		4.938		0.000	Significant
Software & Applications	0.311		10.400		0.000	Significant
Data	0.205		8.115		0.000	Significant

Source: Prepared by the researcher based on SPSS output

All T values exceed the critical value 1.96, and significance is below 0.05, confirming significant effects for all ICT dimensions on service quality independently. R=0.867 and R^2=75.1% indicate a strong explanatory power. The β values rank variables by impact: software & applications (0.311), data (0.205),

hardware (0.182), internet network (0.129). Hence, the second hypothesis is accepted.

Conclusion:

The study demonstrates a statistically significant positive impact of Information and Communication Technology (ICT) on the quality of postal services at Algérie Poste. The research confirms that the dimensions of ICT—including hardware, internet network, software applications, and data management—independently and collectively enhance service quality, explaining a large proportion of its variance. This underscores the critical role of adopting and continuously upgrading ICT infrastructures and capabilities to meet customer needs effectively and sustain competitive advantage. The use of advanced technologies and the improvement of operational processes have contributed significantly to customer satisfaction and institutional performance.

Recommendations:

- Continuously invest in upgrading and maintaining ICT infrastructure to support efficient postal services.
- Enhance training programs for staff to improve their proficiency in using emerging technologies.
- Expand broadband and network coverage, particularly in underserved areas, to ensure equitable access to digital postal services.
- Promote awareness campaigns to educate users on how to effectively utilize electronic postal services.
- Incorporate regular monitoring and evaluation of ICT applications and service quality to identify areas for improvement promptly.
- Encourage innovation and the adoption of smart systems to automate routine tasks and enhance responsiveness.

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