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The Impact of Information Technology on Service Quality, Satisfaction, and Customer Relationship Management (Case Study: IT Organization Individuals)

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ABSTRACT

Recent research and studies have shown that Information Technology (IT) has a significant impact on service quality, customer satisfaction, and customer relationship development. With the proliferation and penetration of technology in all aspects of life, organizations are responding to the implications and opportunities that IT creates in relation to customer services. The main objective of using information technology in organizations is to increase customer satisfaction, service quality, and customer relationship management, which the authors will focus on here. Enhancing service quality, improving customer satisfaction, and establishing close and sustainable customer relationships are key advantages of leveraging information technology in this field. This article examines the impact of information technology on service quality, customer satisfaction, and customer relationship development and provides strategies and models for organizations to improve customer satisfaction and establish closer connections with them through the use of information technology. Seventy individuals from the IT field were used to evaluate the proposed model. The proposed model was compared with three models: SEM, regression, and decision tree, and the results demonstrated better performance of this approach.

Keywords: Information technology; Service quality; Customer relationship; Customer satisfaction; Improvement and development

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1. Introduction

In today's competitive business environment, organizations increasingly recognize the significant impact of Information Technology on customer services. Advances in information technology have transformed the way organizations interact with customers, leading to improved service quality, increased customer satisfaction, and the development of stronger customer relationships. The use of IT tools and systems provides organizations with new opportunities to understand customer needs, deliver personalized services, and create a seamless customer experience. Customer service quality has become a critical factor for the success and sustainability of businesses in various industries. Businesses strive to leverage IT capabilities to improve service delivery, optimize customer interactions, and establish customer loyalty. By integrating information technology into customer service processes, organizations can optimize operations, leverage real-time insights into customer preferences, and customize their offerings to meet individual needs [1]. Furthermore, customer satisfaction is a key performance indicator for organizations. Satisfied customers are more likely to become loyal customers, spread a positive reputation, and contribute to overall business growth. Information technology plays a vital role in empowering organizations to exceed customer expectations by providing quick access to information, personalized recommendations, and efficient problem-solving. **Figure 1** illustrates the varying potential impact of IT on customer service, depending on the extent of transformation (automation) of marketing and/or operations activities within firms. This distinction is depicted through two dimensions: customer focus and operations focus. Firms with a customer focus possess the capability to utilize IT to transform marketing and customer service activities, directly catering to customers' expectations in product marketing and offering additional services.

Establishing and maintaining strong customer relationships is also a critical aspect that organizations seek to achieve. Effective communication, timely responsiveness, and personal engagement are crucial
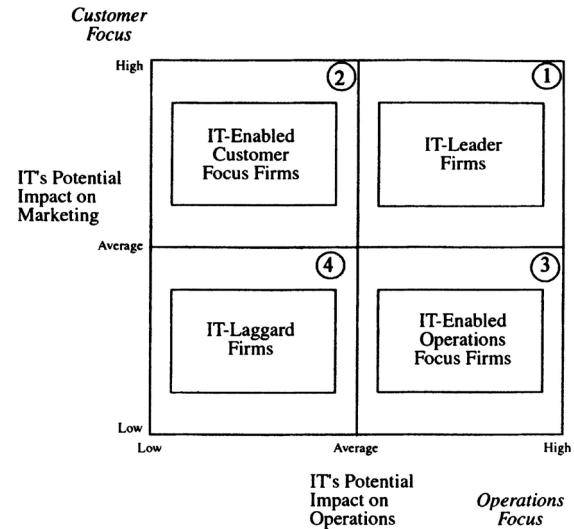

Figure 1. Customer service technology.

in developing long-term relationships with customers. Information technology tools such as Customer Relationship Management (CRM) systems, social media platforms, and online customer portals enable organizations to facilitate continuous and meaningful interactions with customers, enhancing trust, loyalty, and long-term partnerships [2]. The objective of this article is to examine the impact of information technology on service quality, customer satisfaction, and customer relationship development. By analyzing existing research, practical case studies, and industry trends, this article provides a comprehensive view of strategies, frameworks, and models that organizations can leverage to effectively utilize information technology in improving their customer services. Through the analysis of existing research, practical case studies, and industry trends, this article offers valuable insights for organizations seeking to optimize their IT investments and implement customer-centric approaches [3]. **Figure 2** illustrates the main functions of information technology in addressing customer needs.

2. Analytical model for the impact of information technology on customer services

In this section, we present a comprehensive analytical model for examining the impact of informa-
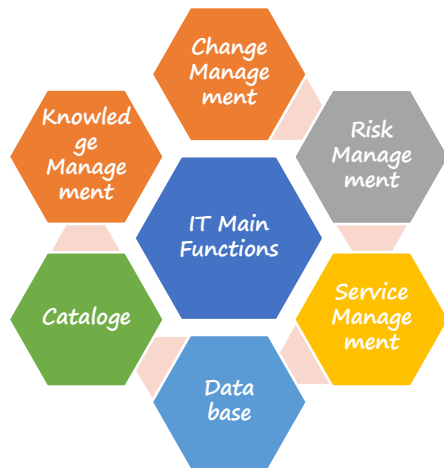
Figure 2. Key functions of information technology in customer needs.

tion technology on customer services. This model encompasses key factors that can enhance and improve customer services under the influence of information technology. An appropriate analytical model should consider various factors that, in interaction with each other, determine the impact of information technology on customer services. **Table 1** provides a summary of the factors and their descriptions in the analytical model of information technology [4].

Information Technology Factors: In this section, we identify factors related to information technology. This includes IT infrastructure, software, information systems, and emerging technologies such as artificial intelligence and the Internet of Things (IoT).

Organizational Factors: In this section, we identify organizational factors that can impact IT activities

and customer services. These include organizational strategies and goals, organizational structure, organizational culture, and leadership.

Customer Factors: In this section, we identify customer factors that influence the use and satisfaction of IT services. This includes customer needs and expectations, user experience, customer behavior, and customer feedback.

Operational Factors: In this section, we identify factors related to organizational operations that can impact the delivery of IT services to customers. This includes processes, systems, technologies, and operational performance.

Environmental Factors: In this section, we identify external environmental factors that can influence the use of information technology and customer services. This includes economic factors, laws and regulations, competition, and industry trends [5,6].

3. Customer focus with the use of information technology

In this section, we examine the impact of using information technology on improving customer focus. This includes utilizing customer data and information to better understand their needs and expectations, providing customized services and personalization, and enhancing communication and customer interactions. The use of information technology in organizations can have a significant impact

Table 1. Description of analytical model dimensions.

Factor	Description	Example
IT agents	IT infrastructure, software, information systems, emerging technologies	Using CRM software to manage relationships with customers
Organizational factors	Organizational strategies and goals, organizational structure, organizational culture, organizational leadership	Creating a customer service culture in the organization
Customer agents	Customer needs and expectations, user experience, customer behavior, customer feedback	Designing a user-friendly website and providing online support options for customers
Operational factors	Processes, systems, technologies, operational functions	Using barcode readers in stores to speed up the process of serving customers
Environmental factors	Economic factors, laws and regulations, competitions, industrial developments	Changes in customer information protection laws and their impact on the use of information technology in the field of customer service

on improving customer focus. By creating appropriate management systems and tools, organizations can experience continuous improvement in customer focus. With information technology, organizations will be able to gather and analyze comprehensive and accurate information about their customers. This information includes preferences, needs, behaviors, and customer responses, which help the organization make necessary improvements in its services and products. Furthermore, information technology enables solutions such as online platforms, mobile applications, and modern communication methods, allowing organizations to directly and effectively engage with their customers [7]. These direct communications between the organization and customers can facilitate dynamic and two-way interactions, helping the organization precisely address customer needs and desires. Additionally, information technology can assist organizations in providing personalized services to customers, as accessing comprehensive information about customers enables the organization to identify their precise needs and preferences and customize their services accordingly. As a result, using information technology as a powerful tool can support organizations in improving customer focus and delivering better services to them [8]. **Table 2** provides a summary of the relationship between the organization's IT level and the level of customer focus.

4. Focus on operations with the use of information technology

In this section, we examine the impact of using information technology on improving organizational operations and customer services. This section includes utilizing IT processes and systems to enhance efficiency, reduce costs, increase the speed and quality of operations, and deliver services to customers [9].

Information technologies can assist companies in improving and effectively managing their operational processes. The following examples and table provide a comprehensive explanation of these impacts. For instance, a manufacturing company utilizes information technology to improve its production operations. By employing Enterprise Resource Planning (ERP) systems, self-diagnostic systems, and automated production systems, the company can enhance its production processes and manage them more intelligently. These technologies enable the company to reduce production time, decrease costs, improve product quality, and enhance overall performance. Therefore, the focus on operations with the use of information technology in this company has resulted in improved efficiency and performance. **Table 3** illustrates different levels of progress and maturity in IT management based on the utilization of various systems. Additionally, using an example, the impact

Table 2. The relationship between the organization's IT level and the level of customer focus.

The level of development of information technology management	Effect on improving customer focus	Example
Low level	Unstable customer relations and inability to provide personalized services and improve customer needs and preferences	An organization that manages information technology in a limited way using traditional tools. For example, limited use of separate systems and decentralized customer information
Middle level	The power to improve access to customer information, better identify their needs and preferences, and provide personalized services based on them	An organization that has improved some advanced IT processes and systems. For example, using CRM software to manage customer relationships and analyze customer data
High level	Access to comprehensive data and advanced customer analysis, identifying customer patterns and behaviors and providing personalized services and targeted offers	An organization that comprehensively and strategically uses information technology and considers it as a key factor in its business strategy. For example, artificial intelligence systems for advanced data analysis and customer behavior prediction

Table 3. The effect of using information technology on improving focus on operations.

The level of development of information technology management	Impact on improving focus on operations	Example
Low level	Reducing efficiency, increasing costs and errors in operations	An organization that uses manual and traditional methods in its operations
Middle level	Improving operation efficiency, reducing costs and errors, improving quality	An organization that uses information management systems and automation systems
High level	Improving general performance, improving efficiency, reducing costs and errors, improving quality	An organization that uses production automation systems and intelligent systems

of each level on improving the focus on operations is explained.

5. Mathematical models

In this section, mathematical models, assumptions, and analytical methods are utilized to quantitatively measure the various effects of information technology on the examined variables. Mathematical models can include regression equations, structural models, or decision models. Through appropriate analytical methods, the relationships and impacts between different variables are quantitatively examined and analyzed to provide evaluative results and inferences for enhancing customer services [10].

5.1 Regression model

This model examines the impact of information technology on service quality and customer satisfaction using dependent and independent variables. By analyzing regression coefficients, the effectiveness and significance of different variables on the dependent variables under investigation are determined. Regression analysis is a statistical method used to examine the relationship between a dependent variable and one or more independent variables. In this case, focusing on the impact of information technology on service quality and customer satisfaction, we will explore the regression model. The general formula for the regression model is as follows [9]:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + ... + \beta_k X_k + \varepsilon \qquad (1)$$

In this formula:

Y represents the dependent variable (e.g., service quality) that we want to examine its impact.

X_1 to X_k are the independent variables (e.g., information technology) whose effects on Y are being investigated.

β_0 is the intercept or the constant term that determines the starting point of the regression line.

β_1 to β_k are the regression coefficients, indicating the direct impact of each independent variable on the dependent variable.

ε represents the error term or uncontrolled factors that may affect the dependent variable. By analyzing the coefficients β_1 to β_k and evaluating their significance (using statistical tests such as t-test or F-test), we can conclude whether information technology has a significant impact on service quality and customer satisfaction. Additionally, by interpreting the sign and magnitude of the regression coefficients, we can infer the direction and strength of the influence of each independent variable on the dependent variable [5].

5.2 Structural equation model

This model investigates complex relationships and interactions among variables. By employing structural equation models, direct and indirect relationships between information technology, service quality, customer satisfaction, and customer relationship development can be modeled and analyzed. Structural Equation Modeling (SEM) is a complex statistical method used to examine the relationships

between variables and investigate the interrelationships among variables in a predictive model. In this case, focusing on the impact of information technology on service quality and customer satisfaction, we will explore the structural equation model. The general formula for a structural equation model is as follows [2,10]:

$$X = \Gamma X + \Lambda \xi + \delta \qquad (2)$$

$$Y = BX + \Psi \xi + \varepsilon \qquad (3)$$

In this formula:

X represents the independent variables (e.g., information technology).

Y represents the dependent variable (e.g., service quality or customer satisfaction).

Γ represents the path coefficients, indicating the extent to which the variations in the independent variables are explained by the dependent variables.

Λ represents the factor loadings, indicating the extent to which the measurable variations in the latent variables are explained by the observed variables.

ξ represents the latent variables that cannot be directly measured.

δ and *ε* represent the errors or uncontrolled factors that may influence the independent and dependent variables.

By analyzing the coefficients *Γ* and *Λ* and evaluating their significance (using statistical tests such as t-test or F-test), we can determine whether information technology has a significant impact on service quality. Similarly, by analyzing the coefficients *B* and *Ψ* and evaluating their significance, we can conclude whether information technology has a significant impact on customer satisfaction. Ultimately, using a structural equation model allows us to analyze causal relationships between variables, examine the direct and indirect effects of variables, and provide a more comprehensive interpretation of the relationships among variables [3,4].

5.3 Decision model

This model is used for optimal decision-making regarding the utilization of information technology to improve customer services. By using decision models such as artificial neural networks, decision trees, and optimization algorithms, the impact of different variables and their optimal combination on enhancing customer services is evaluated. Decision-making models are mathematical frameworks used to analyze and evaluate the decision-making process under different conditions. These models utilize variables, parameters, constraints, and objective functions to arrive at the optimal decision in various situations and constraints. A general decision-making model is formulated as follows [5,6]:

max/min *f(X)*

subject to: $g(X) \leq 0$ $h(X) = 0$

In this formulation:

f(X) represents the objective function, which is defined for either maximization or minimization and serves as a criterion for evaluating the quality of the decision-making.

X is a vector of decision variables, including independent and dependent variables, parameters, and observed values.

g(X) denotes the set of constraint conditions that specify the bounds under which the decision-making should be performed.

h(X) represents the set of equality constraints that determine the equality constraints in the decision-making process.

By solving the decision-making model, one can determine the values of the decision variables that optimize the objective function while satisfying the specified constraints. The objective function can be customized based on the specific problem, and the constraints can reflect the limitations and conditions imposed on the decision-making process. Overall, decision-making models provide a structured approach to analyze and making decisions by considering multiple variables, constraints, and objectives, ultimately guiding the decision-maker towards the best possible decision given the circumstances [1,11].

6. Discussion and results

In this section, we test the proposed model on real-world data. The proposed method is compared to three methods: decision tree, regression, and SEM.

To ensure a fair comparison, we use data from 70 IT organization individuals. These individuals are selected from a university environment, and the dataset is created with 12 independent features and 3 dependent features. A questionnaire is used to obtain the dataset, and coding is done using MATLAB software. All simulations and experiments were performed on a system with an Intel 2.7 GHz 7-core processor, 12 GB RAM, and Windows 10 operating system. The algorithms and methods were implemented using MATLAB software version 2018. The aim is to accurately assess customer satisfaction and service quality. **Table 4** presents the results of the proposed analysis. As evident, the proposed model has performed better in most parameters.

Table 4. The effect of using information technology on improving focus on operations.

Model	Service quality	Satisfaction	Costumer relationship
Decision tree	%87	%81	**%90**
Regression	%83	%77	%86
SEM	%72	%85	%81
Proposed	**%92**	**%90**	%88

As observed, the proposed method has performed better in two main parameters: service quality and customer satisfaction, compared to all three mathematical models. Only in the customer relationship parameter, our method has a very slight difference and ranks second. It is essential to note that due to data collection limitations from IT managers, the performance difference may not be fully demonstrated. With the suggestions made in this model, undoubtedly, the performance of the proposed model will be even better with larger datasets.

7. Conclusions

This article has examined and analyzed the impact of information technology on customer services in the financial services industry. The results have shown that optimal and intelligent utilization of information technology can have a significant impact on customer focus and improvement of company operations. Companies that lead in information technology and have a high level of IT management maturity are capable of delivering superior customer services and have a strong competitive position in the financial services industry. Additionally, the use of information technology in company operations can lead to performance improvement, cost reduction, increased speed, and enhanced customer experience. As observed, three criteria were used to evaluate the impact of IT on organizations: service quality, customer satisfaction, and customer relationship management. Information from 70 IT personnel was collected in raw form, and it was observed that the proposed method performed on average 10% better than the other three models. Furthermore, managers and implementers should prioritize investment in the development and improvement of information technology and formulate appropriate strategies to create customer focus and improve operations using information technology.

Author Contributions

Conceptualization, Hojjat Talebi; proposed methodology, Hojjat Talebi; design and analysis, Hojjat Talebi & Amid Khatibi Bardisir; resources, Hojjat Talebi; writing and editing, Amid Khatibi Bardsiri; Simulation, Amid Khatibi Bardsiri; supervision, Hojjat Talebi.

Conflict of Interest

There is no conflict of interest.

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