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Research paper

Impetus of E-Customer Satisfaction and Its Effects on E-Customer Loyalty: An SEM Approach on App-Based Instant Home Delivery Services In an Emerging Market Context

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Abstract

Despite the widespread popularity of mobile apps for instant home delivery services, prior research has largely overlooked a critical examination of the factors influencing the use of these apps, as well as strategies to retain their customers. To address this gap, this study examines the key factors influencing the use of mobile apps for instant home delivery services and proposes strategies for customer retention by fostering customer loyalty. Drawing upon the SERVQUAL and Technology Acceptance Model (TAM) frameworks, we identify techniques to enhance loyalty. Data for this study were collected from 605 users of mobile apps for instant home delivery services through a questionnaire survey. The data were analyzed using AMOS v. 24 and PROCESS Macro v. 4.20 software, employing SEM as well as PLS-Structural Equation Modeling (PLS-SEM). Our findings reveal that the visual design of mobile apps, reliability, responsiveness, user-friendliness, and personal need fulfillment are the most significant predictors of app usage. These factors drive e-customer satisfaction, which in turn enhances e-customer loyalty. Additionally, we find the mediating role of e-customer satisfaction in the proposed relationships. We also investigate how e-customer satisfaction can be turned into e-customer loyalty.

Keywords: *E-Customer Loyalty; E-Customer Satisfaction; E-Service Quality; Instant Home Delivery Services; Mobile Apps.*

1. Introduction

The rapid advancement of digital technologies has indisputably transformed the service sector, and more conspicuously, instant home delivery services (Melián-González, 2022). With the increasing use of Smartphones and the Internet, mobile application (app)-based home delivery services have become indispensable to urban lifestyles by making it easier and faster for consumers (Laukkanen, 2016; Toteva & Savas-Hall, 2024). To commercialize any app-based services, a substantial Smartphone and internet usage rate is essential, and in Bangladesh, both rates are promising. The Bangladesh Bureau of Statistics reported that as of September 2024, 70.1% of households use Smartphones, with a higher rate of 77.8% in urban areas (Bangladesh. Bureau of Statistics, 2024). The Internet usage rate is also emerging in Bangladesh; as of February 2025, the total number of Internet subscribers is 130.07 million, among which 116.03 million use mobile Internet (BTRC., 2025). The rise of e-commerce platforms and mobile applications has reformed consumer expectations, stressing the importance of e-service quality in influencing customer satisfaction and loyalty (David et al., 2025; Zeithaml et al., 2002; Lindh & Nordman, 2018).

The advent of commercial app-based home delivery services in Bangladesh, including Foodpanda, Pandamart, Pathao Foods, Chaldal, Shwapno, and Shohoz, signifies a growing dependence on fingertip solutions for everyday life (Rahman, 2023). App-based home delivery services differ from general e-commerce apps. E-commerce apps, such as Daraz, only offer purchase options for products listed on their sites and provide home delivery services through third-party logistics companies, which can take several days to deliver. In contrast, app-based home delivery services offer purchasing options from a wide variety of local partner retailers, including physical stores, and provide home delivery services through their own local networks instantly, which takes less than one to a few hours (Kim et al., 2021). This study

examines the impact of app-based instant home delivery service quality on electronic customer satisfaction and loyalty. Still, the focus is not limited to app-based e-commerce services in general (Huma et al., 2024; Al Amin et al., 2023c).

E-service quality is a multidimensional concept encompassing reliability, responsiveness, assurance, empathy, and tangibility, collectively shaping consumers' perceptions and experiences (Parasuraman. et al., 1988). In app-based home delivery services, information quality, familiarity, time saving, usability, and reputation significantly influence purchase intention, particularly regarding home delivery services (Zaheer. et al., 2024). The effectiveness of these services has substantial implications for customer satisfaction, which in turn affects customer loyalty and retention (Zariman. et al., 2023). With intensifying competition in the digital marketplace, organizations must continually enhance the quality of e-services as a key element in maintaining customer trust and the continuity of their relationships (Chuang & Lin, 2015; Kim et al., 2025). These attributes significantly influence consumer choice behavior and brand perception.

A high level of customer satisfaction has a significant impact on how people perceive and interact with a brand (Li & Fang, 2019). Such customers tend to be repeat purchasers, provide positive word-of-mouth, and are highly loyal to the brand (Bitros et al., 2024). By contrast, negative experiences with e-service quality lead to higher customer dissatisfaction, which can result in a switch to competing service providers (Fan et al., 2022). Customer loyalty, a key impact of customer satisfaction, is influenced not only by service quality and perceived value but also by emotional attachment (So et al., 2025). Moreover, besides transactional benefits, overall user experience and brand involvement are crucial factors in establishing brand loyalty in the app-based digital service sector (Khan & Fatma, 2024).

The availability of alternatives, switching costs, and marketing efforts can make loyalty fragile in app-based home delivery services (Gurler, 2025). Given the rapidly changing customer preferences and technological advancements, businesses must adopt customer-centric strategies to enhance service standards and foster long-term loyalty (Salim & Rodhiah, 2021). While app-based home delivery services are gaining popularity, this trend reflects a lack of empirical investigation into e-service quality and its comparison with consumer satisfaction and loyalty in this industry (Rita et al., 2019). Therefore, this study aims to fill this gap by conducting in-depth research on the key determinants influencing consumers' perceptions and behaviors in the Bangladeshi home delivery industry. This study investigated the relationship between e-service quality, customer satisfaction, and loyalty. It provides a guide for industry stakeholders, digital service providers in Bangladesh, and policymakers to enhance customer participation and achieve sustainable business growth.

With high and growing Internet and Smartphone usage, users can fully leverage mobile apps in their daily lives (Oyedele & Goenner, 2024; Dwivedi et al., 2021). Some popular home delivery apps include Uber Eats, Food Panda, Pathao Foods, Chaldal, Shwapno, and Shohoz Foods (Al Amin et al., 2021a; Bint Halim, 2023). With commercial digital services, such as home delivery apps, user experience and satisfaction are crucial (Gupta et al., 2024). Customer loyalty is based on satisfaction with services, which in turn is based on the quality of service (Ampadu et al., 2023). Service providers must track the link between satisfaction and loyalty in the case of digital services or e-services to design a customer-driven marketing strategy (Rita et al., 2019).

Several studies have explored the relationship between e-service quality dimensions and customer satisfaction in various e-commerce and app-based services (Vu & Nguyen, 2025; Ashiq & Hussain, 2024; Palese & Usai, 2018; etc.) However, there remains a dearth of literature on app-based instant home delivery services, especially in emerging markets, and several research studies conducted in recent years have focused exclusively on home delivery services and general e-commerce websites (Ahmad et al., 2025; Ahmed et al., 2024; Alam et al., 2025; Alcántara-Pilar et al., 2025; Johari et al., 2024; Kalantarzadeh Tezerjany, 2024; Lee & Han, 2022; Siddiqi et al., 2024; Su, Nguyen, et al., 2022; Su, Nguyen-Phuoc, et al., 2022; Teo et al., 2024; Zaheer et al., 2024). Indeed, most previous studies on e-service quality have originated in the Western context or focused on developed markets (Huma et al., 2024; Jain et al., 2021; Mamakou et al., 2024; Omar et al., 2021), neglecting the specific socioeconomic, cultural, and infrastructural features of developing countries like Bangladesh. This represents a significant variation in local elements; for example, high Smartphone and Internet usage penetration and distinct consumer behavior can affect the importance of e-service quality dimensions such as visual design, fulfilment, privacy, security, and customer service (Al Karim, 2020), reliability, and responsiveness (Parasuraman. et al., 1985). Thus, conducting a local analysis of these metrics within Bangladesh is meaningful for understanding how consumers feel about the e-service quality, satisfaction, and loyalty to instant home delivery apps in this market.

This study aims to investigate the factors influencing customer satisfaction and loyalty in Bangladesh for mobile app-based home delivery services, addressing three primary issues. First, it examines the impact of visual organization, user-friendliness, personal need fulfilment, and efficiency (Herington. & Weaven, 2009), reliability, and responsiveness (Parasuraman et al., 1985) on electronic customer satisfaction (ECL). Second, we examined the impact of customer satisfaction on customer loyalty (Raza. et al., 2020). Ultimately, this study investigated whether customer satisfaction acts as a mediator in the relationship between e-service quality factors and loyalty. We have structured the manuscript into the following sections: Literature Review, Methodology, Results, Discussion, and Implications.

2. Literature Review

2.1. The SERVQUAL model

The SERVQUAL model is widely used in research to evaluate the quality of a service (Nanu et al., 2024). It covers aspects of reliability, responsiveness, assurance, empathy, and tangibles that customers share to determine their overall experience. Several studies have utilized this model to investigate customer satisfaction and loyalty. Arli et al. (2024) applied the SERVQUAL tool to examine whether customers prefer dining in restaurants or ordering via home delivery services. Similarly, Su et al. (2022a) assessed mobile home delivery services (MHDS) by examining their functions and technical aspects and also explored how this influenced customer loyalty according to the SERVQUAL model. Ahmad et al. (2025) focused on the factors that influenced satisfaction and repeat use of online home delivery services in India, which had experienced rapid growth due to the COVID-19 pandemic, using the SERVQUAL approach. In our work, we used the SERVQUAL model to investigate further how customer satisfaction and loyalty are developed towards home delivery mobile apps. Taufiq-Hail et al. (2023) pointed out that a substantial contribution of the service quality and the trust to the customer satisfaction and the intention to accept and adopt delivery services is developed once it is experienced as satisfaction. It is also noted by Uzir et al. (2021) that service quality, along with customer-perceived value and trust, significantly influences customer satisfaction. Additional dimensions are included in the model, such as how applications are organized (visual organization of apps/VOA), their dependability (app reliability/REL), quickness (responsiveness/RES), ease of use (user-friendliness/USF), how well they meet users' needs (personal need fulfilment/PNF), and how efficiently the app works (efficiency/EFC) to do a more thorough analysis of the service's quality.

2.2. Technology acceptance model (TAM)

Davis (1989) identified the TAM, a theory that helps explain how people adopt and use technology by accepting it (Davis, 1989). The model focuses on the idea that the user's perceived usefulness and ease of use are the main influencing factors for accepting technology. Generally, a technology is more likely to be popular if people see it as both helpful and not challenging to use. Various aspects of technology adoption have been understood through the use of this model. For example, Natarajan et al. (2017) built on TAM by investigating users' intentions for shopping with mobile commerce applications by including perceived enjoyment, perceived risk, and their level of innovation. The study by Alalwan (2020) based on the TAM model concluded that online reviews, ratings, tracking deliveries, performance, enjoyment, applicable price discounts, and convenience all impact users' satisfaction and their plans to keep using mobile apps for home delivery services. Similarly, Silva et al. (2022) applied the Technology Acceptance Model (TAM) to determine what factors lead users to continue using home delivery apps. They discovered that both perceived usefulness and ease of use directly affected continual use, and indirect effects were seen from self-efficacy, technology readiness, perceived severity, and perceived susceptibility. To understand their influence on customer trust and loyalty on mobile home delivery apps (MFDAs), Su et al. (2022b) combined the theories on mobile service, TAM, personalization, and privacy with criteria from M-SERQUAL. It turned out that trust in the company was positively connected to TAM constructs as well as interface, interaction, information, and personalization qualities. Lee et al. (2023) have most recently examined the factors that predict how helpful people perceive a home delivery app, how easy they expect it to be, and their decision to use the app. Based on the existing studies, this study investigates factors influencing e-customer satisfaction with using TAM theory, especially by looking at visual organization, app reliability, responsiveness, user-friendliness, meeting personal needs, and efficiency. With this framework as a basis, we make the following suggestions for testing.

2.3. Definition of the constructs

2.3.1. Visual organization of the apps

When home delivery mobile apps are organized visually, it means the information, menus, options, and elements are strategically set up and shown in platforms like Foodpanda and other delivery apps, focusing on making the experience easy to use, convenient, and engaging for users (Hasan, 2022). In mobile shopping, visual aesthetics have a significant impact on customer trust and loyalty (Zhang et al., 2023). Kumar et al. (2018) state in their study that structural equation modelling reveals positive linkages between the visual aesthetic of mobile apps and m-loyalty outcomes.

2.3.2. Mobile apps' reliability

Mobile app reliability refers to how well and consistently the app performs its intended features. This applies to home delivery companies such as Foodpanda, Pandamart, Uber Eats, HungryNaki, Foodi, Shohoz, and Swapno, which require continuous work, accurate order fulfillment, and timeliness in home delivery. The app's reliability is one of the keys to keeping users satisfied and using the app in the future (Sharma & Padashetty, 2025)

2.3.3. Mobile apps' responsiveness

The speed and accuracy with which the app responds to users' actions are known as responsiveness, ensuring a smooth user experience. To achieve this, mobile apps require fast performance, seamless transitions between screens, screens that adapt to any device, and immediate actions such as adding or removing items, making a purchase, or completing a payment (Yu et al., 2020).

2.3.4. Mobile apps' user-friendliness

The simplicity and straightforwardness of an app's use are what we call its user-friendliness. It involves utilizing various elements that enhance a good user experience. Zhang et al. (2023) state that ease of use or user-friendliness of apps creates customers' trust and loyalty in the context of mobile app-based shopping experiences. Another study found that the functional aspect of mobile apps, including convenience and ease of use, positively influences customer satisfaction with the retailer's mobile app (Iyer et al., 2018).

2.3.5. Personal need fulfilment

Personal need fulfilment in mobile home delivery apps explains how well they respond to each person's tastes and reasons for using them. Ray and his team (2019) indicate that popular apps meet users' enjoyment, practical, and social interests. Mobile apps cater to personal needs by addressing core psychological factors such as the need for connection, skill development, independence, and the craving for enjoyment and excitement (McLean, 2018).

2.3.6. Mobile apps' efficiency

Efficiency in home delivery service refers to how smoothly a platform allows users to place their orders using the app on their phones or tablets. Restaurants and other sellers that start working with home delivery apps experience a boost in sales and gain competitive advantages, resulting in more accurate order fulfillment, as found by Wahyudin et al. (2024). Efficiency significantly accelerates users' satisfaction with mobile apps (Lin et al., 2024).

2.4. Conceptual synthesis table of previous literature

Concept / Construct	Theoretical Foundation	Key Studies	Context / Domain	Methodological Approach	Core Empirical Findings	Identified Research Gaps / Impetus for Current Study
E-Service Quality (Overall)	SERVQUAL; M-SERVQUAL	Nanu et al. (2024); Arli et al. (2024); Uzir et al.	Food delivery services; home delivery;	Survey-based SEM / PLS-SEM	Service quality dimensions significantly	Limited integration of app-specific service quality dimensions with satisfaction–

		(2021); Taufiq-Hail et al. (2023)	emerging markets		influence customer satisfaction, trust, and loyalty intentions.	loyalty linkage in emerging markets
Visual Organization of Apps (VOA)	SERVQUAL (Tangibles); Appscape Theory	Kumar et al. (2018); Hasan (2022); Zhang et al. (2023)	Mobile shopping, food delivery apps	SEM	Visual aesthetics and app structure positively affect trust, satisfaction, and m-loyalty	Underexplored role of visual organization as a service quality antecedent in instant delivery apps
App Reliability (REL)	SERVQUAL (Reliability); TAM (Perceived Usefulness)	Sharma & Padashetty (2025); Su et al. (2022a); Uzir et al. (2021)	Mobile food delivery apps	SEM	Reliable performance and accurate order fulfilment enhance satisfaction and continued usage.	Scarcity of studies linking app reliability → e-satisfaction → e-loyalty in one structural model
Responsiveness (RES)	SERVQUAL (Responsiveness); UX Theory	Yu et al. (2020); Su et al. (2022a)	Mobile applications	Experimental and SEM-based studies	Faster response times and system feedback improve user experience and satisfaction.	Lack of empirical testing of system responsiveness as a distinct construct in emerging markets
User-Friendliness (USF)	TAM (Perceived Ease of Use)	Iyer et al. (2018); Zhang et al. (2023); Lee et al. (2023)	Retail and food delivery apps	SEM	Ease of use directly influences satisfaction, trust, and continued usage	Limited evidence on user-friendliness as a mediator-enhancing service quality perception
Personal Need Fulfilment (PNF)	Uses and Gratification Theory; TAM Extensions	Ray et al. (2019); McLean (2018); Su et al. (2022a)	Food delivery and mobile apps	SEM; longitudinal designs	Fulfillment of utilitarian, hedonic, and social needs strengthens satisfaction and engagement.	Rarely integrated with SERVQUAL dimensions in delivery app research.
Efficiency (EFC)	SERVQUAL: System Quality Theory	Wahyudin et al. (2024); Lin et al. (2024)	Food delivery apps; hospitality	IPMA; SEM	Efficient ordering processes and system performance enhance satisfaction and spillover loyalty effects.	Need for consumer-side efficiency analysis linked to loyalty outcomes.
Technology Acceptance (TAM Constructs)	TAM	Davis (1989); Natarajan et al. (2017); Alalwan (2020); Silva et al. (2022); Lee et al. (2023)	Mobile commerce: food delivery apps	SEM / Integrated models	Perceived usefulness and ease of use significantly drive satisfaction and continued usage.	Fragmented treatment of TAM with service quality; limited holistic SEM frameworks
E-Customer Satisfaction	Expectation–Confirmation Theory; SERVQUAL	Arli et al. (2024); Alalwan (2020); Lin et al. (2024)	Online food delivery services	SEM	Satisfaction acts as a central mediator between service quality and loyalty.	Need for context-specific validation in instant home delivery apps in emerging markets.
E-Customer Loyalty	Relationship Marketing Theory	Kumar et al. (2018); Zhang et al. (2023); Arli et al. (2024)	Mobile commerce; food delivery	SEM	Loyalty is driven by satisfaction, trust, and app experience quality	Insufficient empirical models capturing the full service quality → satisfaction → loyalty chain

2.5. Proposed hypotheses

2.5.1. The effects of visual organization of the apps on e-customer satisfaction

The app layout and design show how easy it is to navigate and scroll. The attractiveness and clarity of a website play a key role in determining customer satisfaction. Herington & Weaven (2009) explain that a well-designed and appealing user interface requires less user effort to operate the app, making it more user-friendly. This enhances the app's enjoyment and enables seamless navigation as you proceed; however, the appearance of the site or app is most important for web-based or app-based services. It is confirmed by Venkatakrishnan et al. (2023) that a positive relationship exists between e-service quality and customer satisfaction and loyalty, with web design having a significant influence on the relationship between e-service quality and customer satisfaction. It was found that a more trustworthy and

reliable user experience occurs when the interface appears easy and straightforward (Zaheer et al., 2024). The ease of navigation is one of the user-friendly aspects that significantly contributes to customer satisfaction in mobile commerce applications, such as Shopee. The systematic review reveals a positive effect of a well-designed user interface on purchase intentions, highlighting the role of usability in shaping consumer experiences and satisfaction (M. Zacky et al., 2024). According to Rahman Oion et al. (2023), when home delivery apps have an effective human-computer interface, like categorized menus, prominently shown product pictures, and simple checkout routines, customers enjoy and complete their purchases more efficiently, causing overall satisfaction to increase. Zhang et al. (2023) explored in their study the significant positive impact of visual aesthetics on customer trust and loyalty in mobile shopping. It was also found by Lee et al. (2023) that stunning and well-designed app interfaces foster greater trust, leading to increased customer satisfaction and loyalty. So, we can suggest the following hypothesis.
H1a: The visual organization of the home delivery mobile app can positively and significantly influence the e-customer satisfaction.

2.5.2. The effects of apps' reliability on e-customer satisfaction

In the app-based services sector, dependability significantly impacts the quality of the service. This is not related to how well the service meets user expectations. Various studies have shown that the more reliable an app is, the higher the customer satisfaction increases. In their research, Baek & Yoo (2018) found that reliability is one of the strongest predictors of customer loyalty and the likelihood of app reuse. Consistent and stepped-up performance often leads customers to be content and make the app a favorite on their list. Cho et al. (2019) found that having error-free and timely order handling is very important for reliability in the eyes of users. Problems with the system, errors in customer orders, and late deliveries affect the company's reputation and the trust of its customers. Even if the app has many positive traits, problems with reliability can stop some from returning. Reliability plays a significant role in determining customer satisfaction with e-services. Reliability, whether as a single dimension or tied to efficiency, consistency, or fulfilment, is a critical contributor to customer satisfaction in mobile app-based services with diverse geographies and service types (Ainani Lukman & Indrawati, 2024; Hassan, 2024). That is why the following hypothesis can be offered.
H1b: The reliability of home delivery mobile apps significantly and positively influences e-customer satisfaction.

2.5.3. The effects of apps' responsiveness on e-customer satisfaction

It describes the situation when a service provider needs to address a client's issue, question, or concern. Increasing customer satisfaction is an essential aspect of this. Based on their study, Zaheer et al. (2024) found that being responsive, for example, in customer support, following up on order status, or addressing complaints, increases customer satisfaction. A responsive app enables easy navigation, resulting in fewer irritations and happier users. Responsiveness is a vital quality dimension of customer satisfaction and loyalty in the context of mobile commerce applications (Zariman et al., 2023). In their analysis of major home delivery apps, including Uber Eats, DoorDash, Grubhub, and Zomato, Chen, McCain, et al. (2022) found that the performance dimension of delivery applications accounts for 39.43% of customer perception toward the apps. Those with the quickest responses satisfied the customers more and were less likely to be removed from their phones. For this reason, we are able to frame the following hypothesis.
H1c: The responsiveness of home delivery mobile apps significantly and positively influences e-customer satisfaction.

2.5.4. The effects of apps' user-friendliness on e-customer satisfaction

How simple or easy an app is to use matters a lot in deciding if it is easy for users to navigate. The user-friendliness of digital services, such as home delivery mobile apps, is a crucial determinant of customer satisfaction with that service. As stated in Herington & Weaven's (2009) study, if an application is straightforward and easy to run, it often leads to higher satisfaction among users. Apps that make things easy and allow users to complete their tasks quickly are favored by users. How quickly and easily customers can place an order, pay, and track their item's delivery can significantly impact their experience with the service. In line with this, Ray et al. (2019) state that most users put greater importance on user-friendliness and useful features than on having a favorite brand when choosing one service over others. Based on the Technology Acceptance Model (TAM), people's view of an application as simple and easy to handle plays a great role in determining their satisfaction and intention to use the app regularly (Davis, 1989). Referring to Zariman et al. (2023), the usability of mobile commerce applications (MCAs) critically influences customer satisfaction with the use of MCAs. Thus, the following hypothesis can be proposed.
H1d: The user-friendliness of home delivery mobile apps has a significant positive effect on e-customer satisfaction.

2.5.5. The effects of personal need fulfilment on e-customer satisfaction

How satisfied the users are satisfied with services depends on how well their personal expectations and wishes are met. According to Oliver's (1999) Expectancy-Confirmation Theory, satisfaction occurs when a service meets or exceeds the customer's expectations. Convenience, saving time, and getting meals right are critical in home delivery apps. Once their primary needs are met, customers are much happier. Users are more satisfied when apps meet personal needs through their ease of use, personalized menus, a caring effect, and hassle-free service. Based on their study, Hashmi et al. (2021) found that matching product designs to users' needs yields significant improvements in customer engagement and satisfaction. In the same way, Taufiq-Hail et al. (2023) investigated the impact of customer satisfaction, trust, and quality of services on the acceptance of home delivery applications, and they found that personal need fulfilment attributes such as privacy, security, and customized services significantly influence the acceptance of delivery services and applications by customers. Two studies by Cho et al. (2019) and Ray et al. (2019) concluded that convenience is closely related to customer satisfaction when using home delivery mobile apps. Additionally, Davis introduced TAM in 1989, stating that the satisfaction of users and whether they plan to use a service again depend on how easy it is to use and how useful it is. When apps fit users' personal needs very well, their opinions about usefulness and likelihood of returning tend to rise. Zhang et al. (2023) confirm in their research that fulfilling a user's needs through personalization makes users happier and more loyal to the app. Therefore, it can be proposed that.
H1e: Fulfillment of personal needs with mobile apps for home delivery has a significant positive effect on e-customer satisfaction.

2.5.6. The effects of home delivery mobile apps' efficiency on e-customer satisfaction

With the sudden rise of Uber Eats, Foodpanda, Pandamart, Shohoz, Chaldal, Zomato, and Deliveroo, how people get home-delivered food and other FMCG products has changed the food and other FMCG industries. Efficiency helps ensure that customers are satisfied and return

because it includes fast loading, an easy-to-use interface, accurate handling of their orders, live tracking, and seamless payment options. Additionally, being efficient depends on minimizing mistakes and making the ordering experience easy for all users. According to Zaheer et al. (2024), the speed and appropriateness with which a service responds to customers' needs significantly affect their satisfaction. It is also consistent with Oliver's (1999) ECT, which argues that when customers compare what they expected and what actually happened, their satisfaction depends on the outcome. Users are likely to be more satisfied when using mobile home delivery apps if the app provides fast and error-free service, say Ahmad et al. (2025). When an interface is simple, it results in a better user experience. Making the layout simple helps people navigate your website more easily and provides them with better satisfaction. The research by Lee et al. (2023) demonstrates that an intuitive navigation system and seamless menus in mobile apps encourage customers to order more comfortably and smoothly, positively enhancing their overall experience. Additionally, according to Wang et al. (2019), interaction quality and environmental quality influence the continuance intention of mobile applications via customer satisfaction. When apps are built efficiently, there is no uncertainty when placing an order, products arrive quickly, and payment is secure —all of which are essential for a good experience. One aspect of Sharma & Padashetty's (2025) research confirmed that the content quality, navigation, visual design, and contact features of a mobile application, which make it efficient, significantly shape customer satisfaction and perceived value. Thus, the following hypothesis can be proposed.

H1f: The efficiency of home delivery mobile apps significantly and positively influences e-customer satisfaction.

2.5.7. The effects of e-customer satisfaction on e-customer loyalty

Oliver (1999) states that customer satisfaction is the overall judgment a customer gives a product or service, indicating whether it meets or surpasses their expectations. It involves checking product quality afterwards, which can play a significant role in forming emotional bonds and trust, two essential factors in gaining customer loyalty (Ladhari, 2010). If a customer consistently has favorable feelings and experiences with a brand's products, they are said to be loyal to the brand (Dick & Basu, 1994). Numerous studies have found that being satisfied increases the likelihood of remaining loyal. Examples include what Molinillo et al. (2022) found: in retail apps, using experience leads to increased satisfaction, which in turn encourages customers to stay loyal. E-commerce sites rely on how satisfied customers feel, which often stems from the simplicity and speed of the service, as well as the dependability of shipments. According to Khan et al. (2019), user satisfaction with the interface is the primary reason users buy again from e-commerce sites. Likewise, for companies in the hospitality industry, customer satisfaction has a significant impact on their loyalty. According to research by Zaheer et al. (2024), Electronic Customer Satisfaction (ECS) influences Electronic Customer Loyalty (ECL), and this loyalty continues to grow as customers trust and receive good service. When users are happy with an app-based service, they tend to remain loyal, and the company keeps them. The level of customer satisfaction with e-commerce becomes particularly important in home delivery settings. If people in Bangladesh enjoy using an app, they tend to reuse it and refer others to it through word-of-mouth communication (Rahman et al., 2022). Additionally, research in other geographies has established that customer satisfaction with mobile app-based services also generates an intention to recommend the service to others (Siyal et al., 2021). De Cicco & others (2021) suggest that when online services are good, and the food is tasty, this enhances customer trust in the business, leading to increased loyalty and satisfaction. For the Indonesian, Taiwanese, and New Zealand markets, Rombach et al. (2023) reported that a high standard of e-service and food enhances perceived value, raises customer satisfaction, and fosters loyalty. Saha & Mukherjee (2022) note that customer inspiration influences customer loyalty, with customer satisfaction serving as a mediator in a study examining the role of e-service quality and customer satisfaction in fostering customer loyalty. All the literature agrees that electronic customer satisfaction is a crucial factor in promoting customer loyalty in home delivery applications. Based on this review, we propose the following hypothesis:

H2: E-customer satisfaction has a significant positive effect on e-customer loyalty in the context of home delivery mobile applications.

2.5.8. Mediating effects of e-customer satisfaction

Classical theories and research support that e-customer satisfaction plays a strong mediating role in e-customer loyalty. It is common knowledge, based on studies, that designing mobile apps visually enhances user satisfaction. For example, studies by Lai et al. (2021) indicate that when e-commerce sites are visually well-designed, it enhances the satisfaction of e-consumers. According to Liu et al. (2023), the appeal of a mobile app's design increases customers' satisfaction, which plays a role in retaining them as users.

When mobile apps function smoothly without issues, are accessible, and provide accurate information, they play a crucial role in influencing customer outcomes (Yang et al., 2022). Based on recent research, satisfaction now appears to help explain the link between a system's reliability and loyalty. Hassan et al.'s (2023) research in South Asia revealed that if an app produces reliable results, it generates better customer satisfaction and encourages users to remain loyal to the app. According to Lim et al. (2022), loyalty is primarily directly influenced by reliability, whereas satisfaction, which reliability affects, has a more lasting and more substantial impact on loyalty. Such apps that generate quick and helpful responses are usually rated better and more popular (Lee et al., 2023).

Furthermore, Luo et al. (2023) explain that responsiveness is closely linked to usefulness and ease of use, which are fundamental elements of the Technology Acceptance Model (TAM). Prabowo and his team (2022) add to these observations, pointing out that satisfaction is the primary factor behind why responsiveness leads to more loyal customers.

The quality of the user interface, research proves, can affect customer loyalty in several ways. Khalid et al. (2023) contributed to this knowledge by demonstrating that Gen Z users of mobile apps for home delivery services are more loyal when they are satisfied with the usability of the apps. Additionally, it has been found that e-consumer satisfaction plays a crucial role in connecting personal needs to loyalty. In this case, the motivation comes from personal need fulfilment, which results in personal satisfaction, and loyalty acts as the response from the product user. Research by Ahmad et al. (2025) backs up this pathway by confirming that satisfaction acts as a full mediator for the impact of need fulfilment on customer loyalty in home delivery apps in Southeast Asia.

It is now clear that the connection between an app's effectiveness and customer loyalty to the brand is partly determined by consumer satisfaction online. In their study, Jung et al. (2023) demonstrated that loyalty is enhanced by efficient apps, particularly when customers are delighted, revealing a partial mediation effect. As Qatawneh et al. (2024) Noted, e-service quality has a significant and positive impact on e-satisfaction and e-loyalty, and e-satisfaction mediates the relationship between e-service quality and e-loyalty. And Oktavia et al. (2024) explained that e-satisfaction was also largely influenced by the quality of mobile services (design, ease of use, privacy, and support), resulting in a stronger repurchase intention – a clear indication that satisfaction fully mediates the relationship between service quality and loyalty. Therefore, we can propose the following mediating hypotheses.

E-customer satisfaction significantly and positively mediates the effects of the visual organization of home delivery mobile apps (H3a), app reliability (H3b), responsiveness (H3c), user friendliness (H3d), personal need fulfillment (H3e), and app efficiency (H3f) on e-customer loyalty.

3. Conceptual Framework

The conceptual framework is a graphical representation of the proposed relationships between e-service quality, customer satisfaction, and customer loyalty in app-based home delivery services. The key dimensions of e-service quality found are Visual Organization of the App (VOA), Reliability (REL), Responsiveness (RES), User-Friendliness (USF), and Efficiency (EFC), each one being important to Electronic Customer Satisfaction (ECS) (Figure 1). ECS is also regarded as a mediating variable because it strongly affects electronic customer loyalty (ECL) through e-service quality. The structure indicates that the more satisfied a customer is with these dimensions of service quality, the greater the loyalty they achieve. Put differently, satisfaction directly leads to loyalty and also enhances the influence of service quality on a customer's intention to reuse the service.

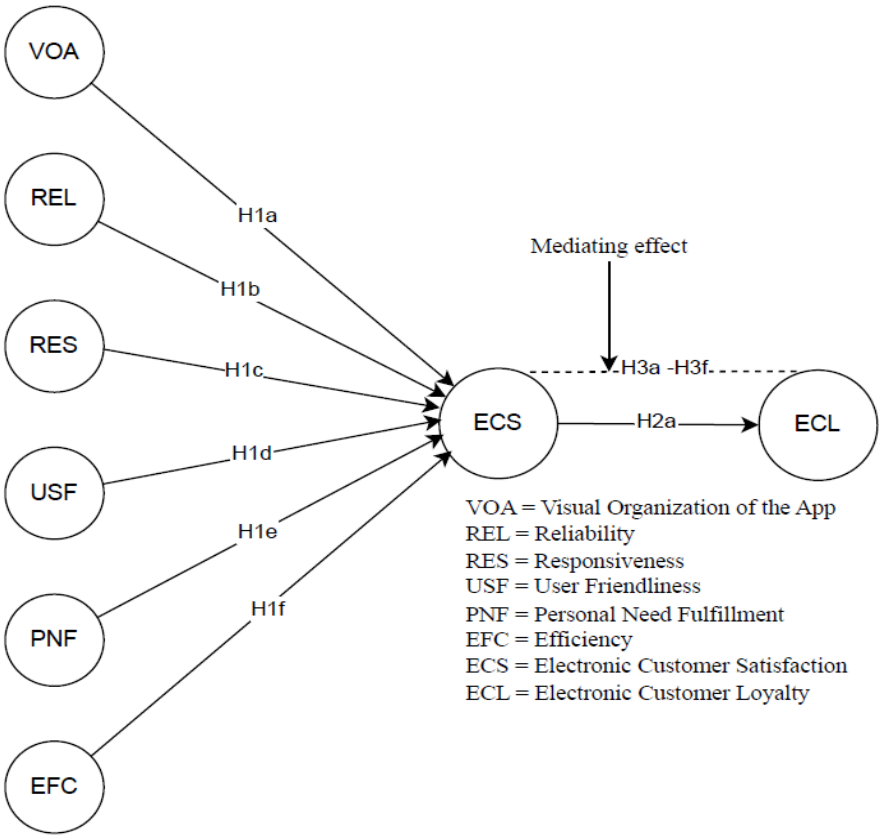

Fig. 1: Conceptual Framework.

4. Methodology

4.1. Data collection and measures

The hypothesized relationships shown in Figure 1 were tested by measuring the effects of electronic service quality on customer satisfaction and loyalty to receiving home delivery service using mobile apps in Bangladesh. Data were collected through an electronic questionnaire prepared in Google Forms. The e-questionnaire link was shared through email, WhatsApp, and Facebook Messenger. At the beginning of the questionnaire and the shared post on Facebook, it was suggested that the sampling criteria include having experience with mobile apps to order instant home delivery services, having a Facebook account, and being at least 18 years old. A structured questionnaire was developed for this purpose, taking the established measures of the constructs used in the study. The measurement scales were sourced from previous studies (as mentioned in Table 1) and adapted to suit the context of this research. Each item was presented as a statement and assessed using a 7-point Likert scale, ranging from "Strongly Disagree" (1) to "Strongly Agree" (7). Before finalizing the questionnaire, the instrument was pilot tested among 63 target respondents to ensure that the respondents correctly understood the questionnaire's intent and requirements. The study employed a purposive sampling technique (Kelly, 2010) to reach the users who order home delivery services using the mobile apps. A total of 627 users responded to our e-questionnaire link. Following a data-cleansing process in which 25 responses were removed (due to incomplete and straight-line responses), a final total of 605 responses were considered suitable for analysis.

4.2. Sample and participant profile

The respondents comprised approximately 53% males and 47% females. Among the final sample of respondents (n = 605), the majority (over 62%) held a bachelor's degree, indicating that they are highly educated and likely knowledgeable about the uses of mobile apps for ordering home delivery services to obtain food and other products. Notably, a significant portion of the respondents, totaling 46.44%, were employed in private-sector jobs. The age distribution ranged from 21 to 35 years, representing 81.48% of the sample. Furthermore, a substantial portion of the respondents, comprising 50.0% of the cohort, had a monthly income between BDT 25,000 and 35,000. Regarding marital status, 80% were married.

4.3. Common method bias

To mitigate potential common method variance, this study implemented a range of procedural and statistical strategies. Procedurally, participants received a well-designed cover letter that clearly outlined survey instructions, ensured anonymity, and encouraged honest participation. This helped elicit responses based on genuine perceptions rather than socially desirable or culturally influenced biases (Podsakoff et al., 2003; Tehseen et al., 2017). Moreover, the study employed established measurement scales and strategically separated dependent and independent variables into distinct sections to enhance psychological separation. Measurement items were adapted from prior studies, and both a pretest and a pilot study were conducted. A variety of scale types were used to capture both broad and specific constructs. Statistically, Harman's one-factor test was applied as recommended by Podsakoff et al. (2003) to examine whether a single factor accounted for most of the variance. The factor analysis identified eight unique factors, with the first accounting for only 44.68% of the variance, indicating that no single factor dominated the data. Consequently, common method bias was not a concern in this study.

5. Data Analysis and Results

5.1. Measurement model

Both the measurement and structural models were examined using the Analysis of Moment Structures (AMOS) software. The measurement model assessed the scale items across all constructs, yielding acceptable outer loading values between 0.760 and 0.900, as suggested by Hair et al. (2019) (see Table 1). Internal consistency was validated, with Cronbach's alpha and composite reliability values exceeding the recommended threshold of 0.70 (Hair et al., 2019). Convergent validity was established, as each construct's Average Variance Extracted (AVE) surpassed the 0.50 minimum recommended by Fornell & Larcker (1981) (refer to Table 2). Discriminant validity was confirmed through cross-loadings, demonstrating that items had strong loadings on their intended constructs and weak loadings on others, consistent with Fornell & Larcker's (1981) criteria (see Table 2). Further evaluation included normality testing via Skewness, Kurtosis, and the Mahalanobis distance for outliers. The Skewness values ranged from -2 to +2, and Kurtosis values fell within the ±7 range, indicating normality (Byrne, 2010). The Mahalanobis distance test produced P1 and P2 values of 0.000. Finally, the model fit indices indicated a good fit for the measurement model (χ^2 = 644.613, df = 369, χ^2/df = 2.008, RMSEA = 0.041, CFI = 0.973, TLI = 0.968, NFI = 0.948).

Table 1: Measurement Model and Confirmatory Factor Analysis

Constructs (Source)	Items	Loadings	CR	Mean	SD
VOA - Visual Organization of the App. (Raza et al., 2020; Herington & Weaven, 2009); α=0.90	VOA1	0.86	0.90	5.68	1.00
	VOA2	0.82		5.56	0.96
	VOA3	0.85		5.62	1.04
	VOA4	0.79		5.53	1.08
REL - Reliability (Raza et al., 2020; Al Karim, 2020); α=0.89	REL1	0.81	0.89	5.43	1.08
	REL2	0.84		5.50	1.06
	REL3	0.84		5.52	1.10
	REL6	0.77		5.56	1.08
RES - Responsiveness (Hassan, 2024, Raza et al., 2020); α=0.84	RES1	0.77	0.84	5.64	1.03
	RES3	0.87		5.60	0.98
	RES4	0.76		5.52	1.09
USF - User Friendliness (Raza et al., 2020, Zhang et al., 2023); α= 0.87	USF1	0.83	0.87	5.85	0.91
	USF2	0.84		5.70	0.93
	USF3	0.83		5.67	0.95
PNF - Personal Need Fulfilment (Raza et al., 2020, Zhang et al., 2023); α= 0.85	PNF2	0.80	0.85	5.59	0.98
	PNF3	0.85		5.58	1.04
	PNF5	0.79		5.57	1.11
EFC - Efficiency (Hassan, 2024, Raza et al., 2020); α= 0.87	EFC2	0.80	0.88	5.72	1.03
	EFC3	0.85		5.74	1.03
	EFC4	0.86		5.76	0.96
ECS - Electronic Customer Satisfaction (Molinillo et al., 2022, Raza et al., 2020); α=0.90	ECS1	0.85	0.90	5.60	0.99
	ECS2	0.82		5.67	0.97
	ECS3	0.85		5.60	1.07
	ECS4	0.80		5.56	1.08
ECL - Electronic Customer Loyalty (Molinillo et al., 2022, Raza et al., 2020); α=0.94	ECL3	0.89	0.93	5.61	0.98
	ECL4	0.87		5.56	1.02
	ECL5	0.90		5.55	1.06
	ECL6	0.86		5.58	1.00

Table 2: Discriminant Validity

	CR	AVE	MSV	MaxR(H)	VOA	USF	PNF	EFC	ECL	ECS	RES	REL
VOA	0.898	0.688	0.410	0.901	0.829							
USF	0.871	0.693	0.373	0.871	0.595	0.832						
PNF	0.854	0.661	0.428	0.858	0.599	0.540	0.813					
EFC	0.875	0.700	0.312	0.878	0.464	0.559	0.524	0.837				
ECL	0.932	0.775	0.410	0.933	0.640	0.611	0.618	0.559	0.880			
ECS	0.897	0.687	0.449	0.899	0.639	0.576	0.654	0.490	0.615	0.829		
RES	0.842	0.640	0.449	0.854	0.611	0.495	0.602	0.480	0.586	0.670	0.800	
REL	0.889	0.666	0.387	0.891	0.429	0.509	0.609	0.513	0.562	0.622	0.548	0.816

Notes: VOA = Visual Organization of the App; USF = User Friendliness; PNF = Personal Need Fulfilment; EFC = Efficiency; ECL = Electronic Customer Loyalty; ECS = Electronic Customer Satisfaction; RES = Responsiveness; REL = Reliability; CR = Composite reliability; AVE= average variance extracted. The diagonal values are the square root of AVEs. Source: Authors' compilation

5.2. Results of the structural model and hypotheses testing

The structural model fit indices are found to be satisfactory (χ^2=806.552, df=327, χ^2/df =2.467, RMSEA=0.049, CFI=0.960, TLI=0.954, and NFI=0.935) and assessed path coefficients and R^2 values. Results revealed that visual organization of the app (β=0.230, p<.01), reliability on the app (β=0.230, p<.01), responsiveness (β=0.250, p<.01), user friendliness (β=0.130, p<.01), and personal need fulfilment (β=0.180, p<.01) significantly positively influenced electronic customer satisfaction, thereby supporting hypotheses H1a, H1b, H1c. H1d, and H1e. However, even though efficiency did not significantly impact electronic customer satisfaction (β =0.140, p>.05), contrary to hypothesis H1f, electronic customer satisfaction substantially and positively influences electronic customer loyalty (β=0.680, p<.01), thus supporting hypothesis H2. The R^2 value for electronic customer loyalty was 0.460, indicating that visual organization of the app, reliability of the app, responsiveness, user-friendliness, personal need fulfilment, efficiency, and electronic customer satisfaction collectively accounted for around 46% of the total variance in electronic customer loyalty (as indicated in Table 3).

Table 3: Results of Direct Effects

Hypotheses	Path relationships	Estimate	t-value	p-value	Decision
H1a	VOA → ECS	0.23	4.94	0.000	Supported
H1b	REL → ECS	0.23	5.22	0.000	Supported
H1c	RES → ECS	0.25	5.19	0.000	Supported
H1d	USF → ECS	0.13	2.80	0.005	Supported
H1e	PNF → ECS	0.18	3.58	0.000	Supported
H1f	EFC → ECS	0.14	0.34	0.733	Not Supported
H2	ECS → ECL	0.68	16.21	0.000	Supported

Note: ECS = Electronic Customer Satisfaction; VOA = Visual Organization of the App; REL = Reliability; RES = Responsiveness; USF = User Friendliness; PNF = Personal Need Fulfilment; EFC = Efficiency; ECL = Electronic Customer Loyalty. Source: Authors' compilation (AMOS output).

5.3. Mediation model analysis

The SPSS PROCESS Macro model # 4 results revealed a significant positive indirect impact of ECS on the link from VOA to ECL, in which β=0.204, t=3.777, and no zero value between the lower (0.108) and upper (0.322) bounds confidence interval, supporting H3a. Similarly, ECS also affirmatively mediate the relationships between REL (β=0.244, t=5.686, and no zero value between lower [0.136] and upper [0.335] bounds confidence interval), RES (β=0.239, t=5.555, and no zero value between lower [0.138] and upper [0.354] bounds confidence interval), USF (β=0.219, t=7.358, and no zero value between lower [0.128] and upper [0.334] bounds confidence interval), PNF (β=0.216, t=6.182 and no zero value between lower [0.123] and upper [0.336] bounds confidence interval), EFC (β=0.191, t=7.555, and no zero value between lower [0.115] and upper [0.292] bounds confidence interval), and ECL, thus, supporting H3b, H3c, H3d, H3e, and H3f, respectively. Since there were no significant direct effects of EFC on ECS, the mediating effects of ECS between EFC and ECL were full, and hence there were significant direct effects of VOA, REL, RES, USF, and PNF on ECS; the mediating effects of ECS between them were partial (Hair et al., 2019). The results of mediating effects are presented in Table 4.

Table 4: Results of Mediation Effects

Hypotheses	Direct Effect (p-value)	Indirect Effect (p-value)	Confidence Interval		t- statistics	Boot SE	Decision
			Lower Bound	Upper Bound			
H3a: VOA→ECS→ECL	0.40 (0.00)	0.204 (0.00)	0.108	0.322	3.777	0.054	Partial Mediation
H3b: REL→ECS→ECL	0.29 (0.00)	0.244 (0.00)	0.136	0.335	5.686	0.051	Partial Mediation
H3c: RES→ECS→ECL	0.30 (0.00)	0.239 (0.00)	0.138	0.354	5.555	0.054	Partial Mediation
H3d: USF→ECS→ECL	0.39 (0.00)	0.219 (0.00)	0.128	0.334	7.358	0.053	Partial Mediation
H3e: PNF→ECS→ECL	0.34 (0.00)	0.216 (0.00)	0.123	0.336	6.182	0.055	Partial Mediation
H3f: EFC→ECS→ECL	0.34 (0.00)	0.191 (0.00)	0.115	0.292	7.555	0.045	Full Mediation

Note: ECS = Electronic Customer Satisfaction; VOA = Visual Organization of the App; REL = Reliability; RES = Responsiveness; USF = User Friendliness; PNF = Personal Need Fulfilment; EFC = Efficiency; ECL = Electronic Customer Loyalty. Note: t- statistics= Indirect effects/Boot SE. Results are the PROCESS MACRO output. The level of confidence for all confidence intervals is out = 95, and the number of bootstrap samples for percentile bootstrap confidence intervals= 5000. Source: Authors' compilation (PROCESS Macro output).

5.4. Importance–performance map analysis (IPMA)

We conducted an Importance–Performance Map Analysis (IPMA) using PLS-SEM, with Electronic Customer Satisfaction (ECS) and Electronic Customer Loyalty (ECL) specified as the target constructs. IPMA extends standard PLS-SEM by enabling a more nuanced interpretation of results through the combined assessment of construct importance and performance (Ringle & Sarstedt, 2016). The analysis estimates the relative importance of predecessor constructs based on their total effects (path coefficients) and evaluates their performance using average latent variable scores, rescaled to a 1–100 range (Hair et al., 2014; Aldholay et al., 2018). This approach facilitates the identification of constructs that exhibit high importance but comparatively low performance, thereby highlighting priority areas for managerial intervention. A priority map was subsequently developed by plotting the importance and performance values of the predecessor constructs.

5.4.1. IPMA for electronic customer satisfaction

Table 5: Importance-Performance Map Analysis for ECS

Latent constructs	Path coefficients (Unadjusted)	Construct performance
EFC	0.023	79.045
PNF	0.164	76.335
REL	0.220	75.012
RES	0.227	76.492
USF	0.119	77.645
VOA	0.210	76.678

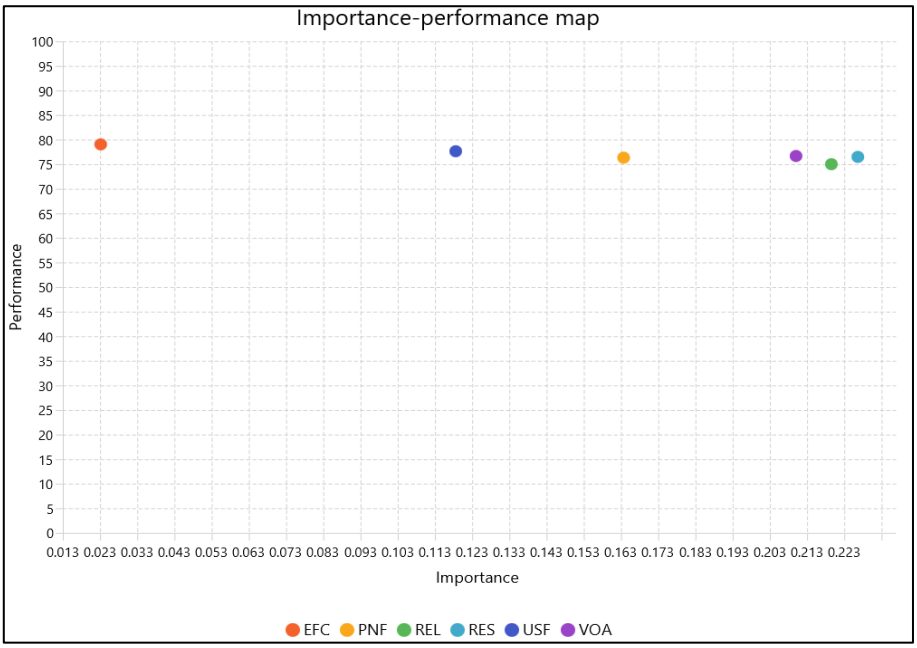

Fig. 2: IPMA for Electronic Customer Satisfaction (ECS).

The IPMA results for electronic customer satisfaction (ECS) show that Responsiveness (RES), Reliability (REL), and Visual Organization of the App (VOA) have relatively high importance (path coefficients of 0.227, 0.220, and 0.210, respectively) but only moderate performance levels (76.492, 75.012, and 76.678). This indicates that improvements in these attributes could yield substantial gains in customer satisfaction (Hair et al., 2019; Ringle and Sarstedt, 2016). In contrast, EFC demonstrates high performance (79.045) but negligible importance (0.023), suggesting limited strategic relevance. These patterns are visually confirmed in Figure 2, where RES, REL, and VOA cluster in the high-importance, moderate-performance quadrant, while PNF and USF fall within the moderate-importance, moderate-performance quadrant.

5.4.2. IPMA for electronic customer loyalty-ECL

Table 6: Importance-Performance Map Analysis for ECL

Latent constructs	Path coefficients (Unadjusted)	Construct performance
ECS	0.564	76.776
EFC	0.013	79.045
PNF	0.092	76.335
REL	0.124	75.012
RES	0.128	76.492
USF	0.067	77.645
VOA	0.119	76.678

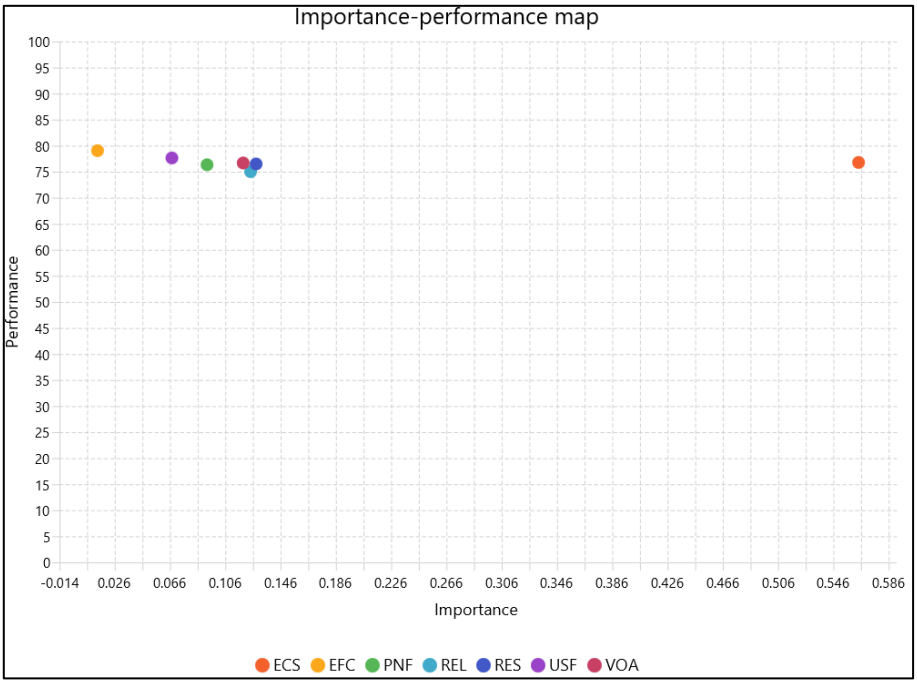

Fig. 3: IPMA for Electronic Customer Loyalty (ECL)

In the case of ECL, the most significant predictor (β = 0.564) with a robust performance score is ECS, and it highlights its core contribution to the development of loyalty. Other constructs like RES, RE, L, and VOA have lower importance and display moderate levels of performance. These findings indicate that loyalty-enhancing techniques must also center on enhancing satisfaction by responsive and reliable service delivery in the first place rather than individualfeatures improvement.

5.5. Artificial neural network (ANN) analysis

The artificial neural network (ANN) method is similar to the design of the human brain, which consists of neurons and axons. It is capable of enriching knowledge by means of the learning process (Ooi et al., 2018). The main advantage of using neural networks is to estimate the complex linear and non-linear relationships among predictors and the acceptance decision, as well as rank the factors by their relative significance. (Chan & Chong, 2012). In addition to this, neural networks are stronger and more accurate in their predictions compared to the common regression models. (Chan & Chong, 2012; Priyadarshinee et al., 2017; Sharma et al., 2016).

5.5.1. Neural network model (NNM) for ECS

Table 7: Root Mean Square Error (RMSE) for NNM of ECS

Network	Training	Testing
ANN1	0.491	0.429
ANN2	0.466	0.438
ANN3	0.444	0.354
ANN4	0.449	0.553
ANN5	0.500	0.466
ANN6	0.421	0.404
ANN7	0.404	0.335
ANN8	0.526	0.430
ANN9	0.430	0.397
ANN10	0.430	0.454
Mean	0.456	0.426
Standard Deviation	0.039	0.061

The values of Root Mean Square Error (RMSE) of ten neural network models to predict ECS are reported in Table 7. The average RMSE of the training (0.456) and testing (0.426) data sets is very close, which means that the model is generalized and does not overfit. ANN 7 has the lowest testing RMSE (0.335) and therefore indicates the best predictive power. The neural network of Figure 4 demonstrates that there are nonlinear relations between service quality dimensions and ECS to the complementary SEM outcomes.

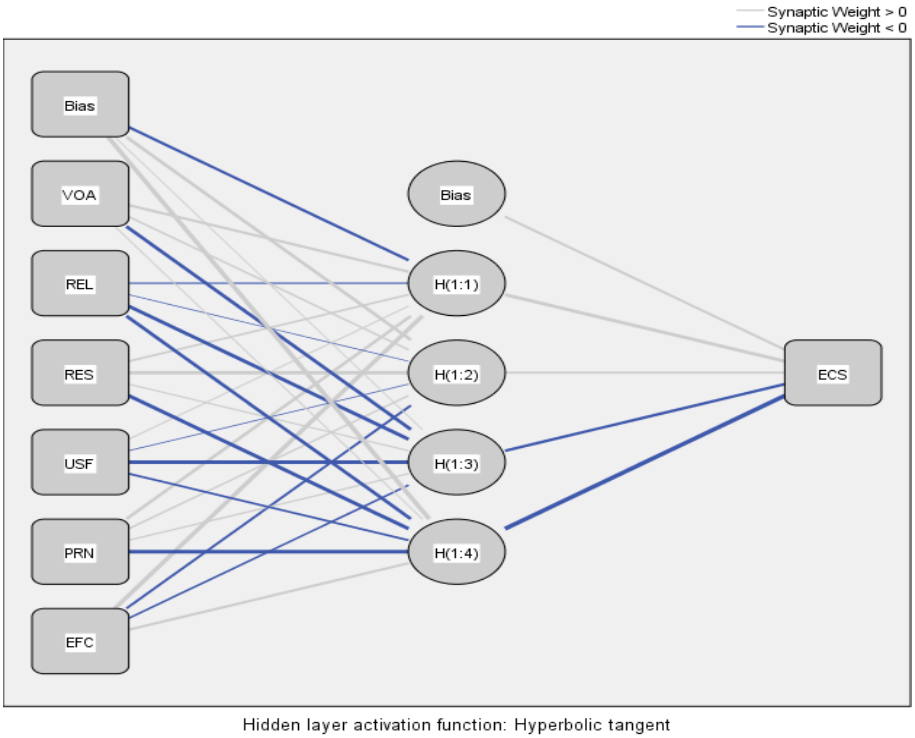

Fig. 4: Neural Network Model for ECS.

5.5.2. Neural network model (NNM) for ECL

Table 8: Root Mean Square Error (RMSE) for Neural Network Model of ECL

Network	Training	Testing
ANN1	0.536	0.606
ANN2	0.573	0.526
ANN3	0.592	0.586
ANN4	0.557	0.551

ANN5	0.636	0.453
ANN6	0.586	0.614
ANN7	0.589	0.540
ANN8	0.540	0.585
ANN9	0.581	0.595
ANN10	0.549	0.576
Mean	0.574	0.563
Standard Deviation	0.030	0.048

Similarly, Table 8 gives the values of RMSE of the neural network models that predict ECL. The average RMSE of training (0.574) and testing (0.563) shows that the performance of prediction remains constant. The ANN models are strong since the training and testing errors are consistent. On the whole, the ANN evaluation confirms and extends the SEM results by the inclusion of non-linear, complex relationships, which enhances the predictive validity of the suggested framework (Shmueli et al., 2019).
Figures 4 and 5 showed the neural network models that were employed in predicting ECS and ECL. The models used complex and non-linear relationships between the input factors (e.g., dimensions of service quality such as reliability, user-friendliness, etc.) and the output variables (ECS and ECL).

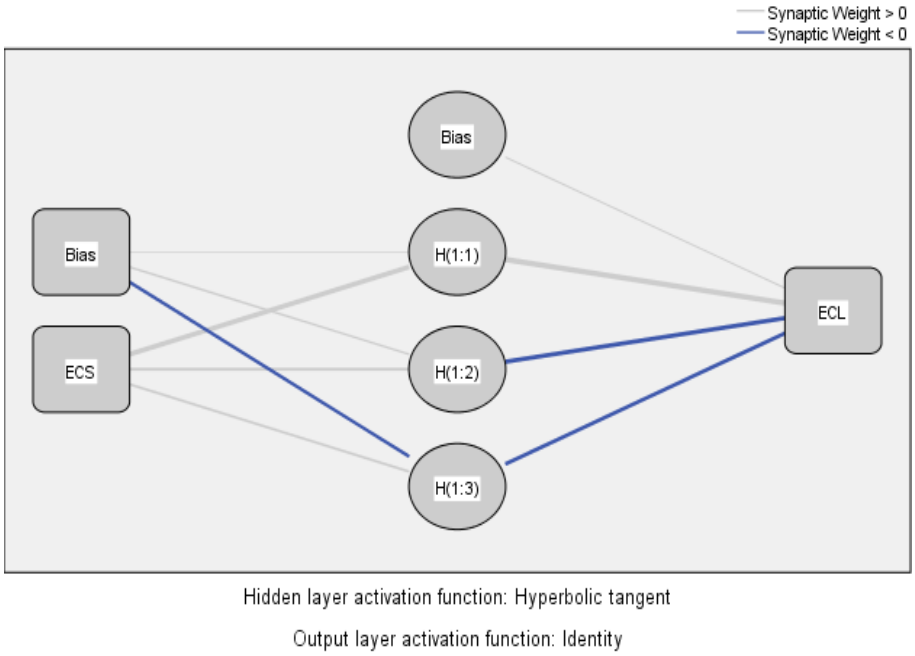

Fig. 5: Neural Network Model for ECL.

6. Discussion

The study attempts to examine the effects of different factors pertinent to mobile app use, such as visual organization of the apps (VOA), apps' reliability (REL), responsiveness (RES), user-friendliness (USF), personal need fulfilment (PNF), and efficiency (EFC) on electronic customer satisfaction (ECS). The study further investigates how electronic customer satisfaction can be turned into electronic customer loyalty (ECL). The results reveal that VOA, REL, RES, USF, and PNF significantly and positively influence electronic customer satisfaction, aligning with H1a, H1b, H1c, H1d, and H1e. These results are also aligned with the prior series of studies, such as Zaheer et al. (2024), who revealed that mobile apps' interface design enormously influences customer satisfaction and enhances customer loyalty (ECL) even in competitive service markets. Cho et al. (2019) found that users prioritize error-free and prompt order processing as key components of reliability. Lee et al. (2023) also unveiled that navigation simplicity and effective feedback systems (e.g., notifications, status updates) significantly enhance user experience and satisfaction in mobile apps. Wang et al. (2019) found that personal need fulfilment is a significant predictor of customer satisfaction in digital services. In particular, interaction quality (e.g., delivery speed, order accuracy) correlates strongly with loyalty via satisfaction.
Furthermore, it is found that the efficiency of mobile apps fails to enhance electronic customer satisfaction, related to H1f significantly. It may happen because functional efficiency alone does not fulfill the complex expectations of modern digital consumers (Huang & Benyoucef, 2017). Studies indicate that factors such as perceived ease of use, aesthetic appeal, personalization, and emotional engagement have a more substantial impact on satisfaction levels than mere operational efficiency (Gummerus et al., 2004; Huang & Benyoucef, 2017). Additionally, the study found that electronic customer satisfaction significantly and affirmatively influences electronic customer loyalty, which is also in line with H2. This result aligns with Zaheer et al. (2024), who argued that ECS can explain ECL in app-based services, particularly those operating in highly competitive markets. They also found that satisfied customers are significantly more likely to remain loyal, even when faced with alternative service options. Thus, e-customer satisfaction is a strong predictor of e-customer loyalty.
The mediating results show that e-customer satisfaction can partially mediate the relationships between VOA & ECL, REL & ECL, RES & ECL, USF & ECL, and PNF & ECL. Even though it can fully mediate the link between EFC and EC, hence the direct effects of VOA, REL, RES, USF, and PNF on ECS are significant, their mediation effects are partial (Hair et al., 2019). Adversely, the direct effect of EFC on ECS is insignificant; thus, it can fully mediate those effects. Previously, several researchers (i.e. Harris & Goode, 2010; Raza et al., 2020; Zaheer et al., 2024, etc.) in different contexts also investigated that customer satisfaction is a critical mediating variable that also mediated the relationships between VOA & ECL, REL & ECL, RES & ECL, USF & ECL, PNF & ECL, and EFC & ECL. Thus, the examined mediating relationships of this study are also consistent and relevant.

7. Implications

7.1. Theoretical implications

The present study offers significant theoretical contributions by enriching current literature on electronic service quality dimensions and customer satisfaction related to home delivery mobile apps. First, the results of the current study extend the e-service quality dimensions (Parasuraman et al., 2005) by demonstrating how electronic customer satisfaction can be influenced by the specific factors. The existing study utilized the notion of the Technology Acceptance Model (TAM) to support the arguments for why people use home delivery mobile apps. Accordingly, it contributes to broadening the TAM theory to examine the electronic customer satisfaction with the use of mobile apps for home delivery services. The study further contributes to addressing the existing research gaps on investigating the predictors of electronic customer satisfaction towards the use of mobile apps for ordering home delivery services and their effects on electronic customer loyalty (Foroughi et al., 2024; Dirsehan & Cankat, 2021).

Secondly, this study also advances a new theoretical framework to clarify how the e-service quality dimensions of visual organization of the mobile apps, apps' reliability, responsiveness, user-friendliness, personal need fulfilment, and efficiency influence electronic customer satisfaction. The direct effect results suggest that visual organization of the apps, apps' reliability, responsiveness, user-friendliness, and personal need fulfilment are the crucial factors that significantly foster the electronic customer satisfaction to use the mobile apps for getting home delivery services.

Thirdly, electronic customer satisfaction is used as a mediating variable to investigate the relationships of e-service quality dimensions and electronic customer loyalty towards the use of mobile apps for home delivery services. The results reveal that electronic customer satisfaction is a vital mediating factor that significantly and positively influences the relationships between those e-service quality dimensions and electronic customer loyalty. Therefore, this study supports that the examined e-service quality dimensions are the central predictors of electronic customer satisfaction, and if the electronic customer is satisfied by the presence of those factors, then it can confirm the repeat use and turn into a loyal user of mobile apps for home delivery services.

Finally, the present study also establishes insights among scholars and academics on how electronic customers can be satisfied by using the mobile apps for home delivery services, confirming those e-service quality dimensions that can help scholars to generate new ideas for conducting further research.

7.2. Managerial implications

The findings of the study also offer significant managerial implications. It provides a key guideline for marketers that examined service quality dimensions should be offered with the instant home delivery mobile apps to satisfy their electronic customers. Moreover, the steady increase in Smartphone and tablet users has contributed to global mobile app downloads surpassing 258 billion, with shifting lifestyles and the COVID-19 pandemic further accelerating usage as social distancing led consumers to dine out less (Dirsehan & Cankat, 2021). Besides, currently in Bangladesh, approximately 15 million people use mobile apps to order food and other products for home delivery, placing around 25,000 orders daily, with over 30,000 restaurants and stores connected to the network (Al Amin et al., 2021b). Thus, there is a massive opportunity for endorsing instant home delivery mobile apps and a greater avenue to benefit them by articulating and disseminating their e-service quality dimension as suggested by this study. Additionally, organizing these dimensions strategically can significantly support users' decision-making when choosing specific mobile apps for instant home delivery services (Foroughi et al., 2024).

Furthermore, the current study also makes a novel contribution in examining how electronic customer satisfaction can be turned into electronic customer loyalty, which confirms repeat purchases and makes customers trustworthy. This result supports that if electronic customers are satisfied with using mobile apps for instant home delivery services due to having those service quality dimensions, they can be converted into delighted customers and become loyal to the apps. Hence, it is an essential guideline for the manager that visual organization of the mobile apps, the app's reliability, responsiveness, user-friendliness, and personal need fulfilment are not only the vital dimensions to satisfy the electronic customers, but also, they are dominant issues to confirm the loyal electronic customers.

Again, a manager can benefit from understanding and leveraging the mediating effects of electronic customer satisfaction in several practical and strategic ways to manage the instant home delivery mobile apps. Hence, instant home delivery mobile apps' managers must carefully design apps that can attract and satisfy the electronic customers by arranging and confirming those service quality dimensions, aiming to convert them into loyal electronic customers. Simultaneously, this study can be a pathway for the electronic customers of home delivery mobile apps to be aware of and consider those dimensions to use those apps.

8. Limitations and Scope for Further Research

Although this study provides valuable insights, it is subject to several limitations that present opportunities for future research. First, the sample was drawn from respondents who met specific criteria, limiting the findings' generalizability to populations with similar characteristics. Future research should consider including more diverse demographic features to enhance generalizability. Second, this study employed purposive sampling to examine the effects of e-service quality dimensions on electronic customer satisfaction and loyalty among individuals who had experience using mobile home delivery apps, were at least 18 years old, and maintained a Facebook account. This sampling method may introduce selection bias and limit the applicability of the results to broader populations.

Third, the study utilized a self-administered, cross-sectional survey for data collection. Future studies could benefit from larger sample sizes and longitudinal designs to broaden the scope and depth of analysis. Fourth, the current research focused on the influence of visual organization, app reliability, responsiveness, user-friendliness, personal need fulfilment, and efficiency on electronic customer satisfaction and its subsequent effect on loyalty. Future studies could explore additional dimensions such as geofencing, real-time order tracking, social media integration, and voice-activated features to gain a more comprehensive understanding of electronic customer satisfaction and loyalty.

Fifth, while this study investigated the indirect influence of these service quality dimensions through customer satisfaction, future research could examine their direct impact on electronic customer loyalty. Additionally, to expand the scope beyond the mediating role of customer satisfaction, future studies could investigate the role of electronic word-of-mouth as a potential mediator between customer satisfaction and loyalty. Sixth, further empirical validation of the proposed model is necessary to enhance its robustness and contribute to advancing knowledge in this domain. Finally, although this study examined the relationship between electronic customer satisfaction and loyalty in the context of mobile home delivery apps, future research could validate this relationship in other digital service contexts to test the generalizability of the findings.

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