

Enhancing customer satisfaction through digital banking: A structural equation model approach

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Abstract: The rapid expansion of digital banking has transformed the traditional banking landscape, positioning customer satisfaction at the center of competitive strategy. This study examines how digital banking improves customer satisfaction in the Nepalese banking industry. The research employed a quantitative method and collected primary data from 388 customers of three selected commercial banks in Kathmandu Valley. After data collection, Partial Least Squares Structural Equation Modeling (PLS-SEM) was used to assess the relationships among variables. The results indicate that all five dimensions, efficiency, privacy, reliability, responsiveness, and cost-effectiveness, have significant and positive effects on customer satisfaction. Among these, responsiveness emerges as the strongest predictor, showing a significant impact on customer satisfaction. This study contributes to the developing literature on digital banking in developing countries by examining the influence of technology-based banking experiences on consumer perceptions and satisfaction. It offers valuable guidance for bank leaders and policymakers aiming to develop and implement customer-focused digital strategies. By improving key dimensions of digital banking quality, financial institutions can gain a competitive edge and foster lasting customer satisfaction.

Keywords: Cost effectiveness, Customer satisfaction, Digital banking, Reliability, and Responsiveness.

1. Introduction

In terms of wealth creation, the banking sector is undeniably very important to national economic growth and social development, which simultaneously has a positive impact on the Gross Domestic Product (GDP) of the country [1]. The current situation has been entirely transformed by technologies and digitization, thereby requiring customers to automate financial services [2]. The importance of customer satisfaction has gradually emerged as a leading competitive differentiator and a vital component of corporate strategy [3]. The emergence of technology and enhanced digital adoption, resulting in increased convenience and protection, has contributed to the changes in mobile payment [4-6]. The push for digital payments represents a new type of digital transformation not only applied to various sectors such as retail, banking, and services, but also across the economy. In addition, digital payment gateways were challenged by the regulations and market dynamics, which led to the need for strong due diligence and strategy anticipation for long-term sustainability [7].

Financial Technology is an innovative disruption that satisfies consumers [8]. In Nepal, digital banking has strongly influenced consumer behavior, creating higher demand for professional and personalized services. According to research, 68% of consumers are “a little satisfied” with e-banking,

and 93% feel it is more cost-effective than traditional banking [9]. Effort anticipation, habit, and enabling conditions all affect digital bank adoption, but the best indicator of acceptability is habit [10]. Digital tools enable process automation, improving operational efficiency, reducing costs, and enhancing banks' competitive strength in a demanding market [11]. Ultimately, digital transformation centers banking services around the empowered and connected customer. The use of IT and the internet has expanded banking services beyond physical branches to mobile devices, a shift commonly known as digital banking [12]. Digital technologies continue to proliferate globally, fundamentally reshaping nearly every industry, with the banking sector experiencing particularly profound change [13]. Rapid technological advances are reshaping consumer behavior and expectations, giving rise to digital-savvy customers and transforming the bank–customer relationship [14]. Digital maturity is essential for banks to achieve strategic objectives, as enhanced digital services improve customer satisfaction, loyalty, and long-term profitability [15].

Nepal's digital banking landscape is rapidly evolving, as highlighted in Nepal Rastra Bank's Payment Systems Oversight Report 2023/24. Mobile banking saw a sharp rise of 15.4%, reaching nearly 24.65 million users, while internet banking grew modestly to about 1.92 million users. Additionally, traditional payment tools were far behind the curve (Debit cards grew at a slow pace to 12.9 million and credit cards to around 289,000 in mid-2024 [16]). Nepalese banks are developing digital banking to accommodate today's customer requirements. However, given that digital banking is relatively new in the Nepalese banking ecosystem, there is a paucity of investigations on digital banking's impact on customer satisfaction. The objective of this study relates to the role of digital banking in improving customer satisfaction in the Nepalese banking sector.

2. Review of Literature

Sharma and Piplani [17] highlight that there are significant opportunities as well as challenges and risks that need to be managed strategically for sustainable growth in digital banking. Digitalization is important for the growth and bettering the service delivery in the Indian banking sector during the digital era [18]. The Technology Acceptance Model (TAM) describes technology adoption through perceived usefulness and ease of use [19]. Expectation–Confirmation Theory (ECT) explains customer satisfaction by comparing initial expectations with actual service performance [20]. The e-SERVQUAL model evaluates electronic service quality through dimensions such as efficiency, reliability, responsiveness, privacy, and security, and is widely used in digital banking studies to assess the impact of online service quality on customer satisfaction and loyalty Parasuraman et al. [21]. Jahan and Shahria [22] found that expense, responsiveness, and relative advantage significantly influence customer satisfaction and loyalty among young digital banking users in Bangladesh. Gomachab and Maseke [23] found that mobile banking enhances financial access and achieves high customer satisfaction, with users viewing it as reliable, convenient, cost-effective, and more secure than traditional banking. Ameme and Wireko [24] found that technology positively influences customer satisfaction in the banking sector and emphasized that continuous innovation in products and services is essential for competitive leadership, despite the associated increase in costs. Limbu [25] studied customer satisfaction regarding internet-banking services in Nepal into three levels: high, medium, and low. This classification aims to identify the primary elements influencing customer satisfaction. The findings indicated that the most significant factor affecting satisfaction with online banking services was user-friendliness. Likewise, Subedi and Bhandari [26] evaluated the effects of internet banking service on customer satisfaction in Nepali commercial banks, finding that the main reason customers were satisfied was that the online services were easy to use.

Genevianm [27] investigated how digital banking services influence customer satisfaction in Bamenda, Cameroon, and revealed that platforms such as mobile banking, ATMs, and electronic fund transfers have a significant positive effect on customer satisfaction. It further suggests that strengthening digital service systems and increasing customer awareness can enhance overall banking experiences. The adoption of e-banking channels such as ATMs, internet banking, and mobile banking

has substantially transformed traditional banking operations in Nepalese commercial banks [28]. The COVID-19 pandemic accelerated the growth of digital banking in Nepal by expanding consumer access and strengthening trust in digital financial services [29]. Nepal has not yet completely benefited from digital payment systems, despite their promise to reduce problems like lengthy lines and inefficient transactions [30].

Thakuri et al. [31] found that responsiveness, security, and convenience significantly influence customer satisfaction with mobile banking in Kathmandu Valley, while cost and relative advantage have minimal impact, and satisfaction alone does not directly translate into customer loyalty. Gautam and Sah [10] found that website efficiency and e-customer service significantly drive e-customer satisfaction in Nepalese online banking, with satisfaction mediating the relationship between service quality and customer loyalty. Ali and Raza [32] found that all six service quality dimensions, compliance, assurance, reliability, tangibility, empathy, and responsiveness, significantly affect customer satisfaction in Pakistani Islamic banks, with compliance identified as the most influential factor due to strong adherence to Sharia principles. Jahan and Shahria [22] examined young users' perceptions of mobile banking in Bangladesh and found that expense, responsiveness, and relative advantage significantly influence customer satisfaction. Aslam et al. [33] found that fulfilment, reliability, ease of use, and security significantly shape ATM service quality, with customer satisfaction strongly influencing loyalty, while convenience and responsiveness show insignificant effects. Rumangkit et al. [34] pointed out the importance of raising awareness on privacy on e-wallet user happiness, and digital wallet service providers should always aim to provide robust data protection. From the review of previous literature, the following hypotheses are suggested:

Hypothesis:

H₁: Efficiency of digital banking has a significant effect on customer satisfaction.

H₂: Privacy in digital banking has a significant effect on customer satisfaction.

H₃: The reliability of digital banking has a significant effect on customer satisfaction.

H₄: The responsiveness of digital banking has a significant effect on customer satisfaction.

H₅: Cost effectiveness in digital banking has a significant effect on customer satisfaction.

3. Research Methodology

This research adopts a quantitative research method that tests the connection between digital banking and customer satisfaction in the Nepalese banking sector. Data were collected through a structured questionnaire for assessing customer satisfaction along five essential dimensions: efficiency, privacy, reliability, responsiveness, and cost-effectiveness. The survey included two parts: respondents' general information and their impressions of digital banking. All measurement items were assessed using a five-point Likert scale ranging from strongly disagree to strongly agree. A total of 388 valid responses were collected for analysis. Out of the 20 commercial banks operating in the Kathmandu Valley, this study focused on three (NIC ASIA Bank Limited, Nabil Bank Limited, and Global IME Bank Limited), which were purposively chosen for their distinctive and well-established digital banking strategies. NIC ASIA Bank represents a hybrid digital-retail approach with platforms such as MoBank and iTouch. Nabil Bank reflects a fully digital neo-banking model through nBank. Global IME Bank highlights scale and financial inclusion via its omni-channel platform, Global Smart Plus. These varied digital approaches provide a comprehensive platform for evaluating the relationship between digital banking practices and customer satisfaction. Structural Equation Modeling (SEM) was applied using Smart PLS to analyze the data. The measurement model was assessed through tests of internal consistency reliability, convergent validity, and discriminant validity.

4. Results

4.1. Information of the Respondents

The demographic profile of the respondents can be summarized in Table 1, which shows a younger population in the economy. Specifically, 72% of the sample is between 18 and 30 years of age, 23% between 30 and 40 years, with those above 40 years accounting for only 5%. This age group is suitable for financial and economic research; those most engaged in decision-making are better targeted. Gender is relatively well balanced, with a majority of respondents being female (52%) or male (48%). Marital status is also nearly equal, with 51% married and 49% unmarried, limiting demographic effects. In terms of education, most survey subjects are well-qualified: 53% are graduates, and 31% are postgraduates, indicating reliable responses regarding financial behavior and economic thought. The income distribution shows significant heterogeneity: 39% report earning more than Rs. 200,000 monthly, 31% earn less than Rs. 50,000, with the remaining falling into middle-income categories, providing adequate diversity for practical financial analysis.

Table 1.
Respondents' profile (N= 388).

| Basis | Categories | Frequency | % |
|-----------------|-------------------------|-----------|----|
| Age | 18-30 | 280 | 72 |
| | 30-40 | 89 | 23 |
| | 40-50 | 15 | 4 |
| Gender | Above 50 Years | 4 | 1 |
| | Female | 201 | 52 |
| | Male | 187 | 48 |
| Marital Status | Married | 197 | 51 |
| | Unmarried | 191 | 49 |
| | SLC | 14 | 4 |
| Education Level | Grade 12 | 49 | 13 |
| | Graduate | 206 | 53 |
| | Post-Graduate | 119 | 31 |
| Income Level | Below Rs. 50000 | 119 | 31 |
| | Rs. 50000 - Rs. 100000 | 65 | 17 |
| | Rs. 100000 - Rs. 200000 | 51 | 13 |
| | Above Rs. 200000 | 153 | 39 |

4.2. Measurement Model Evaluation

The measuring model was confirmed using "internal consistency, convergent validity, and discriminant validity". The circles in Figure 1 represent the latent constructs the researcher used in the study, which include

"Efficiency, privacy, reliability, responsiveness, and cost-effectiveness." There are three statement codes measuring efficiency, three for reliability, four for privacy, and three for responsiveness. Additionally, four statement codes measure time effectiveness, and four assess customer satisfaction. These codes are depicted adjacent to the indicators leading to the corresponding items or constructs. For each item or construct, the factor loading values are displayed near the corresponding arrow.

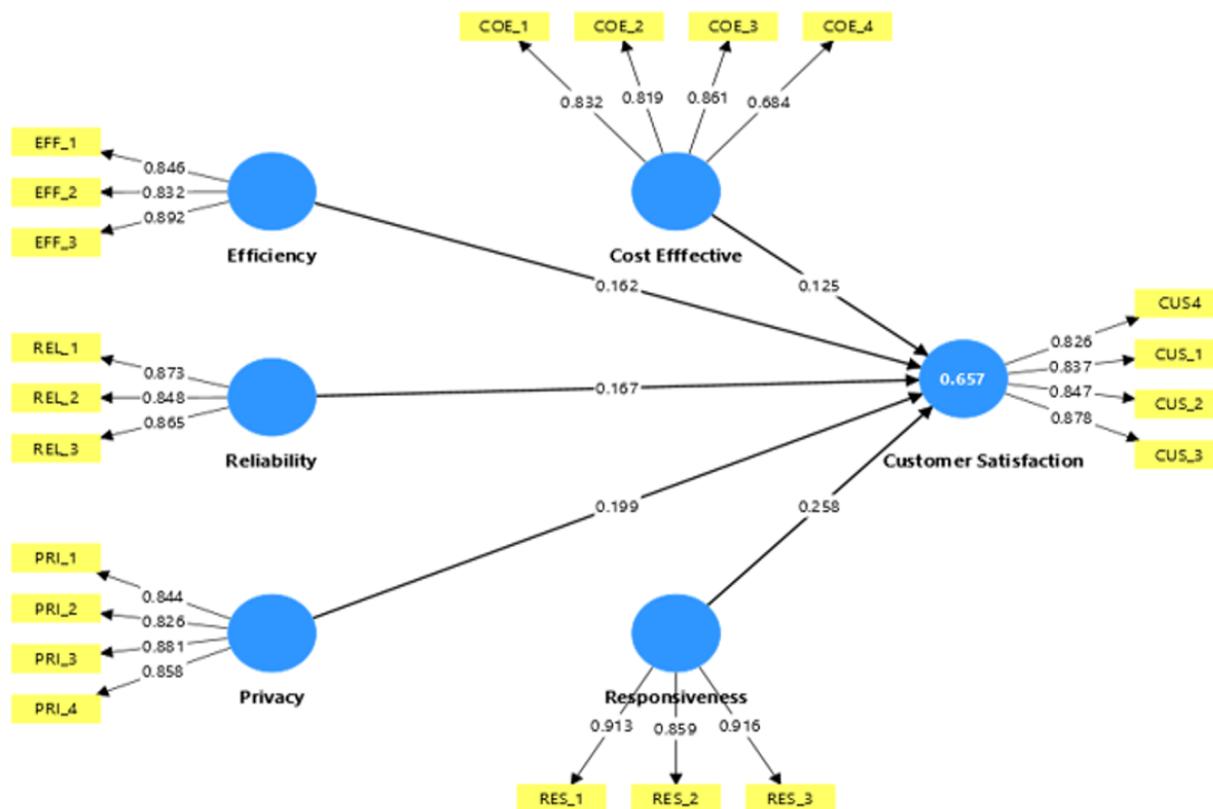


Figure 1. Measurement model from Smart PLS.

Table 2 demonstrates that the average scores of all constructs are larger than the threshold score of 3, indicating positive perceptions toward the constructs by most respondents regarding efficiency, privacy, reliability, responsiveness, cost-effectiveness, and customer satisfaction. A 5-point Likert scale was used in the study, from 1 (strongly disagree) to 5 (strongly agree). The items have factor loadings above 0.70, except for item CUS_4 in the customer satisfaction construct. Overall, the findings confirm that the observed items sufficiently represent their theoretical constructs.

Table 2.
Mean, SD and loading of constructs.

| Construct | Items | Mean | SD | Loading |
|-----------------------|-------|-------|-------|---------|
| Efficiency | EFF_1 | 4.518 | 0.863 | 0.837 |
| | EFF_2 | 4.039 | 0.894 | 0.847 |
| | EFF_3 | 4.232 | 0.854 | 0.878 |
| Reliability | REL_1 | 4.067 | 0.835 | 0.826 |
| | REL_2 | 4.01 | 0.969 | 0.846 |
| | REL_3 | 4.134 | 0.83 | 0.832 |
| Privacy | PRI_1 | 4.302 | 0.846 | 0.892 |
| | PRI_2 | 4.16 | 0.888 | 0.844 |
| | PRI_3 | 4.165 | 0.924 | 0.826 |
| Responsiveness | PRI_4 | 4.294 | 0.835 | 0.881 |
| | RES_1 | 4.175 | 0.897 | 0.858 |
| | RES_2 | 4.152 | 0.859 | 0.873 |
| Cost Effectiveness | RES_3 | 4.183 | 0.888 | 0.848 |
| | COE_1 | 4.448 | 0.84 | 0.865 |
| | COE_2 | 4.17 | 0.975 | 0.913 |
| Customer Satisfaction | COE_3 | 4.418 | 0.877 | 0.859 |
| | COE_4 | 3.812 | 1.128 | 0.916 |
| | CUS_1 | 4.07 | 0.978 | 0.832 |
| | CUS_2 | 3.985 | 1.072 | 0.819 |
| | CUS_3 | 4.023 | 1.049 | 0.861 |
| | CUS_4 | 4.036 | 1.074 | 0.684 |

Table 3 shows the convergent validity results of the study. All five constructs met the required standards limit, as their “Composite Reliability” (C.R.) values were greater than 0.7 and their “Average Variance Extracted” (A.V.E.) values were greater than 0.5. Internal consistency was confirmed by “Cronbach’s Alpha and rho-a” values that were significantly greater than 0.7. As a result, the concept of “convergent validity” was developed [35].

Table 3.
Convergent validity result.

| Factor | Cronbach's alpha | Rho_A | C.R | A.V.E |
|-----------------------|------------------|-------|-------|-------|
| Customer Satisfaction | 0.869 | 0.870 | 0.911 | 0.718 |
| Efficiency | 0.819 | 0.822 | 0.892 | 0.734 |
| Privacy | 0.874 | 0.878 | 0.914 | 0.726 |
| Reliability | 0.827 | 0.828 | 0.897 | 0.743 |
| Responsiveness | 0.877 | 0.881 | 0.925 | 0.803 |
| Cost Effectiveness | 0.811 | 0.814 | 0.877 | 0.643 |

4.3. Discriminant Validity Result

The discriminant validity was checked by applying the “Fornell-Larcker and cross-loading criteria.” Discriminant validity specifies “the extent to which the measure is adequately distinguishable from related constructs within the nomological net.” To calculate the “Fornell-Larcker” criterion, the square roots of the “Average Variance Extracted” (AVE) of the available constructs were calculated (see Table 4). In summary, the values were as follows:

Customer satisfaction (0.847), efficiency (0.857), privacy (0.852), reliability (0.862), responsiveness (0.896), and cost-effectiveness (0.802) are higher than their respective inter-construct correlations. This confirms that discriminant validity is established using the “Fornell-Larcker” criterion [36].

Table 4.
Discriminant validity: Fornell-Larcker criterion.

| Factors | Customer Satisfaction | Efficiency | Privacy | Reliability | Responsiveness | Cost Effectiveness |
|-----------------------|-----------------------|--------------|--------------|--------------|----------------|--------------------|
| Customer Satisfaction | 0.847 | | | | | |
| Efficiency | 0.707 | 0.857 | | | | |
| Privacy | 0.729 | 0.746 | 0.852 | | | |
| Reliability | 0.713 | 0.737 | 0.715 | 0.862 | | |
| Responsiveness | 0.739 | 0.703 | 0.737 | 0.778 | 0.896 | |
| Cost Effectiveness | 0.701 | 0.734 | 0.797 | 0.669 | 0.724 | 0.802 |

Table 5 shows that all indicators load higher on their respective constructs than on other constructs, satisfying the cross-loading criterion for discriminant validity. Each item demonstrates strong primary loadings compared to cross-loadings. Furthermore, VIF values range from 1.386 to 2.837, remaining below the recommended threshold of 5. These results confirm adequate discriminant validity and the absence of multicollinearity issues.

Table 5.
Discriminant validity: Cross-loading criteria.

| Factor | Customer Satisfaction | Efficiency | Privacy | Reliability | Responsiveness | Cost Effectiveness | VIF |
|--------|-----------------------|--------------|--------------|--------------|----------------|--------------------|-------|
| CUS_1 | 0.837 | 0.555 | 0.602 | 0.591 | 0.613 | 0.555 | 2.518 |
| CUS_2 | 0.847 | 0.636 | 0.619 | 0.641 | 0.628 | 0.596 | 1.851 |
| CUS_3 | 0.878 | 0.608 | 0.64 | 0.603 | 0.648 | 0.628 | 2.777 |
| CUS_4 | 0.826 | 0.593 | 0.608 | 0.58 | 0.614 | 0.595 | 1.386 |
| EFF_1 | 0.558 | 0.846 | 0.652 | 0.572 | 0.576 | 0.644 | 2.095 |
| EFF_2 | 0.623 | 0.832 | 0.578 | 0.633 | 0.568 | 0.583 | 2.099 |
| EFF_3 | 0.631 | 0.892 | 0.689 | 0.682 | 0.66 | 0.662 | 2.500 |
| PRI_1 | 0.627 | 0.686 | 0.844 | 0.64 | 0.632 | 0.684 | 2.210 |
| PRI_2 | 0.563 | 0.597 | 0.826 | 0.557 | 0.569 | 0.629 | 2.100 |
| PRI_3 | 0.666 | 0.621 | 0.881 | 0.602 | 0.65 | 0.681 | 2.046 |
| PRI_4 | 0.624 | 0.639 | 0.858 | 0.637 | 0.655 | 0.721 | 2.456 |
| REL_1 | 0.618 | 0.64 | 0.568 | 0.873 | 0.65 | 0.518 | 1.909 |
| REL_2 | 0.6 | 0.613 | 0.628 | 0.848 | 0.691 | 0.589 | 1.947 |
| REL_3 | 0.625 | 0.651 | 0.655 | 0.865 | 0.671 | 0.625 | 1.619 |
| RES_1 | 0.678 | 0.644 | 0.666 | 0.685 | 0.913 | 0.666 | 2.208 |
| RES_2 | 0.618 | 0.598 | 0.63 | 0.674 | 0.859 | 0.619 | 1.992 |
| RES_3 | 0.688 | 0.646 | 0.683 | 0.731 | 0.916 | 0.659 | 1.791 |
| COE_1 | 0.58 | 0.644 | 0.692 | 0.551 | 0.572 | 0.832 | 1.897 |
| COE_2 | 0.545 | 0.559 | 0.621 | 0.527 | 0.576 | 0.819 | 2.803 |
| COE_3 | 0.581 | 0.688 | 0.719 | 0.564 | 0.591 | 0.861 | 2.004 |
| COE_4 | 0.537 | 0.45 | 0.51 | 0.5 | 0.578 | 0.684 | 2.837 |

4.4. Structural Equation Model

Figure 2 presents the structural model, showing that efficiency, reliability, privacy, responsiveness, and cost-effectiveness significantly influence customer satisfaction. The PLS-SEM results indicate that all t-values exceed the threshold of 1.96, confirming that each path is statistically significant at the 5% level. The detailed structural model results are reported in Table 6.

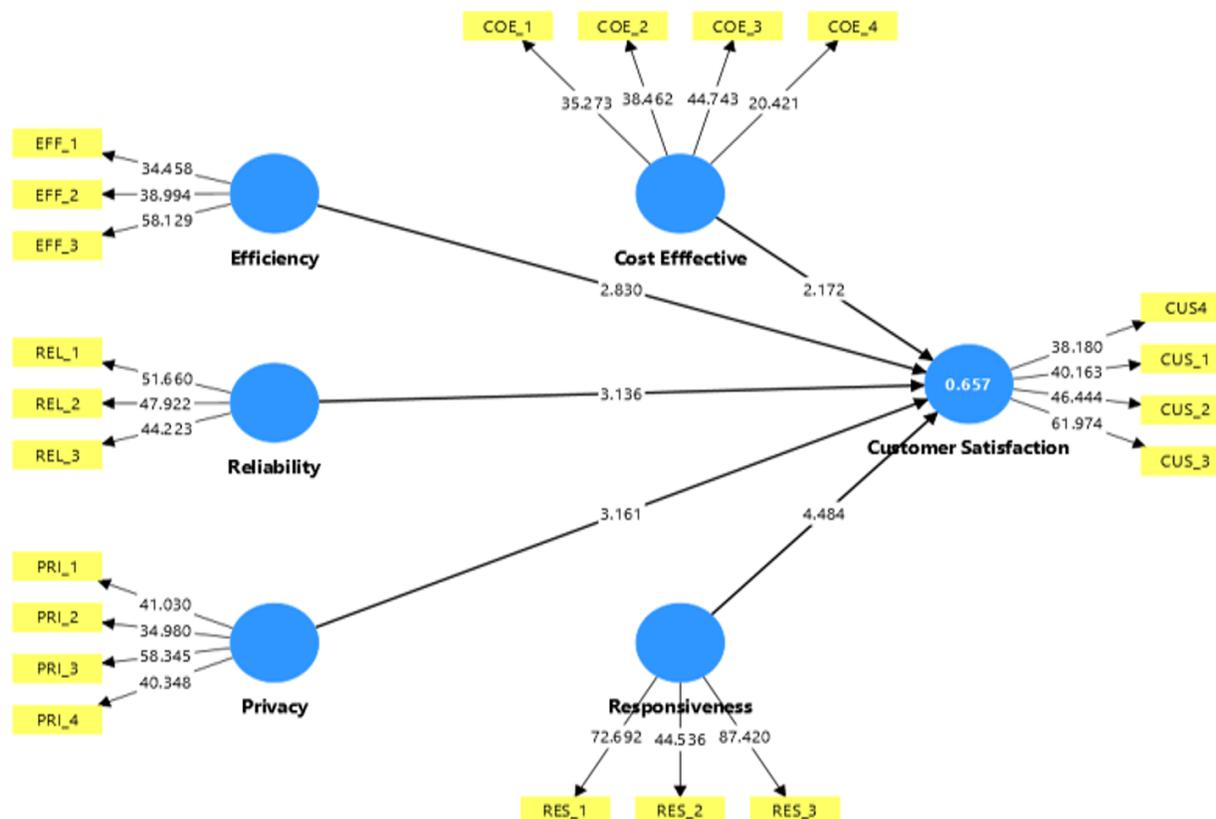


Figure 2.
Structural Equation Model (SEM).

Table 6.
Direct impacts of efficiency, reliability, privacy, responsiveness, and cost effectiveness.

| Hypothesis | Path | Beta | t-value | p-values | Results |
|------------|---|-------|---------|----------|-----------|
| H1 | Efficiency -> Customer Satisfaction | 0.162 | 2.83 | 0.005 | Supported |
| H2 | Privacy -> Customer Satisfaction | 0.199 | 3.161 | 0.002 | Supported |
| H3 | Reliability -> Customer Satisfaction | 0.167 | 3.136 | 0.002 | Supported |
| H4 | Responsiveness -> Customer Satisfaction | 0.258 | 4.484 | 0.000 | Supported |
| H5 | Cost Effectiveness -> Customer Satisfaction | 0.125 | 2.172 | 0.030 | Supported |

Table 6 indicates that all the hypotheses proposed (H1, H2, H3, H4, and H5) are satisfied, since all structural paths show positive and statistically significant associations between them ($p < 0.05$). Responsiveness has the strongest positive effect on Customer Satisfaction ($\beta = 0.258$, $t = 4.484$, $p < 0.001$), followed by Privacy ($\beta = 0.199$, $t = 3.161$, $p = 0.002$), and Reliability ($\beta = 0.167$, $t = 3.136$, $p = 0.002$). Efficiency shows a similar large positive effect ($\beta = 0.162$, $t = 2.83$, $p = 0.005$). Cost Effectiveness shows the smallest yet significant effect on Customer Satisfaction ($\beta = 0.125$, $t = 2.172$, $p = 0.030$). It seems from these results that improvements in these measures tend to significantly increase Customer Satisfaction, with Responsiveness being by far the strongest predictor.

5. Discussion

This paper was conducted to find out how digital banking improves customer satisfaction in the Kathmandu Valley's financial sector. The demographic analysis is younger and more active than the others, and the sample has a large proportion of active and economically focused population, a large

(72% of its subjects) between 18 and 30 years of age. The close-to-uniform mix of gender and marital status contributes to the representativeness and balanced analysis. The inclusion of the highly educated respondent group, who are overwhelmingly graduate and postgraduate students, bolsters the credibility and breadth of the findings. Furthermore, a wide range of income levels from the lower to high income groups contribute to meaningful diversity in the data, so that a more detailed or richer examination may be achieved. Clients typically want digital banking by taking less time and labor out of their banking process [37]. Convenience in digital banking is evidenced by the use of user-friendly interfaces, 24-hour availability, avoiding the obstacles of queues, faster processing of transactions when compared to conventional banking, and an accessible and secure login system. Digital banking is a significant factor that makes the customer satisfied, which improves the convenience and efficiency of the service. These include simple platforms and quick transaction processing, which are important for good customer experience [38]. Results show that efficiency has a substantial positive influence on customer satisfaction, showing that digital services help to enhance users' overall experiences. This is consistent with Gautam and Sah [10], who found that website efficiency and e-customer service were found to have a positive influence on e-customer satisfaction in online banking in Nepal, while satisfaction was shown to enhance customer loyalty. Privacy itself, in turn, has significantly increased the relationship between privacy and customer satisfaction, thereby reinforcing data protection and security as a crucial aspect of digital financial services. This result is in line with Rumangkit et al. [34], who highlighted that privacy consciousness strongly affects e-wallet user satisfaction and that service providers need to provide strong data protection. The research also shows that reliability and responsiveness have a significant positive effect on customer satisfaction. Such findings correlate with previous studies, which indicated that reliability and responsiveness have a significant role in banking sector satisfaction [22, 32, 33]. In addition, the cost effectiveness has a significant positive relationship with client satisfaction, indicating that the provision of cost-effective and value-based services improves users' perception. As Gomachab and Maseke [23] showed, mobile banking allows access to finance on an expanded scale and is also associated with high levels of customer satisfaction through its reliability, cost efficiency, and perceived security in contrast to face-to-face financial institutions.

6. Conclusion

This study proves that digital banking is not an elective addition to traditional banking but the key motivator of customer satisfaction in Nepal's banking sector. Based on the PLS-SEM method, evidence supports that efficiency, privacy, reliability, responsiveness, and cost effectiveness are all essential to improving customer satisfaction. Responsiveness emerged as the most significant factor and illustrates increasing customer expectations to receive timely assistance and resolution of issues through online technology. It's clear from the findings that today's banking clients want more than technological advancements – they also want safe, reliable, and user-friendly digital platforms that save them time and effort. As Nepal's digital banking market continues to grow, banks should invest strategically in enhancing service responsiveness, data privacy, operational reliability, and cost-effective digital solutions. In a bigger sense, this research helps to add to the emerging banking literature related to digital banking in growing economies and offers banks, as well as business managers and policymakers, useful practical implications for customer-centric digital transformation. Deepening these core service dimensions will be vital for fostering sustainable competitive advantage, fostering customer loyalty, and nurturing extended growth in Nepal's changing financial landscape.

Institutional Review Board Statement:

This study was approved by the Institutional Review Board of Kathmandu BernHardt College, Bafal, Kathmandu, Nepal, under protocol number 462, dated 12 February 2026. Informed verbal consent was obtained from all participants, and all data were anonymized to protect participant confidentiality.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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