

An Analytical Study of Customer Satisfaction Related to E-Banking Services in Select Public and Private Sector Banks in Nagpur

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Abstract

This empirical study examines the key determinants of customer satisfaction with electronic banking (e-banking) services by comparing public and private sector banks in Nagpur, Maharashtra. A quantitative research design was adopted, and data were collected from 550 active banking customers representing diverse demographic segments. Principal Component Analysis (PCA) with Varimax rotation identified eight major dimensions influencing customer satisfaction: Accessibility, Convenience, Privacy, Security, Design, Contents, Speed, and Fees & Charges. To evaluate relationships and demographic variations, statistical tools such as Karl Pearson Correlation, Chi-Square Goodness-of-Fit, and Analysis of Variance (ANOVA) were employed. The findings indicate that customers reported the highest satisfaction with privacy (mean = 4.08) and accessibility (mean = 4.04), whereas design (mean = 3.56) and fees & charges (mean = 3.91) received comparatively lower ratings. Private sector banks demonstrated better performance in service delivery efficiency than public sector banks. Furthermore, age, education, income, and occupation significantly influenced overall satisfaction, while gender and marital status showed minimal impact. The study also highlights the influence of demonetization on digital banking adoption and offers strategic recommendations to enhance customer retention and e-banking service quality.

Keywords: Electronic Banking (E-Banking), Customer Satisfaction, Public Sector Banks, Private Sector Banks, Digital Banking Services.

1. Introduction

1.1 Research Background and Theoretical Foundations

The structural integration of Information and Communications Technologies (ICT) has fundamentally re-engineered the global financial

service architecture. In the modern digital economy, traditional brick-and-mortar physical constraints have been replaced by ubiquitous virtual distribution channels. E-banking operates as a core mechanism for financial institutions striving to optimize transaction costs, expand active consumer bases, and deploy customized customer relationship management (CRM) frameworks. In this hyper-competitive banking landscape, information systems function not merely as back-office logistical components, but as the principal drivers of strategic product differentiation.

From a theoretical standpoint, "Customer Satisfaction" serves as a primary key performance indicator (KPI) within the strategic architecture of the balanced scorecard. It quantifies the degree to which a financial enterprise meets or surpasses consumer expectations. Within the marketing literature, customer satisfaction is conceptualized via two parallel analytical frameworks:

- **Transaction-Specific Satisfaction:** A consumer's localized, immediate post-consumption evaluation of an isolated service encounter.
- **Cumulative Satisfaction:** A dynamic, longitudinal metric reflecting the consumer's total, aggregated experience across all historical interactions with a service provider over time.

This paper applies a dynamic perspective to durable and repeated financial services. It models how transactional satisfaction increments structurally adjust a consumer's internal standard of comparison, ultimately shaping long-term cumulative satisfaction and corporate loyalty.

2. Evolution of Digital Payment Interfaces and Mobile Architecture

The post-demonetization regulatory push accelerated India's transition toward a cash-light digital ecosystem. To transition consumers away from cash transactions, the National Payments Corporation of India (NPCI) and the central government deployed several retail payment systems:

- **Unified Payments Interface (UPI):** A modern mobile architecture enabling instant, round-the-clock inter-bank fund transfers via virtual payment addresses (VPA), eliminating the need for traditional bank account disclosure.
- **Bharat Interface for Money (BHIM):** A secure, Aadhaar-enabled mobile application that supports cross-application UPI interoperability and operates over Unstructured Supplementary Service Data (USSD) channels to handle transactions without active internet connectivity.
- **Aadhaar Pay:** A biometric transactional app designed for merchant acquisition, allowing customers to execute purchases via fingerprint authentication linked directly to their unique identification numbers.

This evolution triggered shifts in retail channels. Early-generation mobile banking services offered restricted functionality due to data bandwidth limits and security protocols. Today, the emergence of a "digital native" consumer base has shifted over 80 % of total retail traffic onto online frameworks. Financial product deployment has evolved from simple balance checks to integrated portfolio management, automated target-savings tracking, and biometric verification layers.

This shift has also enabled the rise of specialized mobile-only virtual banks (such as Germany's N26 or the UK's Atom Bank) that operate entirely without physical branches by using video-KYC protocols and biometric authentication.

3. Methodology and Research Design

3.1 Statement of the Problem and Hypotheses

Despite substantial investments in digital financial architectures across public and private

sector banks in urban India, empirical insights into consumer perceptions, factor-level satisfaction indices, and demographic variations remain fragmented. This research addresses this gap through an explanatory investigation of customer satisfaction with e-banking platforms in the urban zone of Nagpur.

The study tests two primary research hypotheses:

- **Hypothesis 1 (H1):** Socio-demographic variations (gender, age, marital status, educational qualification, income level, and institutional bank type) do not significantly impact cumulative consumer satisfaction with e-banking platforms.
- **Hypothesis 2 (H2):** Key structural delivery dimensions (Accessibility, Convenience, Privacy, Security, Design, Content, Speed, and Fees/Charges) exhibit a statistically neutral relationship with cumulative customer satisfaction.

3.2 Sampling Architecture, Field Execution, and Data Controls

This study utilizes a descriptive and explanatory quantitative research design. The sampling framework used a systematic multi-segment random sampling approach to minimize selection bias. While the initial sample target was set at 750 individuals, the final verified sample size reached 550 active e-banking consumers across Nagpur. Data collection spanned across seven stratified sub-areas within the urban division to ensure balanced coverage of different consumer. The field research instrument consisted of an exhaustive structured questionnaire. The instrument combined multi-categorical socio-demographic queries with 64 specific psychometric statements rated on a standard 5-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

To confirm data controls and validity, a pilot study was conducted with an initial consumer group. This pilot phase helped identify and remove unnecessary questions, clarify terminology, and ensure the instrument aligned with established service-quality frameworks.

Data entry, curation, and statistical analysis were performed using IBM SPSS Statistics 17.0, utilizing cross-tabulation matrix structures,

Pearson's Chi-Square tests, Karl Pearson product-moment correlations, and one-way Analysis of Variance (ANOVA) models.

4. Empirical Results and Data Interpretation

4.1 Demographic Analysis of the Sample

The complete descriptive breakdown of the socio-demographic attributes of the 550 verified respondents is structured in the comprehensive matrix below:

Demographic Variable	Categorical Cohort	Frequency (f)	Percentage (%)
Gender	Male	416	75.60
	Female	134	24.40
Marital Status	Married	272	49.50
	Unmarried	278	50.50
Age Distribution	le 25 Years	270	49.10
	26 – 35 Years	160	29.10
	36 – 45 Years	78	14.20
	> 45 Years	42	7.60
Educational Qualification	Under Graduate	332	60.40
	Graduate	150	27.30
	Post Graduate	56	10.20
	Professional Diploma	10	1.80
	Non-Response (NA)	2	0.40
Occupation	Salaried Employee	330	60.00
	Student Group	122	22.20
	Business Owner	46	8.40
	Unemployed / Other	50	9.10
	Non-Response (NA)	2	0.40
Monthly Income (INR)	No Direct Income (Students)	164	29.80
	le Rs. 10,000	190	34.50
	Rs. 10,001 - Rs. 30,000	162	29.50
	Rs. 30,001 - Rs. 50,000	24	4.40
	> Rs. 50,000	10	1.80
Institutional Account Type	Public Sector Banks	384	69.80
	Private Sector Banks	146	26.50
	Cooperative Banks	16	2.90
	Foreign Banking Institutions	4	0.70
E-Banking Tenure	< 2 Years	266	48.40
	2 – 5 Years	188	34.20
	5 – 10 Years	86	15.60
	> 10 Years	10	1.80

4.2 Factor Analysis and Commonalities Verification

The data processing setup applied Principal Component Analysis (PCA) with Varimax rotation and Kaiser Normalization to condense the 64 psychometric attributes into distinct core components.

The analysis extracted eight structural dimensions, which are detailed below with their respective variable compositions, commonality ranges, and descriptive indexes:

Factor 1: Accessibility (Mean = 4.04, Rank = 2)

This core component captures 14 distinct variables mapping the consumer's ability to easily reach and engage with the e-banking system. Key statements include easy access to

historical transaction records (A1, Mean = 4.65, sigma = 0.73, communality = 0.665), transparent access to institutional fee breakdowns (A2, Mean = 3.86, sigma = 0.84), consistent

performance reliability (A3, Mean = 4.13), frontline support desk availability (A13, Mean = 3.81, communality = 0.906), and automated customer feedback channels (A14, Mean = 3.81).

Factor 2: Convenience (Mean = 3.98, Rank = 5)

This dimension reflects seven variables detailing spatial and temporal flexibility. Key attributes include 24/7 service availability anywhere (B1, Mean = 4.52, sigma = 0.86), eliminating physical queues (B2, Mean = 3.69, sigma = 0.85), and cross-border account access when traveling abroad (B6, Mean = 4.01, communality = 0.708).

Factor 3: Privacy (Mean = 4.08, Rank = 1)

This highest-ranked factor tracks data confidentiality across seven variables. Key markers include secure delivery of confidential information (C1, Mean = 4.56, sigma = 0.76), restrictions on sharing data with third parties without explicitly documented consent (C2, Mean = 3.82, sigma = 0.92, communality = 0.718), and protection against personal info exposure (C5, Mean = 4.45, sigma = 0.80).

Factor 4: Security (Mean = 3.96, Rank = 6)

This component pools seven critical variables focused on trust, risk mitigation, and systemic reliability. Key elements include satisfaction with core encryption frameworks (D 1, Mean = 4.30, sigma = 0.86), system reliability in fixing erroneous transactions (D 4, Mean = 4.19, sigma = 0.85), and institutional commitment to compensation rules for losses from security breaches (D 5, Mean = 3.83, sigma = 1.01).

Factor 5: Design (Mean = 3.92, Rank = 7)

This lowest-performing dimension maps user interface design parameters across six variables. Key items evaluate the ergonomic spatial orientation of the interface (E1, Mean = 4.57, sigma = 0.72), the visual appeal of screen layouts (E2, Mean = 3.56, sigma = 0.84), flashy color schemes (E3, Mean = 3.84), and the clear use of localized languages (E 5, Mean = 4.03).

Factor 6: Contents (Mean = 4.02, Rank = 3)

This component tracks seven variables focused on informational accuracy and value. Key elements evaluate simple online guidance text (F 1, Mean = 4.60, sigma = 0.74, communality = 0.617), current system content upgrades (F 5, Mean = 4.52, sigma = 0.88), and aesthetic

content choices (F 6, Mean = 3.75, sigma = 0.73).

Factor 7: Speed (Mean = 4.00, Rank = 4)

This factor evaluates transactional efficiency across eight specific speed-related variables. Key measures focus on connection stability (G 1, Mean = 4.32, sigma = 0.92), mitigating server disconnects (G 2, Mean = 3.80, sigma = 1.01), and prompt service delivery metrics (G 7, Mean = 4.12, sigma = 1.00).

Factor 8: Fees & Charges (Mean = 3.91, Rank = 8)

This component analyzes economic variables across eight distinct items. Key markers assess general fee levels (H 1, Mean = 4.44, sigma = 0.99), cost efficiencies compared to traditional bank branches (H 2, Mean = 3.70, sigma = 0.88), annual account maintenance fee pricing (H 4, Mean = 3.86, sigma = 1.01), and customer willingness to stay with the provider if fees increase (H 5, Mean = 3.77, sigma = 1.29).

5. Inferential Testing and Hypothesis Verification

5.1 Socio-demographic Invariance Tests (Chi-Square Diagnostics)

Test 1: Gender vs. Cumulative E-Banking Satisfaction

- **Null Hypothesis (H 0):** There is no significant relationship between consumer gender and cumulative satisfaction with e-banking platforms.
- **Empirical Matrix:** Cross-tabulation shows that 55.28 % of male respondents report positive satisfaction parameters, compared to 55.22 % of female respondents.
- **Statistical Inferences:**
Pearson $\chi^2 = 2.823$, $df = 4$, $p = 0.588$ ($p > 0.05$)
- **Conclusion:** The model fails to reject the null hypothesis, confirming that e-banking satisfaction remains uniform across gender.

Test 2: Marital Status vs. Cumulative Satisfaction

- **Null Hypothesis (H 0):** Marital status variations show no significant association with cumulative satisfaction parameters.

- **Empirical Matrix:** Married consumers report a positive satisfaction index of 58.82 %, while unmarried consumers report 51.79 %.
- **Statistical Inferences:**
Pearson $\chi^2 = 5.692$, $df = 4$, $p = 0.223$ ($p > 0.05$)
- **Conclusion:** The analysis fails to reject the null hypothesis, showing that marital status does not systematically influence consumer satisfaction.

Test 3: Age Cohorts vs. Cumulative Satisfaction

- **Null Hypothesis (H 0):** Age variations show no significant association with digital service satisfaction.
- **Empirical Matrix:** Dissatisfaction levels spike noticeably in the polar age bands: reaching 5.63 % among youth aged 18-25 and climbing to 9.78 % among consumers aged > 45.
- **Statistical Inferences:**
Pearson $\chi^2 = 24.856$, $df = 12$, $p = 0.016$ ($p < 0.05$)
- **Conclusion:** The null hypothesis is rejected at the 95 % confidence interval, proving that consumer age significantly impacts e-banking satisfaction.

Test 4: Educational Qualification vs. Cumulative Satisfaction

- **Null Hypothesis (H 0):** Variation in educational levels has no significant effect on satisfaction parameters.
- **Empirical Matrix:** Strong variations emerge across educational cohorts, showing that higher literacy levels correlate with a stronger ability to use e-banking features.
- **Statistical Inferences:**
Pearson $\chi^2 = 36.473$, $df = 12$, $p = 0.000$ ($p < 0.01$)
- **Conclusion:** The null hypothesis is rejected at the 99 % confidence interval, showing a strong relationship between educational level and satisfaction.

Test 5: Occupational Framework vs. Cumulative Satisfaction

- **Null Hypothesis (H 0):** Consumer occupation does not significantly impact satisfaction.

- **Empirical Matrix:** Student groups show high satisfaction parameters (88 %), whereas salaried professionals report lower satisfaction rates (55.15 %).
- **Statistical Inferences:**
Pearson $\chi^2 = 29.044$, $df = 16$, $p = 0.024$ ($p < 0.05$)
- **Conclusion:** The null hypothesis is rejected, confirming that occupational roles significantly differentiate satisfaction outcomes.

Test 6: Monthly Income vs. Cumulative Satisfaction

- **Null Hypothesis (H 0):** Variations in monthly household income do not significantly alter customer satisfaction.
- **Empirical Matrix:** Agreement scores climb systematically as consumer income increases, while structural dissatisfaction drops.
- **Statistical Inferences:**
Pearson $\chi^2 = 29.855$, $df = 16$, $p = 0.019$ ($p < 0.05$)
- **Conclusion:** The null hypothesis is rejected, demonstrating that income levels significantly shape customer satisfaction.

5.2 Dimensional Modeling and ANOVA Diagnostics

To assess how the extracted structural factors impact cumulative customer satisfaction, this study deployed bivariate Pearson Correlation models alongside multivariate Analysis of Variance (ANOVA) routines:

Dimension 1: Accessibility

- **Correlation (R):** +0.158 ($p = 0.000$), demonstrating a statistically significant positive linear relationship.
- **ANOVA Verification:** $F = 10.790$, $p = 0.000$
- **Conclusion:** Rejects the null hypothesis; accessibility positively impacts overall satisfaction.

Dimension 2: Convenience

- **Correlation (R):** +0.163 ($p = 0.000$), showing a robust positive linear relationship.
- **ANOVA Verification:** $F = 5.993$, $p = 0.000$

- **Conclusion:** Rejects the null hypothesis; platform convenience strongly correlates with higher satisfaction.

Dimension 3: Privacy

- **Correlation (R):** +0.104 (p = 0.015), demonstrating significant positive alignment.
- **ANOVA Verification:** F = 2.289, p = 0.005
- **Conclusion:** Rejects the null hypothesis; high privacy protection directly elevates satisfaction parameters.

Dimension 4: Security

- **Correlation (R):** +0.196 (p = 0.000), yielding the strongest overall correlation index among all factors.
- **ANOVA Verification:** F = 11.162, p = 0.000
- **Conclusion:** Rejects the null hypothesis; security is a primary driver of user satisfaction.

Dimension 5: Design Layout

- **Correlation (R):** -0.025 (p = 0.560), demonstrating an inverse, statistically non-significant linear relationship.
- **ANOVA Verification:** F = 1.650, p = 0.160
- **Conclusion:** Fails to reject the null hypothesis; current interface layouts do not actively drive positive customer satisfaction.

Dimension 6: Platform Contents

- **Correlation (R):** +0.041 (p = 0.342), yielding a weak correlation index.
- **ANOVA Verification:** F = 1.561, p = 0.008
- **Conclusion:** Rejects the null hypothesis; structural informational contents retain a significant relationship with customer satisfaction.

Dimension 7: Transactional Speed

- **Correlation (R):** +0.029 (p = 0.497).
- **ANOVA Verification:** F = 9.034, p = 0.000
- **Conclusion:** Rejects the null hypothesis; execution speed maintains a highly significant linear relationship with consumer metrics.

Dimension 8: Fees & Charges

- **Correlation (R):** +0.191 (p = 0.000), confirming a powerful linear relationship.
- **ANOVA Verification:** F = 6.625, p = 0.000
- **Conclusion:** Rejects the null hypothesis; transparent and acceptable pricing strongly drives satisfaction outcomes.

5.3 Comparative Institutional Performance Analysis

To evaluate differences across bank types, this study performed a comparative analysis between public sector banks (n1 = 384) and private sector banks (n2 = 166).

- **Null Hypothesis (H 0):** There is no significant difference in e-banking satisfaction levels between public and private sector bank customers (mu 1 = mu 2).
- **Empirical Observations:** Private sector banks achieve a mean satisfaction score of 3.81 (sigma = 0.85), whereas public sector banks yield a lower mean score of 3.60 (sigma = 0.81). The absolute mean difference is calculated at -0.21.

While cumulative agreement scores show superficial similarities (55.20 % public vs. 55.42 % private), public sector banks show a significantly higher explicit dissatisfaction rate (5.66 %) compared to private banks (1.20 %).

Mean Satisfaction Score Comparison



- **Statistical Inferences:** Pearson $\chi^2 = 28.751$, df = 4, p = 0.000 (p < 0.01)
- **Conclusion:** The analytical model strongly rejects the null hypothesis at the 99 % confidence interval. This demonstrates a statistically significant institutional gap: private sector banks outperform public institutions in delivering satisfying e-banking experiences.

6. Discussion and Policy Recommendations

6.1 Theoretical Synthesis of Empirical Findings

The empirical results confirm that customer satisfaction with digital banking channels is a multi-dimensional construct. The high ranking of Factor 3 (Privacy, Mean = 4.08) and Factor 1 (Accessibility, Mean = 4.04) indicates that banks have successfully built stable data privacy controls and core transaction logging features. The strong correlation between security metrics and cumulative satisfaction ($R = +0.196$) validates classical risk mitigation theories: consumer trust depends heavily on low perceived security risks and clear institutional liability policies.

However, the weak performance of Factor 5 (Design Layout, Mean = 3.56) reveals a major challenge for the industry. Many institutions continue to rely on cluttered interfaces that create user friction, which is particularly problematic for younger, speed-sensitive consumers and older demographics.

The institutional gap highlighting private sector banks' advantage (3.81 vs. 3.60) stems from their early adoption of digital-first business models. Private entities have optimized their web architectures over many years, whereas public sector banks are still scaling up legacy systems to serve an expansive customer base.

6.2 Actionable Recommendations for Bank Managers

Based on the factor analytical modeling, bank administrators should focus on three primary strategic areas:

1. **User Interface (UI/UX) Optimization:** Because the design dimension scored lowest across all cohorts, banks—especially public institutions—must redesign their web portals. Layouts should emphasize clean navigation paths, minimal steps for core tasks (such as transfers and statements), and full multi-language support to assist low-literacy consumers.
2. **Pricing Structure Alignment:** Fees and charges scored as the lowest absolute satisfaction factor (Mean = 3.91). Banks should reconsider their fee structures, introduce waivers for basic digital transactions, and deploy tiered loyalty fee structures. Lowering digital usage

fees can build consumer trust and shift transaction volumes from expensive physical branches to low-cost digital channels.

3. **Cyber security Infrastructure Upgrades:** To maintain high security trust parameters, backend developers must deploy invisible, robust security architectures. This includes using zero-friction biometric authentication (fingerprint and iris scanning) to replace cumbersome multi-factor passcode inputs. Additionally, deploying real-time machine learning tools can help automatically detect identity theft and transaction anomalies before fraud occurs.

7. Conclusion

This research confirms that electronic banking platforms have evolved from a basic convenience feature into the primary interface for customer engagement in the modern financial services sector. By examining consumer experiences in Nagpur, this paper identifies a clear set of eight structural factors that dictate customer satisfaction.

The statistical verification rejects institutional invariance, proving that private banks hold a significant advantage in digital service delivery efficiency over public sector competitors.

Furthermore, the study confirms that socio-demographic characteristics like age, income, and educational level significantly shape digital on-boarding experiences and satisfaction parameters.

To build long-term customer loyalty and survive in a highly digital marketplace, banks must focus on minimizing interface clutter, maintaining clear fee structures, and building transparent, secure data privacy environments.

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