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Cost Efficiency And Sustainability In Banking: An Assessment Of Automated Teller Machines And Teller Machines

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Abstract

Sustainability has become a critical priority in the banking sector as financial institutions strive to balance environmental responsibility with operational efficiency. This study examines the role of Automated Teller Machines (ATMs) and teller services in enhancing cost efficiency within the framework of sustainable banking practices. Technological innovations such as energy-efficient ATMs, paperless transactions, and cash recycling systems significantly reduce environmental impact while lowering operational costs. The transition toward self-service banking and digital transformation has decreased reliance on physical branch infrastructure, thereby optimizing resource utilization and improving customer accessibility and satisfaction. Initiatives such as green branches and financial inclusion programs further demonstrate the banking sector's commitment to sustainability. In the Indian context, the rapid increase in both on-site and off-site ATMs, along with their growing usage, reflects higher customer acceptance and alignment with sustainable banking objectives. Increased public awareness of sustainability practices and satisfaction with ATM services encourage frequent usage, thereby supporting sustainable operations. The study concludes that integrating sustainability into ATM and teller services not only advances environmental goals but also contributes to long-term financial and operational efficiency, benefiting banks and society by reducing costs, expanding access to banking services, and promoting financial inclusion.

Key words:

Cost Efficiency,Environmental Sustainability, Self-Service Banking,Operational Efficiency, Financial inclusion.

Introduction

Sustainability in the banking sector has emerged as a critical and inevitable focus for financial institutions worldwide in the contemporary financial environment. The concept of sustainability is a well-recognized and widely acknowledged phenomenon in modern banking (Darius D. et al., 2009) and represents the philosophical application of sustainable development principles within banking practices (Kemp, 2005). As technologies and economies continue to evolve through ongoing innovations and advancements, banks face increasing pressure to adopt and implement modern practices that effectively balance profitability with environmental and social responsibility, while also meeting customer needs and expectations.

Automated Teller Machines (ATMs) and teller services are fundamental to this transition, offering significant opportunities to enhance operational efficiency while integrating sustainable banking practices. ATMs serve as one of the key indicators of modern financial technology and have been widely accepted and adopted by both commercial and non-commercial banks across the globe (Otukoya, 2014; Adane M. D., 2021).

The widespread deployment of ATMs has brought about substantial transformation in the banking sector by enabling customers to perform a wide range of banking and non-banking transactions independently, without the need to physically visit bank branches. Banking services such as cash withdrawals, deposits, and bill payments have become more accessible, thereby reducing reliance on physical branch infrastructure. At the same time, teller services have evolved to complement technological advancements by focusing on more complex, customized, and value-added financial assistance and customer interactions. Collectively, ATM and teller services provide a strong foundation for integrating and practicing sustainability within banking operations, particularly in the areas of cost efficiency and optimal resource utilization.

The Role of Teller Services in Sustainable Banking

While Automated Teller Machines (ATMs) have automated many routine banking transactions, teller services continue to play a vital role in addressing more complex banking needs. The evolution of teller services reflects a growing emphasis on sustainability and operational efficiency. Teller services primarily focus on providing personalized and customized assistance for transactions that require human interaction, such as loan processing, personal financial planning, grievance redressal, and other advisory services.

In addition, teller services are integral to green branch initiatives, which aim to minimize the environmental impact of physical banking operations. The adoption of energy-efficient infrastructure, including LED lighting and optimized heating, ventilation, and air-conditioning (HVAC) systems, supports these sustainability objectives. Furthermore, teller counters are increasingly equipped with digital interfaces that facilitate paperless transactions.

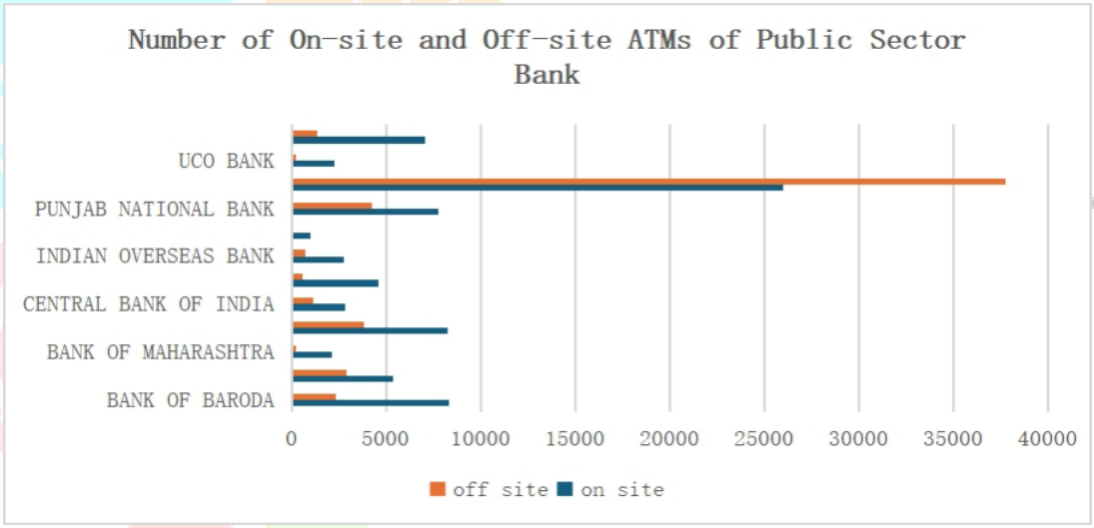
These initiatives collectively reduce the workload on tellers, enabling banks to allocate human and physical resources more effectively while enhancing service quality. The integration of digital tools into teller services helps streamline operational processes and reduce overall resource consumption. For example, the use of digital signatures, electronic receipts, and automated workflows significantly decreases reliance on paper, aligning teller operations with broader sustainability goals. In addition to environmental benefits, these technological enhancements improve transaction speed and accuracy, ultimately contributing to greater cost efficiency in banking operations.

Empirical Evidence from the Indian Banking Sector

The Indian banking sector delivers a captivating case study for the effectiveness and efficiency of ATMs and teller services in encouraging and endorsing sustainability practices and cost efficiency. Over these years, the number of on-site and off-site ATMs has grown significantly, exhibiting their critical and prominent role in expanding banking access. All together there are 215387 On-site ATMs and 86359 Off-site ATMs in India and public sector banks plays a remarkable position with respect to the number of ATMs in India. Among the total number of ATMs, 78477 (on-site) ATMs are owned and operated by the public sector banks and State Bank of India occupies a major portion in it, consisting of 26037 ATMs in the country.

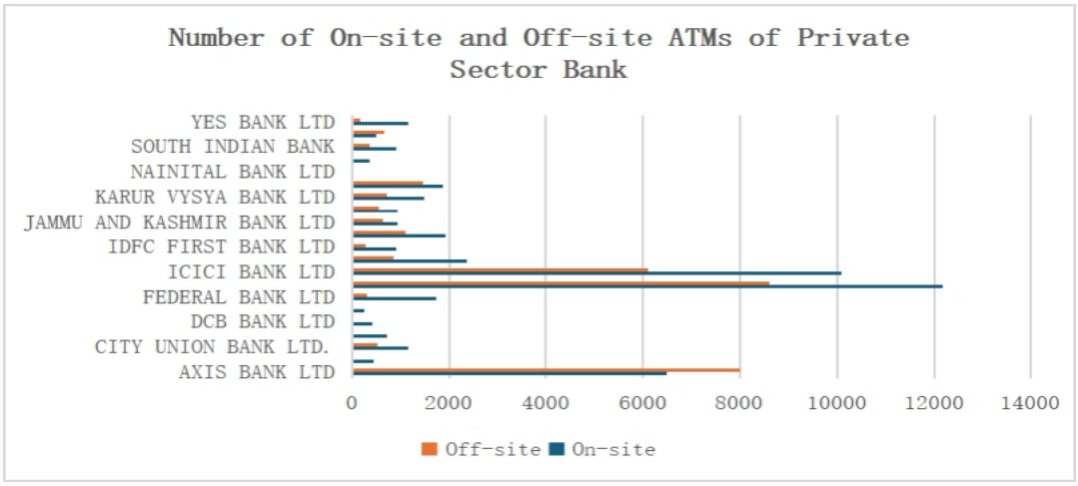
With respect to the private sector banks, they have a number of 46855 on-site ATMs and 30498 off-site ATMs in the country counting a total number of 77353 ATMs all around the country. Among the private sector banks HDFC (12174) occupies the major position with regard to the number of ATMS in the country followed by ICICI (10081), where these two are the most leading private sector banks in India. Along with the public and private sector bank, other banks such as foreign banks and small finance banks also provides ATM services.

Chart 1: Number of On-site and Off-site ATMs of Public Sector Bank



Source: RBI Statistics

Chart 2: Number of On-site and Off-site ATMs of Private Sector Bank



Source: RBI Statistics

Statement of the Problem

The effectiveness and quality of banking services play a crucial role in determining customer satisfaction and shaping trust in financial institutions. Among the various service delivery channels, Automated Teller Machines (ATMs) and teller services are central to the provision of essential banking functions. Despite their importance, there is limited empirical evidence on customers' satisfaction with ATM services, their perception of the efficiency of teller services, and the extent of customer awareness regarding sustainability practices adopted by banks. Furthermore, the relationship between customers' awareness of sustainable banking practices and their frequency of ATM usage remains underexplored, particularly in the context of evolving digital and self-service banking models. The lack of comprehensive understanding in these areas restricts banks from effectively optimizing service delivery, improving customer satisfaction, and aligning operational practices with sustainability objectives.

Therefore, the present study seeks to address this research gap by examining customer satisfaction with ATM services, perceptions of teller services, awareness of banking sustainability practices, and the relationship between sustainability awareness and ATM usage frequency. By addressing these issues, the study aims to contribute insights that can assist banks in enhancing service efficiency, strengthening customer satisfaction, and promoting sustainable banking practices.

OBJECTIVES OF THE STUDY

- To assess the level of customer satisfaction with ATM services and their perception of teller services provided by banks.
- To examine the relationship between individuals' awareness of sustainability practices and the frequency of ATM usage.
- To compare the satisfaction levels of respondents who are aware of sustainability practices with those who are not aware of such practices.
- To analyse variations in satisfaction levels across different categories of ATM usage frequency.

Research Methodology

Nature of the study: The present study is descriptive and analytical in nature. By descriptive it denotes the extent to which the respondents are satisfied with the services offered by ATMs and their perception towards the teller service facility. The analytical nature of the study denotes the testing of proposed hypotheses by employing various statistical tests.

Source of data: Primary as well as secondary data has been used for the study. The secondary data were collected from various published sources and the primary data for the study has been collected through a structured questionnaire.

Sample size: A sample of 150 respondents were selected for the purpose of the study. The study used simple random sampling method to select the respondents.

Tools used for data collection: The data for the study has been collected by using a structured questionnaire measuring the satisfaction level of respondents towards the ATM services, their perception towards the teller service as well as the awareness of sustainability practice. The satisfaction level of the respondents and their perception towards the teller service were measured by using a 5 point Likert scale ranging strongly agree to strongly disagree.

Data analysis: The data collected has been examined and analysed by applying both descriptive and inferential statistics to arrive at the conclusion and the statistical tests were performed by using the statistical software SPSS 22.0

Data analysis and Interpretation

Demographic Characteristics of the respondents

Table 1 Demographic Characteristics of the respondents

Demographic Variable	Category	Frequency	Percentage (%)
Gender	Male	85	56.7%
	Female	65	43.3%
Age Group (years)	18–25	30	20.0%
	26–35	55	36.7%
	36–45	40	26.7%
	46–55	15	10.0%
	56 and above	10	6.7%
Education Level	High School	25	16.7%
	Undergraduate	60	40.0%
	Postgraduate	50	33.3%
	Other	15	10.0%
Occupation	Student	35	23.3%
	Employed (Private Sector)	55	36.7%
	Employed (Public Sector)	30	20.0%
	Self-Employed	20	13.3%
	Retired	10	6.7%
Monthly Income (₹)	Below 20,000	40	26.7%
	20,001–40,000	50	33.3%
	40,001–60,000	35	23.3%
	Above 60,000	25	16.7%
Region of residence	Urban	95	63.3%
	Rural	55	36.7%

Source: Survey Data

Interpretation:

The demographic data of the respondents provides a basis for analysing the responses and understanding how background factors may influence opinions on ATMs, teller services, and banking sustainability. From the results reported in the table 1 reveals that, among the total respondents, male respondents outnumber females, forming 56.7% of the sample. A majority of respondents are in the 26–35 age group (36.7%), representing young working professionals and 40% of them are from the age group of 36-45. With respect to the educational qualification, most respondents possess an undergraduate degree (40.0%) and also 33% of them are post graduated ones. Likewise, a significant proportion of respondents are employed in the private sector, consisting of 36.7% and 20% of them are government employees, 13.3% of them are self employed and the remaining 23.3% were students. Moreover, with respect to the income level, 33.3% of the respondents fall within the range of ₹20,001–₹40,000 and also it was observed that, a quarter of the respondents falls within the income group of below 20,000 (26.7%).

Assessment of Level of Satisfaction

To assess the level of satisfaction with regard to the ATM services and teller efficiency descriptive statistics such as mean and standard deviations were used, and the results are as follows;

Table 2 Assessment of Level of Satisfaction

Variable	Mean	Median	Mode	Standard Deviation
Satisfaction Score	4.2	4.0	5	0.7
Teller Efficiency Score	3.8	4.0	4	0.9

Source: Survey Data

Interpretation: The results reported in the table 2 reveals that, the respondents perceive to have a higher satisfaction with the ATMs Mean = 4.2) and moderate level of satisfaction with teller efficiency (Mean = 3.8). The low standard deviation for satisfaction indicates relatively consistent responses. Thus it was inferred that, the respondents are highly satisfied with ATM and teller services provided by the banks.

Association between awareness of sustainability practices and ATM usage

To test the association be association between awareness of sustainability practices and ATM usage frequency, the following hypothesis has been proposed.

Hypothesis H1: There is a significant association between awareness of sustainability practices and ATM usage frequency.

To test the proposed hypothesis the chi-square statistical test has been performed and the results are as follows;

Table 3 Association Between Awareness of Sustainability Practices and ATM Usage Frequency.

Variable	Chi-Square Value	Degrees of Freedom (df)	p-value
Awareness vs. ATM Usage Level	12.56	2	0.002

Source: Survey Data

Interpretation: The result of the chi-square test performed reveals that, there exist a significant association between the awareness of sustainability practices and ATM usage frequency of individuals where the p value obtained was less than 0.05 (p value 0.002). thus it was inferred that, respondents who are aware of sustainability practices are more likely to use ATMs frequently.

Assessment of awareness of sustainability practices

To examine the awareness level of respondents with respect to the sustainability practices and its association with their satisfaction level, the following hypothesis has been proposed.

Hypothesis H2: There is no significant difference in satisfaction scores between aware and unaware respondents.

To test the hypothesis, one sample t test was used and the results are as follows.

Table 4 Awareness of Sustainability Practices and its Association with Satisfaction

Group	Mean Value	t-value	p-value
Aware of Sustainability	4.4	2.73	0.007
Unaware of Sustainability	3.0		

Source: Survey Data

Interpretation: The results reported in the table 4 indicated that, there is a significant difference in the respondents awareness of sustainability practices and their satisfaction level where the p-value value obtained is less than 0.05 (0.007). Thus, it was inferred that, the respondents aware of sustainability practices report higher satisfaction.

Association between satisfaction with ATM services and its usage

To assess the association between the satisfaction with ATM services and the usage level of ATM, the following hypothesis was proposed,

Hypothesis 3: There is a significant association in the satisfaction scores across ATM usage levels.

To test the proposed hypothesis one way ANOVA has been performed and the results are as follows.

Table 5 Association between satisfaction with ATM services and its usage

Source of Variation	Sum of Squares (SS)	Degrees of Freedom (df)	Mean Square (MS)	F-value	p-value
Between Groups	8.12	2	4.06	5.21	0.006
Within Groups	115.34	147	0.79		

Source: Survey Data

Interpretation: The results reported in the table 5 reveals that there exist a significant association between the satisfaction scores of ATM and the ATM usage frequency where the p value obtained for the F value is less than 0.05 (p-value 0.006). the result of the post hoc Thus it was inferred that, is less than 0.05, indicating a significant difference in satisfaction scores across levels of ATM usage frequency. Post-hoc analysis may reveal that high-frequency ATM users have higher satisfaction scores. Thus it was inferred that, satisfaction with the ATM services determines the frequency of ATM usage and the users with higher satisfaction with the services offered by the ATMs have higher - frequency ATM usage than their counterparts.

Discussion and Conclusion

Sustainability in banking is a multidimensional objective that necessitates the integration of environmentally responsible practices with operational efficiency. In this context, the present study examined customers' satisfaction with ATM services and teller services, their level of awareness regarding banking sustainability practices, and the frequency of ATM usage. The findings indicate that respondents are generally satisfied with both ATM and teller services and possess a reasonable level of awareness of sustainability initiatives undertaken by banks. This awareness positively influences the frequency of ATM usage, thereby supporting sustainable banking operations.

ATMs and teller services play a significant role in facilitating this transition by enabling banks to reduce operational costs, enhance customer access to banking services, and promote financial inclusion. Investments in energy-efficient technologies, digital transformation, and innovative problem-solving mechanisms allow banks to align their operational strategies with sustainability objectives while simultaneously achieving long-term profitability. The results of this study underscore the importance of ATM and teller services in shaping the future of sustainable banking practices, particularly within the context of the Indian banking sector.

Suggestions and Recommendations

Based on the findings of the study, the following recommendations are proposed to enhance sustainability and cost efficiency in the banking sector through the effective use of ATMs and teller services:

- **Expand the Deployment of Energy-Efficient ATMs:**
  Banks should prioritize replacing outdated ATM machines with energy-efficient models that consume less power. The integration of renewable energy sources, such as solar panels, in ATM operations can further reduce operational costs and support environmental sustainability goals.
- **Optimize Teller Services:**
  Teller services should focus primarily on handling complex and value-added banking transactions. This approach can reduce the routine workload of tellers, improve operational efficiency, and enable banks to reallocate resources toward more customer-centric services.
- **Enhance Financial Inclusion Efforts:**
  Banks should increase the deployment of off-site ATMs in rural and underserved areas to improve access to banking services. Collaboration with government initiatives such as the Pradhan Mantri Jan Dhan Yojana (PMJDY) can further strengthen financial inclusion efforts.
- **Adopt Paperless Operations:**
  Banks should actively promote and implement paperless transactions by encouraging the use of e-receipts and digital statements, thereby minimizing or eliminating paper consumption.
- **Ensure Regular Maintenance and Upgradation of ATM Infrastructure:**
  Timely maintenance of ATMs is essential to reduce downtime and enhance customer satisfaction. Banks should also consider upgrading ATM infrastructure with advanced features such as biometric authentication and contactless transaction facilities to improve the overall customer experience.
- **Monitor Customer Satisfaction:**
  Banks should conduct regular customer satisfaction surveys and implement effective feedback mechanisms to evaluate the quality of ATM and teller services. This will help align banking services with customer expectations and improve service delivery.
- **Implement Data Analytics for Decision-Making:**
  The use of advanced data analytics can assist banks in monitoring transaction patterns, operational costs, and customer behavior. Data-driven insights will support informed decision-making related to service optimization and efficient resource allocation.
- **Leverage Technology for Sustainability Reporting:**
  Banks should develop systems to track and report the environmental impact of banking operations. Transparent sustainability reporting can enhance institutional credibility and attract environmentally conscious customers.

By implementing these recommendations, banks can achieve a balance between operational efficiency, improved customer satisfaction, and sustainability, thereby positioning themselves as leaders in the transition toward green and sustainable banking practices.

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