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Challenges in CBDC Adoption; Perception from Bank Employees in Kerala

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Abstract: *The study focuses on studying the possible challenges in the CBDC implementation from the point of view of bank employees in the state of Kerala. Since India has been piloting its digital rupee in the economy, its adoption seems to be slow. Thus, in such a situation, the barriers in various aspects like employee related challenges, customer related challenges and challenges in terms of non-users have been studied in this paper. Primary data have been used for the study which was collected through a structured questionnaire and the same was analysed using descriptive statistics, Mann Whitney U Test, Kruskal Wallis H Test and Dunn's Post Hoc Test. And the results show that while CBDC adoption faces multiple operational and perceptual challenges, these are more pronounced among employees with lower technical proficiency, limited experience, or lesser exposure to digital transformation. Addressing these issues will help to promote CBDC adoption.*

Key Words: *CBDCs, employee related challenges, customer related challenges and barriers in terms of non-users*

1. INTRODUCTION

The way payments are carried on in the economy is undergoing substantial digital transformations driven by continuous innovation. The use of traditional physical cash is getting drastically reduced due to the introduction of digital payment mechanisms. In such a scenario, majority of the countries are also introducing their own digital currency like digital rupee in India. Due to a number of determinants, countries are at different stages of its implementation. In our country, Digital Rupee is currently in pilot mode and various use cases, underlying technology, features are being tested and explored (IBA, n.d.). Bank employees play an inevitable role in the CBDCs rollout since they are in direct contact with the general public. While the adoption of CBDCs ensure to revolutionize the payment mechanisms by enabling more safer and faster transactions, its success depends on overcoming some hindrances also. For the smooth implementation, the possible challenges must be well understood. This study explores the hurdles faced by the CBDC adoption from the perspectives of the bank employees in the context of Kerala. According to the existing studies, the general public shows a favourable attitude towards CBDC as well as significant level of awareness and growing interest in the same. Trust in central banks is highlighted as crucial for successful CBDC implementation (G and AS,2024). But at the same time, they are concerned about the challenges related to managing and operation, security and trust (Jagdishprasad Varma, 2023).

Bank employees and their perceptions are vital in influencing public acceptance. As this study explores the challenges in CBDC adoption from bank employees' perspective, the same can be rectified in a better manner. It was said that CBDC suffers from a number of challenges like it requires serious tech upgrade while UPI is a huge win, cyber security issues, digital divide and inclusion since 65% of India's population lives in rural areas, operational and regularity issues, cost of switching such as system updates, staff training, better customer support etc., as well as the cost-free and convenient system of UPI (Srivastava, 2024). All those hindrances must be properly understood and well-treated which otherwise may adversely affect the effective and successful adoption of the CBDC in the country.

The respondents of the study belong to the workforce especially in public, private and other types of banks in the state of Kerala, a state with unique banking dynamics influenced by high financial literacy as well as regional digital adoption gaps. Bank employees report familiarity with the term CBDCs, since they get updates directly from the central bank. Even then they are concerned about various aspects like privacy issues, technological integration etc. addressing these challenges may contribute to have a clear picture on the possible barriers in the CBDC rollout in Kerala and beyond. This study aims to analyse these challenges systematically, emphasizing the areas that require focused intervention such as employee training, institutional communication, and customer education to ensure a smoother transition and broader acceptance of CBDC within the Indian banking ecosystem especially in the context of Kerala state.

2. OBJECTIVES

The major objectives of the study include;

- To understand the employee level challenges in CBDC adoption
- To have an idea on perceived barriers in terms of non-users
- To study customer related challenges and concerns

3. RESEARCH METHODOLOGY

The study adopts a quantitative research design. The sample constitutes the bank employees in Kerala and the same was selected with the help of purposive sampling technique. Primary data was used for the study which was collected through a well-structured questionnaire. The questionnaire has been designed in such a way as to fetch the details on the demographic profile of the respondents, and the challenges in various perspectives. And the collected data were analysed using frequency analysis, percentage, mean, median, standard deviation, Mann Whitney U Test, Kruskal Wallis H Test and Dunn's Post Hoc Test.

4. RESULTS AND DISCUSSIONS

Table 1 *Descriptive Statistics on Challenges*

Q code	Items	N	Mean	Median	SD
Employee Level Challenges					
CH1	I have not received adequate training or support to effectively use or promote CBDC.	395	3.22	3	1.035
CH2	Using CBDC at work increases my workload or creates confusion with parallel systems like UPI and NEFT.	395	2.76	3	0.852
CH3	I find the technical interface or transaction process of CBDC less intuitive than other payment platforms	395	3.02	3	0.716
CH4	I face challenges in accessing or using CBDC infrastructure in certain operational contexts.	395	3.05	3	1.041
Perceived Barriers in terms of non- users					
CH5	Lack of awareness and internal communication has slowed down the adoption of CBDC in my branch or network	395	3.3	3	0.999
CH6	There is hesitation among employees to adopt CBDC due to uncertainty about its long-term viability or relevance	395	3.18	3	0.814
CH7	Concerns over system stability, b1s, or downtime prevent me (or 3) from exploring CBDC adoption	395	3.14	3	0.75
Customer related challenges and concerns					
CH8	Many customers have expressed concerns about CBDC replacing cash and reducing their financial control	395	3.11	3	0.968
CH9	Customers often complain that CBDC is too complex or unfamiliar compared to UPI or cash	395	3.27	3	0.852
CH10	There is customer resistance due to privacy concerns or fear of government surveillance via CBDC	395	3.3	3	0.903

Source: Compiled from primary data

The descriptive statistics on challenges highlight the key difficulties perceived by bank employees in adopting and promoting the Central Bank Digital Currency (CBDC). Among the ten challenge statements, the highest mean scores were recorded for **"Lack of awareness and internal communication has slowed down the adoption of CBDC in my branch or network"** ($\bar{x}$ = 3.30) and **"There is customer resistance due to privacy concerns or fear of government surveillance via CBDC"** ($\bar{x}$ = 3.30). These findings suggest that institutional communication gaps and customer-related apprehensions, particularly regarding privacy and state monitoring, are major barriers to effective CBDC adoption. Moderately high mean values were also found for **"Customers often complain that CBDC is too complex or unfamiliar compared to UPI or cash"** ($\bar{x}$ = 3.27) and **"I have not received adequate training or support to effectively use or promote CBDC"** ($\bar{x}$ = 3.22), indicating operational and knowledge-based limitations at both the employee and customer levels. On the other hand, lower mean scores were noted for **"Using CBDC at work increases my workload or creates confusion with parallel systems like UPI and NEFT"** ($\bar{x}$ = 2.76) and **"I find the technical interface or transaction process of CBDC less intuitive than other payment platforms"** ($\bar{x}$ = 3.02), implying that while employees acknowledge minor operational complexities, these are not viewed as severe challenges. Overall, the results indicate that the most prominent challenges to CBDC adoption stem from inadequate institutional awareness, limited training, and customer-level resistance due to privacy concerns and unfamiliarity.

Hypothesis Testing

*Ho: There is **no statistically significant difference** in the challenges experienced by bank employees in adopting the Central Bank Digital Currency (CBDC) based on their gender*

Table 2 *Descriptive Statistics on Challenges based on their gender*

	Group	N	Mean	Median	SD	SE
Employee Level Challenges	**Male**	284	3.18	3	0.917	0.0544
	Female	111	3.62	4	0.787	0.0747
Perceived Barriers in terms of non- users	**Male**	284	3.1	3	0.894	0.0531
	Female	111	3.41	3	0.493	0.0468
Customer related challenges and concerns	**Male**	284	2.9	3	0.647	0.0384
	Female	111	3.3	3	0.804	0.0764

Source: Compiled from primary data

The descriptive statistics on challenges based on gender reveal noticeable differences in how male and female bank employees perceive the barriers related to the adoption of the Central Bank Digital Currency (CBDC). In the category of **employee-level challenges**, female employees reported a higher mean score ($\bar{x}$ = 3.62) compared to their male counterparts ($\bar{x}$ = 3.18), indicating that women experience greater difficulties such as lack of training, inadequate institutional support, or increased workload in relation to CBDC usage and promotion. Similarly, under **perceived barriers in terms of non-users**, females recorded a higher mean ($\bar{x}$ = 3.41) than males ($\bar{x}$ = 3.10), suggesting that female employees perceive more challenges related to limited awareness or hesitancy among non-users toward adopting CBDC. A similar pattern is observed in **customer-related challenges and concerns**, where female employees again reported a higher mean ($\bar{x}$ = 3.30) than male employees ($\bar{x}$ = 2.90), reflecting stronger concern regarding customer resistance, privacy issues, and lack of familiarity with CBDC.

Table 3 *Mann Whitney U Test on Challenges based on their gender*

Constructs	Statistic	p	Effect Size
Employee Level Challenges	11746	<.001	0.255
Perceived Barriers in terms of non- users	12366	<.001	0.215
Customer related challenges and concerns	12577	<.001	0.202
Note. H_a $\mu_{Male} \neq \mu_{Female}$			

Source: Compiled from primary data

The results of the Mann–Whitney U test reveal significant gender-based differences in the challenges perceived by bank employees regarding the adoption of the Central Bank Digital Currency (CBDC). For **employee-level challenges**, the U statistic (11746, $p < .001$, effect size = 0.255) indicates a significant difference between male and female employees,

with females reporting higher levels of difficulty related to training, workload, and institutional support. Similarly, for **perceived barriers in terms of non-users,** the result (U = 12366, p < .001, effect size = 0.215) confirms that female employees experience greater perceived resistance and awareness-related barriers compared to males. In the case of **customer-related challenges and concerns,** the U statistic (12577, p < .001, effect size = 0.202) also shows a significant difference, suggesting that female employees are more likely to encounter or recognize customer apprehensions such as privacy concerns, confusion, or resistance toward CBDC usage.

*Ho: There is **no statistically significant difference** in the challenges experienced by bank employees in adopting the Central Bank Digital Currency (CBDC) based on their educational qualification*

Table 4 *Kruskal Wallis H Test on challenges, based on their educational qualification*

	χ^2	df	p
Employee Level Challenges	13.5	2	0.001
Perceived Barriers in terms of non- users	13.7	2	0.001
Customer related challenges and concerns	37.8	2	<.001

Source: Compiled from primary data

The results indicate statistically significant differences across all three constructs **employee-level challenges, perceived barriers in terms of non-users,** and **customer-related challenges and concerns.** For **employee-level challenges**, the chi-square value (χ^2 = 13.5, p = 0.001) suggests that the level of challenge varies meaningfully with educational background, indicating that employees with different qualifications experience varying degrees of difficulty in training, technical adaptation, and operational readiness. Similarly, for **perceived barriers in terms of non-users**, the chi-square value (χ^2 = 13.7, p = 0.001) also shows significant variation, implying that education influences how employees perceive external resistance or awareness gaps among non-users. The highest difference was observed in **customer-related challenges and concerns** (χ^2 = 37.8, p < .001), suggesting that employees' educational qualification strongly affects their sensitivity to customer-related issues such as privacy concerns, technological unfamiliarity, and hesitation to adopt CBDC.

Table 5 *Dunn's Post Hoc Test*

Employee Level Challenges					**Perceived Barriers in terms of non- users**				
		z	**p(unadj)**	**p(Bonferroni)**			**z**	**p(unadj)**	**p(Bonferroni)**
Graduate	**Post-Graduate**	-0.607	0.544	1	**Graduate**	**Post-Graduate**	-2.821	0.005	0.014
Graduate	**Technical**	2.916	0.004	0.011	**Graduate**	**Technical**	0.792	0.428	1
Post-Graduate	**Technical**	3.642	<.001	<.001	**Post-Graduate**	**Technical**	3.155	0.002	0.005
Customer related challenges and concerns									
		z	**p(unadj)**	**p(Bonferroni)**					
Graduate	**Post-Graduate**	2.16	0.03	0.091					
Graduate	**Technical**	6.09	<.001	<.001					
Post-Graduate	**Technical**	4.81	<.001	<.001					

Source: Compiled from primary data

The results of Dunn's post hoc test indicate that **educational qualification** significantly influences the challenges faced by bank employees in adopting the Central Bank Digital Currency (CBDC). For **employee-level challenges**, significant differences were found between graduates and technical employees (**z = 2.916, p = 0.011**) and between postgraduates

and technical employees (**z = 3.642, p < .001**), showing that technically qualified employees face fewer institutional or operational barriers. For **perceived barriers among non-users**, significant differences were observed between graduates and postgraduates (**z = –2.821, p = 0.014**) and between postgraduates and technical employees (**z = 3.155, p = 0.005**), suggesting that education level affects perceptions of user awareness and resistance. Similarly, for **customer-related challenges and concerns**, graduates and technical employees (**z = 6.09, p < .001**) and postgraduates and technical employees (**z = 4.81, p < .001**) differed significantly, indicating that technically trained employees perceive fewer customer-side difficulties.

*Ho: There is **no statistically significant difference** in the challenges experienced by bank employees in adopting the Central Bank Digital Currency (CBDC) based on type of banks*

Table 6 *Kruskal Wallis H Test on challenges, based on type of banks*

	χ^2	df	p
Employee Level Challenges	6.37	2	0.041
Perceived Barriers in terms of non- users	17.12	2	<.001
Customer related challenges and concerns	8.97	2	0.011

Source: Compiled from primary data

The Kruskal–Wallis H test was conducted to examine whether the challenges faced by bank employees in adopting the Central Bank Digital Currency (CBDC) differ based on the **type of bank** they work in public, private, or others. The results reveal statistically significant differences across all three constructs. For **employee-level challenges**, the chi-square value (**$\chi^2 = 6.37$, p = 0.041**) indicates that the degree of internal or operational challenges varies among employees from different bank types. In the case of **perceived barriers in terms of non-users**, the chi-square statistic (**$\chi^2 = 17.12$, p < .001**) shows a strong and highly significant difference, suggesting that employees' perceptions of external user resistance or lack of awareness differ notably across banking categories. Similarly, **customer-related challenges and concerns** also show significant variation (**$\chi^2 = 8.97$, p = 0.011**), implying that employees from different banks encounter varying levels of customer hesitation, privacy concerns, or trust issues regarding CBDC.

*Ho: There is **no statistically significant difference** in the challenges experienced by bank employees in adopting the Central Bank Digital Currency (CBDC) based on experience*

Table 7 *Kruskal Wallis H Test on challenges, based on experience*

	χ^2	df	p
Employee Level Challenges	67.3	2	<.001
Perceived Barriers in terms of non- users	29.6	2	<.001
Customer related challenges and concerns	45	2	<.001

Source: Compiled from primary data

The Kruskal–Wallis H test was conducted to assess whether the challenges faced by bank employees in adopting the Central Bank Digital Currency (CBDC) differ significantly based on their **years of experience** in the banking sector. The results show statistically significant differences across all three dimensions of challenges. For **employee-level challenges**, the chi-square value (**$\chi^2 = 67.3$, p < .001**) indicates that employees with different experience levels encounter varying degrees of internal or operational challenges, such as training adequacy, workload, and system familiarity. In the case of **perceived barriers among non-users**, the chi-square value (**$\chi^2 = 29.6$, p < .001**) shows significant variation, suggesting that employees' perceptions of awareness gaps and adoption resistance differ notably with experience. Similarly, for **customer-related challenges and concerns**, the chi-square statistic (**$\chi^2 = 45.0$, p < .001**) also reveals a strong difference, implying that experienced employees are more aware of customer hesitations, privacy concerns, and resistance towards CBDC.

Table 8 *Dunn's Post Hoc Test*

Employee Level Challenges					**Perceived Barriers in terms of non- users**				
		z	**$p_{(unadj)}$**	**$p_{(Bonferroni)}$**			**z**	**$p_{(unadj)}$**	**$p_{(Bonferroni)}$**
0-5 years	**6-15 years**	-4.42	<.001	<.001	**0-5 years**	**6-15 years**	3.13	0.002	0.005
0-5 years	**More than 16**	2.2	0.028	0.083	**0-5 years**	**More than 16**	5.4	<.001	<.001
6-15 years	**More than 16**	8.17	<.001	<.001	**6-15 years**	**More than 16**	2.53	0.011	0.034
Customer related challenges and concerns									
		z	**$p_{(unadj)}$**	**$p_{(Bonferroni)}$**					
0-5 years	**6-15 years**	0.364	0.716	1					
0-5 years	**More than 16**	5.236	<.001	<.001					
6-15 years	**More than 16**	5.805	<.001	<.001					

Source: Compiled from primary data

The results of Dunn's post hoc test reveal that the challenges faced by bank employees in adopting the Central Bank Digital Currency (CBDC) vary significantly across different experience levels. For **employee-level challenges**, significant differences were observed between employees with **0–5 years and 6–15 years** of experience (**$z = -4.42$, $p < .001$**) and between **6–15 years and more than 16 years ($z = 8.17$, $p < .001$)**, indicating that experienced employees perceive fewer operational and institutional barriers compared to less experienced ones. In the case of **perceived barriers among non-users**, significant differences were found between **0–5 years and 6–15 years ($z = 3.13$, $p = 0.005$), 0–5 years and more than 16 years ($z = 5.4$, $p < .001$)**, and **6–15 years and more than 16 years ($z = 2.53$, $p = 0.034$)**, suggesting that longer-serving employees perceive fewer awareness and adoption-related barriers. For **customer-related challenges and concerns,** significant differences appeared between **0–5 years and more than 16 years ($z = 5.236$, $p < .001$)** and **6–15 years and more than 16 years ($z = 5.805$, $p < .001$)**, implying that employees with greater experience handle customer resistance and privacy concerns more effectively.

5. SUGGESTIONS

- Providing proper education to the users through campaigns etc. will help to clear out their doubts and enhance confidence by tackling the knowledge gaps
- Transparent and timely communication from the central bank regarding its benefits as well as security measures to avoid any possible ambiguities
- Ensure building public trust, investing in infrastructure, establishing clear legal frameworks and addressing socio-economic barriers.

6. CONCLUSION

The analysis of challenges associated with the adoption of the Central Bank Digital Currency (CBDC) reveals that while employees acknowledge its potential, they also experience several institutional, operational, and behavioral barriers that hinder its effective implementation. The descriptive statistics highlighted that the most prominent challenges include inadequate training and support, insufficient internal communication, customer resistance due to privacy concerns, and limited public awareness of CBDC. Female employees reported higher levels of challenge compared to their male counterparts across employee-level, user-related, and customer-related dimensions, suggesting gender-based variations in digital adaptability and exposure. Similarly, differences across educational qualifications indicated that technically qualified employees face fewer difficulties compared to graduates and postgraduates, emphasizing the role of digital competence and professional training in easing adoption barriers. Moreover, the type of bank also influenced perceptions, with private-sector employees reporting fewer challenges than those in public or other banking institutions, reflecting differences in technological readiness and innovation-driven cultures. Experience emerged as another significant determinant of perceived challenges. Employees with more years of service reported lower barriers in terms of institutional readiness, non-user awareness, and customer resistance, implying that familiarity with banking

operations and digital systems enhances confidence in handling CBDC-related issues. Conversely, less experienced employees exhibited higher concern regarding technical complexity, system integration, and customer hesitation.

Overall, the findings underscore that while CBDC adoption faces multiple operational and perceptual challenges, these are more pronounced among employees with lower technical proficiency, limited experience, or lesser exposure to digital transformation. Addressing these gaps through structured training programs, continuous awareness campaigns, and robust institutional communication mechanisms will be essential to foster employee preparedness and ensure a smoother, inclusive transition toward CBDC adoption in the banking sector.

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