

Business Correspondents (BCs) for Advancing Financial Inclusion: A Customer-Centric Study for Analyzing the performance of BC's Operations

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Article

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Abstract

The Business Correspondent (BC) model serves as a mechanism to accelerate the Financial Inclusion (FI), adopted by banks to extend their banking services into unbanked and underserved regions. This empirical study was conducted to analyze the performance of BC models from the customer's point of view with respect to products and services offered by BCs and their usability, affordability, availability, and accessibility to the BC customers. Thus, the study assessed the impact of BC Models on financial inclusion, for which 400 BC customers were surveyed from the state of Kerala in India. Since the data were collected primarily, the preliminary analyses such as outlier, missing value deletions, Exploratory and Confirmatory factor analysis (CFA), and Normality tests were performed followed by reliability tests, convergent and discriminant validity tests. To execute the statistical tests, Covariance-based Structural Equation Modeling (CB-SEM) and SPSS were used to perform CFA, descriptive and inferential tests. So far, none of the studies has been carried out an empirical research for analyzing the customer's perception on BC models, especially regarding the state of Kerala. The overall analytical results indicate, customers prefer BC models for financial services but not extensively, therefore BCs lag to accomplish full-fledged financial inclusion based on 'Availability', 'Accessibility', 'Awareness' and 'Affordability' of their services offered to the customers.

JEL Classification: C83, D12, G21, G28

Introduction

The emergence of the Business Correspondent model marks a new era in financial inclusion, bridging the gap between traditional banks and the unbanked to ensure everyone has viable access to proper financial services. CRISIL (2015) defines financial inclusion as "the extent of access by all sections of society to formal financial services such as bank savings, deposit, insurance, credit, investment and pension services." Financial Inclusion (FI) broadly refers to the provision of affordable financial services, especially banking services to underserved and marginalized sections of the society, aiming to integrate them into the formal financial system. It is a multi-dimensional phenomenon that is essential for perpetual economic welfare and alleviation of poverty. Peterson K. Ozili (2021) asserts that financial inclusion is a multidimensional outcome, shaped by a country's unique mix of financial innovation, economic stability, poverty levels, and regulatory environment. Without a stable policy on financial inclusion, comprehensive economic growth of the country is an unattainable task especially for the financial empowerment of each citizen.

In India, financial inclusion gained widespread acceptance, particularly after the launching of largest financial inclusion initiative in 2014 called as "Pradhan Mantri Jan Dhan Yojana (PMJDY)". The Business Correspondent (BC) model gained significant momentum following the launch of the PMJDY. Under this initiative, banks increasingly adopted BC outlets as functional extensions of their brick-and-mortar branches, thereby facilitating greater financial inclusion among the unbanked population.

Business Correspondents are deployed by the banks to expand their services in unbanked and underserved areas to ensure financial inclusion of every citizens and disseminate financial literacies. Business Correspondents (BCs) or Bank Mitras serve as agents of banks, acting as mobile, branchless representatives to deliver banking services in remote and unbanked areas. They facilitate savings and financial transactions, playing a crucial role in accelerating financial inclusion by bridging gaps in access to banking infrastructure. In

India, the BC model was introduced in 2006 through guidelines issued by the Reserve Bank of India (RBI), with the objective of extending banking and financial services to all regions of the country. BCs leverage digital technologies such as mobile banking applications, Point of Sale (PoS) devices and kiosk banking systems to enhance the delivery of financial services through financial technology (FinTech) and most of them are working in the form of microfinance.

According to the PMJDY website (accessed on 20th April 2026), there are 13.55 lakh BCs are delivering the branchless banking services across the country. Since BC models are well channelized and deployed in many nooks and corners of India with the mission mentioned above, a study is required to analyze their impact on financial Inclusion and the usability of BC services by customers. Hence, this research work has been carried out to know the perceptions and awareness of BC customers on various banking activities of the bank and to examine how that awareness influences them to avail BC's products and services more affordable and accessibility of their services. Thus, the focus of this study has been directed based on the following objectives of the study.

- Assess the accessibility and availability of BC's services for the customers as part of financial inclusion
- Analyze the awareness of BC customers about the services and operations of the BCs
- Evaluate the outreach and usability of the BC services to the customers

So far, no study has been carried out to analyze the impact of the BC model on financial inclusion and its effectiveness or usefulness to BC customers. Further, the area of field survey is the state of Kerala where any such studies is not yet carried out. Thus, the study seeks to evaluate the effectiveness of the Business Correspondent (BC) program and to identify subsequent measures required to achieve comprehensive financial inclusion, based on the recommendations derived from the research findings. This research incorporates both quantitative and qualitative analyses, quantitative analysis involved utilizing suitable descriptive or inferential statistical methods, employing SPSS and AMOS (Analysis of Moment Structures) as per the data's nature and analytical objectives.

The paper follows a structured approach, commencing with the introduction for providing context to the study, which is succeeded by a comprehensive review of existing literature to establish a foundation for the research. Subsequently, the methodology of study is elucidated, delineating the approach taken for data collection and analysis. Preliminary analyses of the gathered data are then presented, followed by detailed descriptive and inferential analyses. The paper culminates with concluding remarks, wherein major limitations are addressed, and avenues for future research are identified, thereby delineating the scope for further study. Quintessentially, this study will be benefited in understanding the viability of BC operations with a practical approach and to exploring the potential for utilizing BCs in advancing financial inclusion beyond basic banking services.

Review of Literature

The majority of the literature was sourced from computerized databases, primarily electronic resources, to provide theoretical support for the study and to identify the research gap. In this context, major studies on financial inclusion and the BC model were systematically reviewed and subjected to qualitative analysis.

Recent literature emphasizes the multifaceted impact of financial inclusion on household-level economic outcomes. Some studies (Sarma, 2025; Urueña-Mejía et al., 2023; Chaurasiya & Singh, 2025) have empirically examined financial inclusion and its practices, which were primarily focusing on individual countries and specific geopolitical forums. Jiang, Hu, and Cao (2024) examined how Digital Financial Inclusion (DFI) influences consumer spending using data from the China Household Finance Survey. Their findings reveal that DFI significantly promotes household consumption in rural and eastern regions. Saravanabhavan and Rajeev (2024) focused on India's grassroots financial institutions, particularly cooperative banks, highlighting their effectiveness in reducing reliance on informal lenders even at low levels of financial inclusion. Whereas, commercial banks showed similar effects only beyond a certain financial inclusion threshold. Complementing these micro-level insights, Biru et al. (2024) conducted a meta-analysis of 67 studies and found that financial inclusion has a statistically significant but modest positive impact, particularly on household consumption. However, they noted methodological inconsistencies and emphasized the role of national policies and intervention types as moderating factors. Collectively, these studies call for more theory-driven, context-specific research to deepen understanding of financial inclusion's long-term, heterogeneous effects on socio-economic outcomes.

Reserve Bank of India (2025) critically examined the performance of Indian financial inclusion and developed an index called as 'Financial Inclusion Index of India' based on three parameters which are Access, Usage, and Quality. In this, Access refers to the availability of services, Usage refers to how often and how much people use them, and Quality refers to the quality of the services, including financial literacy, consumer protection, and inequalities. According to this Index, the financial inclusion index of India in 2025 was 67 up from 43.4 in 2017. The index replicates the methodology of the United Nations Development Programme (UNDP) which measures the poverty and human development index (HDI), whereas this index indicates the progress of the nation towards inclusive banking, insurance, postal and pension systems. The index assigns weights to each parameter such as Access is 35%, Quality is 20% and Usage is 45%. The value of this index lies between 0 to 100 and out of 97 indicators, 90 are the primary indicators and the remaining seven indicators are the equality measures (The Hindu Business Line, 2023).

The World Bank (2025) presentation on Universal Financial Access highlighted significant expansion of global financial inclusion, raising account ownership to about 79% worldwide from 70% in 2020. Growth was largely driven by digital financial services, improving access and usage in developing economies. However, significant gaps remain among women, low-income groups, and digitally divided populations, indicating that achieving complete universal financial inclusion still requires targeted policy efforts. About two-thirds of these unbanked individuals reported insufficient funds as the primary reason for not having an account, which underscore the issues of affordability and accessibility of financial services for low-income users.

Shafi M.K, M. and Reddy, M.R (2022) conducted an empirical study on BCs which synthesized that BCs have a moderate impact on financial inclusion. BCs offers mainly eleven services in the state of Kerala and the study pointed out eight forms of BC operations. Akshaya E centers are the most dominant form of kiosk-based banking services offered by the BCs, however, as a limitation, the study didn't encompass the utilization of those services by the customers and how customers evaluate BCs services.

Satyasai and Kumar, A (2020) constructed an index called NAFINDEX based on the field level data collected during 2016-17 from NABARD-All India Rural Financial Inclusion Survey (NAFIS). To develop the index, three parameters were considered such as Modern banking services (M), Traditional banking products (T), and Payment mechanisms (P). The index covers 40,000 samples of households across 29 states of India with respect to their financial and livelihood aspects. The all India score of NAFINDEX is 0.337 on a scale of 0 to 1. The index results show that Punjab, Kerala, and Karnataka rank among the top three states in the banking products dimension, while Bihar, Chhattisgarh, and Madhya Pradesh occupy the bottom three positions.

The CRISIL Financial Inclusion Report 2018 evaluated India's financial inclusion based on four key parameters such as Credit Penetration (CP), Deposit Penetration (DP), Insurance Penetration (IP) and Branch Penetration (BP). The financial inclusion score at the national level stood at 58.0 (out of 100), reflecting an improvement from 50.1 in 2013. Kerala outperformed all other states with a score of 90.9. South India led regionally with a score of 79.8. Among 666 districts, only 267 surpassed the national average, which indicates uneven progress in financial inclusion across India.

The study by Mandira Sarma and Jesim Pais (2008) conducted a cross-country analysis of financial inclusion and development. The study introduced a composite measure, termed the Index of Financial Inclusion (IFI), to assess the degree of inclusiveness within a country's or region's financial system. In this study, the calculations of IFI values are based on three fundamental dimensions such as accessibility, availability, and utilization of banking services across 54 countries worldwide.

Research Gap and the rationale of the study

The previous studies primarily concentrated on various aspects of financial inclusion, such as indexation, digital financial inclusion, and the impact of government schemes like PMJDY on financial inclusion. In contrast, this study is specifically focused on investigating the perceptions of customers regarding Business Correspondent (BC) services, particularly within the state of Kerala. Given the existing research questions surrounding the effectiveness of BCs in meeting customer needs and their role in fostering financial inclusion, it is crucial to conduct a study to comprehend the performance of BCs from the perspective of their customers. This study seeks to address inquiries such as 'to what extent BCs effectively fulfill the needs of their customers' and 'whether BCs contribute significantly to the advancement of financial inclusion or not'.

As part of this study, the choice of Kerala is highly pertinent since the state secured top position among all Indian states in the CRISIL financial inclusion (Inclusix 2018), achieving a remarkable score of 90.9 out of 100. Further, The Hindu (2021) articulated that, the state Kerala has been ranked as the first state to declare banking coverage of all the households under the scheme of PMJDY. This apart, as per the State Level Banker's Committee (SLBC) data on BCs, the state has 10,281 Banking outlets through BCs, of which, 277 BCs are working in the form of Akshaya E -Banking Kiosks (State Level Bankers' Committee Kerala, 2026).

In order to accurately assess the impact of specific services, the respondents must have a good awareness on services offered by the BCs, and the fieldwork area should be one where a high level of accessibility to BC services is available. Given the aforementioned data from various reports on Financial Inclusion, Kerala emerges as an ideal fieldwork location to conduct research on this topic. Conducting the study in Kerala

provides a conducive context for examining financial inclusion, thereby enhancing the reliability and validity with which the research objectives can be achieved.

In addition to pointing out a noticeable research gap, the promotion of financial inclusion stands as a key priority for governing bodies like the RBI and the Government of India. In India, though there has been gradual progress in financial inclusion, its implications have yet to fully manifest across various sections of the society. According to index of the RBI, India's financial inclusion score stood at 67%, a figure that has evolved over the last 75 years. Whereas, the full-fledged financial inclusion is highly imperative for achieving multifaceted, sustainable national growth, particularly as the country transitions toward a robust digital economy and prioritizes financial inclusion. Having a motive for more empirical studies, this study is justified in its focus on examining Business Correspondent Models, given their pivotal role as a gateway to bolstering financial inclusion efforts.

Conceptual Constructs and indicators of the study

To analyse the impact of BC operations on financial inclusion, the factors identified in prominent previous studies and commonly used financial-inclusion indicators were considered. Accessibility and usage, particularly the availability and affordability of financial services, are widely recognised as important dimensions of financial inclusion in the literature and policy reports, including Sarma (2008, 2015), the RBI (2025), the IMF Financial Access Survey (2025), and the World Bank Global Findex (2025). Accordingly, accessibility and usage were incorporated into the present study.

Whereas, Ernst & Young LLP and the Confederation of Indian Industry (2024), as well as Nanda et al. (2024), identified awareness and affordability as important variables for assessing financial inclusion. However, the existing literature and institutional reports do not employ a universally accepted set of dimensions or indicators for measuring financial inclusion. Different studies use different combinations of accessibility, availability, affordability, awareness, usage, quality, and adequacy, depending on their research objectives and context.

Therefore, based on the evidence from the existing literature, the present study considers awareness, accessibility, affordability, and usage as the key dimensions for examining the contribution of Business Correspondents to financial inclusion. The conceptual framework developed for the study is presented in Fig. 2. Its statistical representation is:

Model 1: Product-Service Awareness = $\beta_0 + \beta_1(\text{BC Operations Awareness}) + \epsilon_1$

Model 2: Accessibility = $\beta_0 + \beta_1(\text{BC Operations Awareness}) + \beta_2(\text{Product-Service Awareness}) + \epsilon_2$

Model 3: Affordability = $\beta_0 + \beta_1(\text{BC Operations Awareness}) + \beta_2(\text{Product-Service Awareness}) + \epsilon_3$

Methodology

Financial inclusion is of paramount importance for fostering comprehensive economic and financial growth within a nation. However, BC models, as RBI's bank-led initiatives aimed at expediting banking services,

require careful analysis of their operational procedures and service stages. This analysis can be approached from the perspectives of BCs, their customers, or the banks they represent. In this research, the model of BC customer's approach has been adopted by considering the variables such as impact assessment, accessibility to financial services, scalability of services, and the awareness on services offered by the BCs. These are the factors considered by the different central banks and institutes (Reserve Bank of India FI index, 2025; World bank Global Findex, 2025; Ernst & Young LLP, 2024) in their reports as part of assessing the financial inclusion. However, within the scope of this research study, the methodology has been specifically crafted to examine BC's operations through the lens of its customers.

This empirical research is focused on the state of Kerala as the primary fieldwork location. Consequently, the population under study comprises the customers of Business Correspondents (BCs) operating within selected districts of Kerala, including Malappuram, Kozhikode, and Ernakulam. The justification for selecting the state has been explained in the section of 'research gap and rationale of the study'. To survey the BC customers, a scheduled questionnaire was distributed either directly or through the online survey method which was executed via electronic media i.e through the web-based online survey software called 'Questionpro'. The questionnaire consists of both categorical and interval (metric) data, which were appropriately coded using a five-point Likert scale in accordance with the nature of the statements, with approximately 95% of the items being close-ended questions. The comprised questions extracted the information to know the customer perceptions on BC programs, awareness of BC customers and usability of products and services offered by BCs. There are eleven reverse-coded questions in the questionnaire, where "Strongly Agree" was assigned a value of 1 and "Strongly Disagree" was assigned a value of 5, as the statements were negatively framed to identify the issues related to BC service.

So far, no surveys or official documents issued by government bodies or other regulatory authorities have explicitly reported the total number of BC customers in the state. Consequently, the population of BC customers has been treated as infinite for the purpose of this study. Accordingly, the sample size has been determined using the formula for an infinite population, as outlined in the book *Research Methodology* by C. R. Kothari (2004), presented below.

$$n = \frac{Z^2 \cdot p \cdot q}{e^2}$$

1

In this case, $p = 0.5$, and $q = 1 - p$, i.e $= 0.5$, the value of $Z = 1.96$ corresponds to a 95% confidence level, representing the standard normal variate. The margin of error is set at $e = 0.05$, considering the assumption of an infinite population of BC customers. Substituting these values into the sample size formula for an infinite population:

$$n = \frac{(1.96)^2 \cdot 0.5 \times 0.5}{(0.05)^2} \quad n = 384.16$$

According to the formula, the adequate sample size is 384.16. However, 400 sample size has been considered to ensure more accuracy of the collected data.

Preliminary analysis of the study

Since the strength of data analyses depend on the accuracy and validity of the data, straightaway analyses may often be prone to error before embarking on inferential or descriptive tests. Hence, preliminary analyses have been executed to conform the correctness, consistency, and appropriateness of collected data. In this regard, after doing the content analysis for open-ended questions through the systematic evaluation of textual materials to determine the presence of theme and intents of the questionnaire. Thereafter, such qualitative questions were converted into quantitative figures for analytical purposes.

Descriptive statistics were employed to conduct univariate analyses, including outlier detection, as well as the computation of mean, skewness, and kurtosis to assess data normality. Multivariate analysis was subsequently undertaken to identify underlying factor structures and to test the proposed hypotheses. The following techniques were executed as part of the preliminary data analyses, subsequent to data editing, coding, transcription, and organization.

Reliability and Validity test

Initially, the face validity and content validity of the questionnaire items were tested following the pilot study, and subsequently, reliability analysis also was conducted. Reliability testing was undertaken to evaluate the internal consistency of the questionnaire, reflecting its ability to capture consistent and accurate responses. Internal consistency was initially examined using the split-half method, which involves correlating the scores of two halves of the instrument. Cronbach's alpha was employed as it is the most widely accepted measure of reliability test, particularly in the context of survey-based research using multiple Likert-scale items.

The Cronbach's alpha (α) coefficient for the 33 items (questions) of the questionnaire was found to be 0.774, which exceeds the commonly accepted threshold of 0.70 (J. C. Nunnally & Ira H. Bernstein, 1994), thereby indicating satisfactory internal consistency of the questionnaire. Though there are 44 Likert scaled questions, 11 reverse coded questions were not considered for this study. Further, the application of face and content validity assessments facilitated refinement of the questionnaire through the addition and elimination of certain items, ensuring alignment with the objectives and enhancing the overall accuracy and coherence of the study instrument.

Deletion of missing data and outliers

A few returned questionnaires contained missing values. In the cases where the extent of missing data was at minimal, such values were replaced using mean imputation, whereby the neutral (mean) value of the respective variable was assigned (Pramod Shukla, 2014). This imputation method was followed twelve times across eighteen questionnaire items.

To address missing data more rigorously, listwise deletion was employed, whereby cases with incomplete responses were excluded from the analysis. Outliers were identified using boxplot techniques in SPSS. The removal of outliers contributed to improving data normality and enhancing the accuracy and robustness of subsequent statistical analyses.

Normality Test

Normality assumes that the data approximate a bell-shaped distribution and constitutes a key assumption underlying parametric statistical tests. In this study, the normality of the data was tested by using skewness and kurtosis measures, where skewness indicates the degree of symmetry in the distribution, and kurtosis reflects the extent of peakedness or tail thickness. For both measures, the standardized Z-values are expected to fall within the range of ± 1.96 (Kent Löfgren, 2013; Stephen Rose, 2015). The results of the skewness and kurtosis tests for all questionnaire items are reported in the Annexure-I. Items with Z-values falling outside the acceptable threshold of ± 1.96 were excluded from subsequent hypothesis testing to ensure compliance with the assumptions underlying parametric analysis.

Discussion

This section contains diverse discussions focusing on the analyses carried out to identify the principal variables of the study by validating the scale, alongside performing the descriptive and inferential analyses to discern the significant outcomes of the study.

Demography of the BC Customers

The demographic profile of the surveyed BC customers and their frequency analyses have been presented in the Table-1.

Table-1. Demographic Profile of the BC Customers					
Gender of Customers			Profession		
1	Male	257	1	Student	97
2	Female	143	2	Self-Employed	71
Total		400	3	Private Sector Employee	130
Age			4	Government Employee	31
1	18-25	129	5	Business Man	31
2	26-40	200	6	Other	40
3	Above 41	71	Total		400
Total		400	Districts		
No Frill A/c			1	Malappuram	143
1	Yes	33	2	Kozhikode	126
2	No	182	3	Ernakulum	131
Total		217	Total		400

Source: Primary Data

In this survey, male respondents outnumbered female respondents. Among the districts, Malappuram has the highest population, while Ernakulam, recognized as the financial hub of the state and the third most populous district, accounted for 131 respondents out of the total sample of 400.

Services availed by BC Customers

The objective of mobilizing the BC (Business Correspondent) services is to expand banking services in underbanked areas and provide access to mainstream financial services for the unbanked people. The survey findings reveal that, out of 400 respondents, only 217 BC customers availed themselves of the bank account opening facility, as presented in Table 2. Similarly, 228 customers reported utilizing technology-enabled transaction services. Overall, customers primarily benefited from 12 distinct services offered through the BC model, as detailed in Table 2.

Sl.No	Table-2: Services availed by the BC Customers	
1	Opening Banking Accounts	217
2	KYC clearance	252
3	Remittance of Savings	154
4	Technology-Enabled Transactions	228
5	Financial education	114
6	Transfer of Money	198
7	Services for Government grants	137
8	Insurance	32
9	Advisory and financial counseling services	170
10	Receiving Pension Schemes	42
11	Loans and advances	85
12	Bills and tax payment services	103

Source: Primary data

In addition to core banking services, customers also approach BC centers to access a range of ancillary services, including applications for government benefits, issuance of income and residence certificates, submission of educational scholarship applications, and examination-related services. These services are predominantly facilitated through Akshaya E-Centers. However, many BC agents operate these services alongside their primary business activities while simultaneously serving specific banks.

Multivariate Analysis based on factor analysis

Factor analysis is a multivariate statistical technique used for dimensionality reduction by examining the interrelationships among a large set of variables and identifying the number of underlying latent factors that

explain the observed data structure. In this study, Exploratory Factor Analysis (EFA) was initially employed to know the underlying factors, which was followed by Confirmatory Factor Analysis (CFA) to validate the identified constructs. Variables with factor loadings below 0.40 were suppressed from the rotated component matrix obtained through Varimax rotation, as 0.40 is considered the minimum acceptable threshold for a sample size of approximately 200 (Hair et al., 2018).

Factor analysis was conducted on the Likert five-point responses based on the items in the questionnaire, those were obtained from BC customers, comprising 23 positively worded statements. The Kaiser-Meyer-Olkin measure (KMO) value was found to be 0.681, indicating acceptable sampling adequacy for conducting EFA. The result of the Bartlett's test indicates whether enough correlations are existing among the variables. Since its significant value is 0.000, the statistical significance of the correlations within the correlation matrix are fulfilled among the items in Factor Analysis, thereby it assesses whether the matrix significantly differs from an identity matrix. Based on the Rotated Component Matrix, four distinct factors were extracted, as presented in Table-3.

Table-3. Rotated Component Matrix^a

	Component			
	1	2	3	4
Q13-Offering secure saving options for bank accounts and better investment	0.603			
Q16- Easy clearance of doubts and ambiguities in filling the documents	0.598			
Q15- Providing proper banking services and finance information	0.542			
Q17- The effective mechanism for fulfilling the basic needs of needy and destitute people	0.475			
Q14-BCs Play mediatory role between have and have not	0.414			
Q9- Providing services at an affordable cost		0.642		
Q8-Know Your Customer (KYC) procedures are simple for opening the bank accounts		0.568		
Q6- You are getting customer-friendly banking and financial services		0.524		
Q12- BCs utilize technological devices to facilitate and streamline the transaction process		0.475		
Q10- The terms and conditions are highly transparent and well aligned with the requirements		0.431		
Q7-No hassles for money transactions		0.422		
Q5- You are aware of all products and services offered by the BCs			0.625	
Q4- Cognitive changes are low			0.591	
Q2- BCs conduct financial literacy programs and actively disseminate information about financial products and services			0.471	
Q3- BCs engage in promotional activities through door-to-door outreach, distribution of leaflets, and similar methods			0.441	
Q1-BC services are useful for making awareness of banking among local people	0.403		0.408	
Q20-Access to Biometric / ATM in your area				0.682
Q22- Convenience and Interoperability				0.433
Q19- It serves as a convenient channel for investing and accessing credit when needed				0.431
Q18- Easier to carry out with agents than with banks				0.444
Q21-e-payment option is available through kiosk banking	0.435			0.523
Q11- This model encourages rural development and industrial growth				

Q23- Providing vernacularized materials and documents

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

Source: Primary Data Analysis (SPSS output table)

The four extracted factors were labeled as 'Availability', 'Accessibility', 'Awareness', and 'Affordability'. Out of the 23 items, two variables (Q11 and Q23) were eliminated as they did not exhibit significant loadings on any factor. Additionally, two items demonstrated cross-loadings; however, these were retained for Confirmatory Factor Analysis (CFA) based on the factor on which they exhibited higher loadings. The measurement models developed for CFA to validate and confirm the underlying factor structure are presented in Figure-1.

The path diagram (Figure-1) comprises four measurement models, with standardized factor loadings predominantly close to or exceeding the threshold of 0.70, thereby indicating that the extracted factors adequately retain the measurement scale. To improve the overall model fit in the Confirmatory Factor Analysis (CFA), the residual errors associated with the fourth construct (e19 and e20) were allowed to covary based on the Modification Indices (MI). The goodness-of-fit indices for both the initial and the modified models are presented in Table-4.

Table-4: Model fit Measurements

Sl No	Measures of Fit	Model fit criterion	First Model fit	Actual Fit Values*
Absolute Fit Measures				
1	CMIN/DF (χ^2 /df)	< 3 Good: < 5 Sometime permissible	4.122	3.887
2	Goodness-of-Fit Statistic (GFI)	Above .90	.823	.867
3	Root Mean Square Residual (RMR)	<0.05Good: 0.05 - 0.10 moderate	.101	.082
4	Root Mean Square Error of Approximation (RMSEA)	<0.05Good, <0.08 is permissible	.079	.085
Parsimony Fit Indicators				
5	Adjusted Goodness-of-Fit Statistic (AGFI)	Above .90	.628	.829
6	Parsimony Normed-Fit Index (PNFI)	Greater value, improved fit.	.731	.852
Incremental Fit Indicators				
7	Comparative Fit Index (CFI)	Near 1 signifies an excellent fit.	.712	.878
8	Normed-Fit Index (NFI)	≥ 0.90	.816	.910

*Modified values based on the modification indices

Source:- AMOS Model fit result of CFA

The model fit indices can be summarized as follows: CMIN/DF (χ^2/df) = 3.887, GFI = 0.867, CFI = 0.878, NFI = 0.910, RMSEA = 0.085, and AGFI = 0.829. The absolute fit indices provide a fundamental indication of how well the proposed theoretical model fits the observed data. As noted by David Hooper et al. (2008), model fit indices can be broadly categorized into absolute, incremental (comparative or relative), and parsimony fit measures. In the present analysis, although the CFI value (0.878) falls slightly below the threshold of 0.90, the deviation is marginal rather than substantial.

To assess construct validity, CFA was performed using CB-SEM implemented through AMOS. Convergent and discriminant validity were evaluated using standard metrics, including Average Variance Extracted (AVE), Composite Reliability (CR), Average Shared Squared Variance (ASV), and Maximum Shared Squared Variance (MSV). The results of both convergent and discriminant validity for the measurement model are presented in Table 5. The values for these metrics were derived from the CB-SEM output.

Table-5: Convergent and Discriminant Validity Measures

	CR	AVE	MSV	ASV	A1	A2	A3	A4
Awareness (A1)	0.838	0.511	0.237	0.196	0.714			
Availability (A2)	0.876	0.587	0.518	0.310	0.487	0.766		
Affordability (A3)	0.872	0.534	0.517	0.329	0.372	0.720	0.731	
Accessibility (A4)	0.853	0.537	0.328	0.238	0.463	0.416	0.572	0.731

Source:- Generated values using Gaskin Stat Package

The indicators of construct validity such as Composite Reliability (CR) and AVE for convergent validity, and MSV and ASV for discriminant validity were found to meet the acceptable thresholds, indicating that the measurement scales are both valid and reliable. The results confirm the fulfilment of convergent and discriminant validity, as all AVE values exceed 0.50 and CR values are above 0.80. Both convergent and discriminant validity measures collectively establish the construct validity of the scales associated with the four measurement models. This further suggests that the constructs are distinct and exhibit minimal overlap. In summary, the validity criteria can be expressed as CR (>0.70) > AVE (>0.50) > MSV and ASV.

Inferential analysis: To analyze the customer awareness on various components of BC operations

Ultimately, the study is designed to examine the perceptions and awareness levels of BC customers and to analyze how such awareness influences their utilization of BC products and services. It further evaluates customer perceptions regarding the affordability and accessibility of services offered through the BC model. In this regard, hypotheses were formulated and all such inferential tests have been performed based on the 95% significant level to make a decision on generated 'P-value'. The inferential analysis incorporates four latent variables: 'customer awareness of BC operations', 'customer awareness of products and services

offered by BCs', 'accessibility of BC services', and 'affordability of BC services'. RBI, IMF Financial Access survey and World Bank considered these variables as part of constructing their financial inclusion index, therefore, this study framed questions based on those four factors in the conceptual framework. Further, three hypotheses have been administrated (Figure-2) as part of inferential test which were executed through the Structural Equation Modeling (SEM) i.e. Maximum Likelihood Regression Estimation (MLE Regression) since all the variables have been formed in the nature of 'construct' and all are metric data.

H01: There is no significant difference between customer awareness on operations of BCs and their awareness of BC's products and services.

H02: There is no significant variance between customer's awareness of BC's products and services and accessibility of those services to the customers.

H03: There is no significant difference between customer's awareness of BC's products and services and affordability of those services to the customers.

The path diagram of the aforementioned inferential model, incorporating the latent variables and their corresponding observed variables (i.e., questionnaire items loading onto each construct), is presented in Figure-2.

Each construct was specified as a reflective measurement model, with four or more observed variables loading onto each latent construct. To improve overall model fit, selected error terms were allowed to covary in two measurement models based on theoretical and statistical justification. The values presented in the path diagram are standardized estimates, and residual terms were incorporated for each endogenous variable to account for unexplained variance influencing the respective constructs. The output corresponding to the path diagram on analyzing the impact of customer awareness on BC's products and services and their affordability and accessibility of BC services, including all three Critical Ratios (CR) and p-values, have been presented in Table-6.

Table-6: Results of Path modeling

	Estimate		S.E.	C.R.	P
	Standardized	Unstandardized			
AwarenessPandS <-- AwarenessBC	.930	.100	.096	1.039	.299
Accessibility <-- AwarenessPandS	1.268	10.387	9.716	1.069	.285
Affordability <-- AwarenessPandS	.649	7.699	7.226	1.065	.287

Source: AMOS Output on primary data analysis

Based on the results presented in the Table-6, it can be inferred that none of the proposed hypotheses is statistically significant, as all p-values exceed the chosen significance level (α). The Critical Ratio (CR), analogous to a Z-statistic or t-statistic, is computed as the ratio of the unstandardized estimate to its standard error (S.E.), thereby indicating the strength of the estimated relationship relative to its variability. Based on the inferential analysis, the findings suggest that customers' awareness of BC operations does not

have a statistically significant impact on their awareness of the products and services offered by the Business Correspondents. Furthermore, awareness of BC products and services does not significantly influence customers' perceptions of the affordability and accessibility of BC services.

Conclusion

With the aim of achieving the study's goals, various parameters were considered including customer awareness of the BC's products and services, customer usage patterns, as well as the accessibility and affordability of BC services. Consequently, the research aimed to analyse the impact of BC performance on financial inclusion (FI) from the customer's perspective. Preliminary analyses, including both univariate and multivariate techniques, were conducted to screen the data and establish the construct validity of the derived variables. Subsequently, path analysis using covariance-based structural equation modeling (CB-SEM) indicates that none of the aforementioned variables exerted statistically significant effects on the other constructs included in the inferential test. Furthermore, it was observed that customer's awareness on offered products and services by the BCs did not significantly influenced by the accessibility and affordability of BC services.

In most instances, fewer than 50% of customers availed themselves of the various BC services. Specifically, 154 customers utilized remittance services, 228 customers engaged in technology-enabled transactions, and 170 customers received advisory and financial counselling services. However, only 42 out of 400 customers benefited from pension-related services. The mean score for the statement on "Lack of awareness regarding products and services" was 2.815 (on a five-point scale), indicating a moderate level of awareness among customers regarding the offerings of BCs. Most of such reverse coded questionnaire shows mean value of more than 3 (annexure-1), which indicates customers don't have high negative perceptions on products and services, therefore, this BC models can be extended by and large for next levels of financial inclusion.

Kerala's high score of CRISIL inclusix indicates that the residents of Kerala predominantly rely on formal financial channels to meet their inclusive financial needs, rather than utilizing BC models or Customer Service Centres (CSCs). Consequently, to ensure the sustainability of BC models, it is imperative to deploy them selectively in the areas where there is a genuine need, rather than aiming for widespread coverage of BC services. Moreover, the established BC channels in the state, such as Akshaya E-Centres, should be leveraged for advanced or next level financial inclusion. This could involve offering a broader spectrum of financial services, including pensions, insurance, investment opportunities etc. By expanding the scope of services through these BC channels, the financial freedom and prosperity of each individual across all socioeconomic strata can be achieved which will lead a better standard of living.

Scope of Future Research

To gauge the true impact of BC operations on different factors of financial inclusion, analysing the the additional factors such as the levels of activities among BCs, the geographical outreach of BC services, comparative assessment of the demand and supply dynamics of BC services etc are highly imperative. By considering these components, future research can provide concrete insights into the actual impact of deploying BC models on financial inclusion. These findings offer a roadmap for banks and policymakers to develop the strategic frameworks necessary for advancing massive, technology-driven financial inclusion endeavors in India. While this study evaluated the products, services, and accessibility of Business

Correspondents (BCs) in relation to banking mobility, several critical factors remain unaddressed. Future research should address these overlooked dimensions, specifically targeting the limitations identified within this work to provide a more comprehensive understanding of the different dimensions of the financial inclusion.

Declarations

Funding availability statement: This research was carried out without any specific grant from funding agencies or for the publication of this manuscript. However, the fund for open access will be procured under the One Nation One Subscription (ONOS) scheme of India.

Data availability statement: The dataset collected and analyzed during the current study has been provided separately with the manuscript submission. Further details of the data are available from the corresponding author upon reasonable request.

Author Contribution: There is only one author in this paper. Hence, all works were carried out by one author.

Competing interests: No competing interests since there is one author in the paper.

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Ethics declaration statement

This study was conducted in accordance with established ethical principles for social science research and the applicable guidelines of the Indian Council of Social Science Research (ICSSR). Participation in the study was voluntary, and informed consent was obtained from all respondents prior to data collection. The study adhered to established ethical principles for research involving human participants (BC customers from Kerala). Respondents were informed about the study purpose, participation was voluntary, and confidentiality was assured. The data was used solely for academic purposes, and voluntary completion of the questionnaire constituted informed consent. The analyses conducted in this study were approved by the appropriate institutional authority at the National Institute of Technology Warangal (NIT Warangal), India.

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Figures

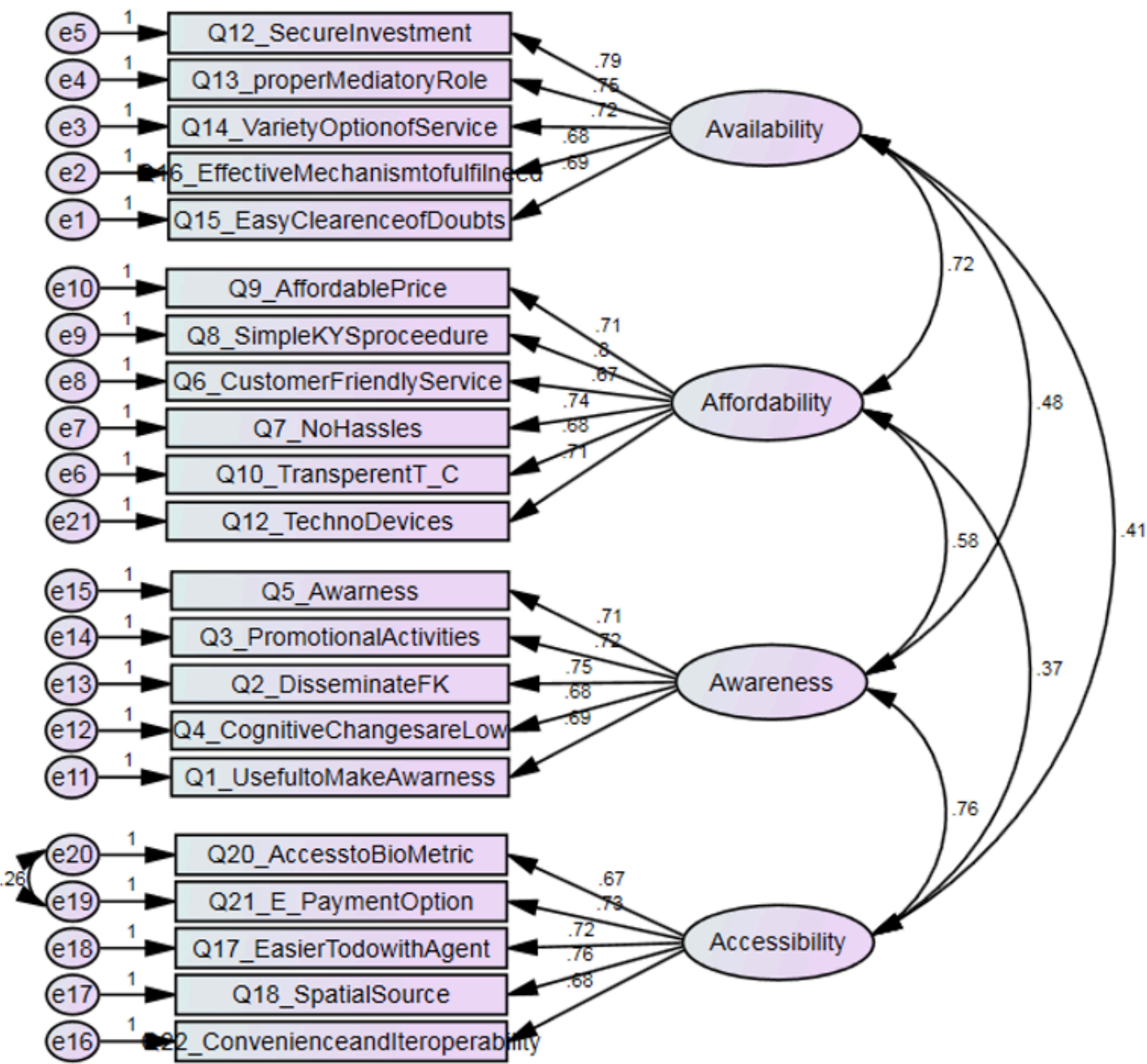
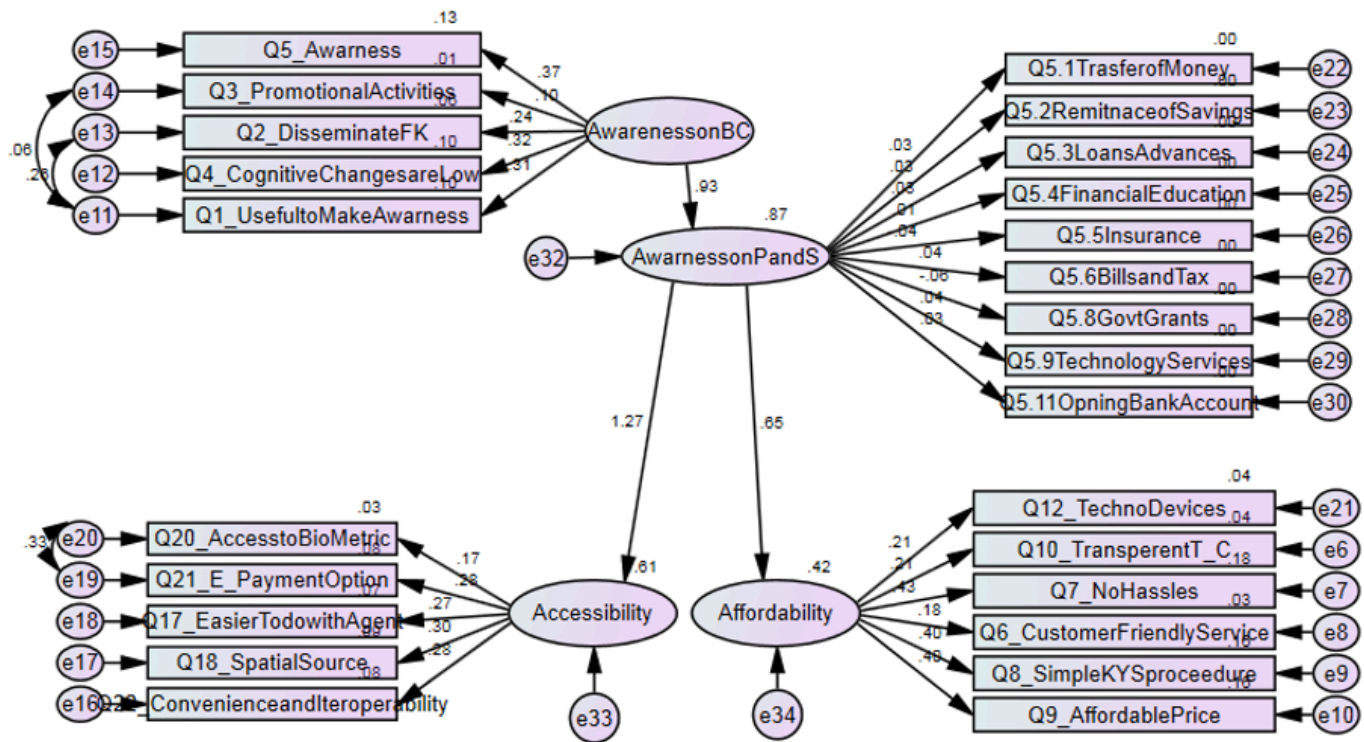


Figure 1
Modified Path model of CFA (Perceptions of customers on BC services)



Source: AMOS Path Diagram based on the validated constructs

Figure 2

Customer awareness on BC's Operations, Product and Services, and their Accessibility and Affordability

Supplementary Files

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- [Annexure.docx](#)