2026 Volume: 02 Issue: 05 www.ijrpa.com ISSN 2456-9995 Research Article

International Journal Research Publication Analysis

Page: 01-18

IMPACT OF INTELLECTUAL CAPITAL EFFICIENCY ON FINANCIAL PERFORMANCE AND GROWTH IN THE INDIAN BANKING SECTOR: A COMPARATIVE ASSESSMENT OF VAIC, MVAIC AND EXTENDED VAIC (EVAIC) MODELS

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Article Received: 08 April 2026
Article Revised: 28 April 2026
Published on: 18 May 2026

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DOI: https://doi-doi.org/101555/ijrpa.2471

ABSTRACT

The banking sector depends heavily on knowledge-based resources such as employee capability, organisational routines, customer relationships and technology-enabled processes. This paper examines intellectual capital efficiency as a potential driver of financial performance and growth in the Indian banking sector through a comparative assessment of the VAIC, MVAIC and Extended VAIC (EVAIC) frameworks. The paper first explains the conceptual logic of each framework and compares their formula structures, strengths and limitations. It then reviews 20 relevant studies in paragraph form and summarises their broad reported results in portrait-friendly tables. A research-ready methodology is proposed for a fuller panel study of Indian public and private sector banks. To demonstrate feasibility, the paper also provides an illustrative annual-report-based calculation trail for State Bank of India and HDFC Bank for FY2023-24 and FY2024-25. The evidence from prior literature broadly supports a positive association between intellectual capital efficiency and bank performance, although the effects of individual components are not always uniform. The paper concludes that VAIC remains the most practical baseline framework for Indian banking studies, whereas MVAIC and Extended VAIC offer stronger conceptual coverage when reliable relational and innovation-capital proxies are available.

KEYWORDS: *Intellectual capital efficiency; VAIC; MVAIC; Extended VAIC; EVAIC; Indian banking sector; financial performance; bank growth.*

1. INTRODUCTION

Banks are knowledge-intensive institutions. Their value creation depends not only on regulatory capital and financial assets but also on employee expertise, credit appraisal quality, risk-management systems, digital platforms, customer relationships and organisational learning. In the Indian banking sector, this issue has become more important because banks are simultaneously dealing with credit growth, digital transformation, regulatory compliance and changing customer expectations.

Intellectual capital efficiency is commonly measured through VAIC, which decomposes value creation into human capital efficiency (HCE), structural capital efficiency (SCE) and capital employed efficiency (CEE). However, modern banking cannot always be fully understood through these three dimensions alone. Customer relationships, service quality, digital innovation and technology-led process capability have become increasingly central to bank performance and growth. This creates a strong reason to compare VAIC with broader frameworks such as MVAIC and Extended VAIC (EVAIC) before selecting the final empirical model.

Accordingly, the present paper compares these frameworks, reviews the relevant empirical literature, proposes a research design for Indian banks and demonstrates a transparent calculation trail using official annual-report data of State Bank of India and HDFC Bank. The purpose is to present a research-ready manuscript without making unsupported sector-wide causal claims.

2. Conceptual Background

Intellectual capital refers to the knowledge-based resources that enable an organisation to create value beyond the visible contribution of physical and financial capital. In banking, intellectual capital is usually discussed through three broad building blocks: human capital, structural capital and relational capital. Human capital reflects employee competence, experience and problem-solving capacity. Structural capital refers to organisational systems, databases, routines, technology architecture and institutional processes. Relational capital reflects customer trust, brand reputation and external stakeholder relationships.

The original VAIC framework is attractive because it can be computed from published financial statements. Rather than valuing intangible assets directly, it measures how

efficiently a firm generates value added through human capital, structural capital and capital employed. The broader MVAIC and Extended VAIC frameworks were developed because the original VAIC model does not explicitly capture certain knowledge dimensions that are increasingly important in contemporary business settings, including relational and innovation capital.

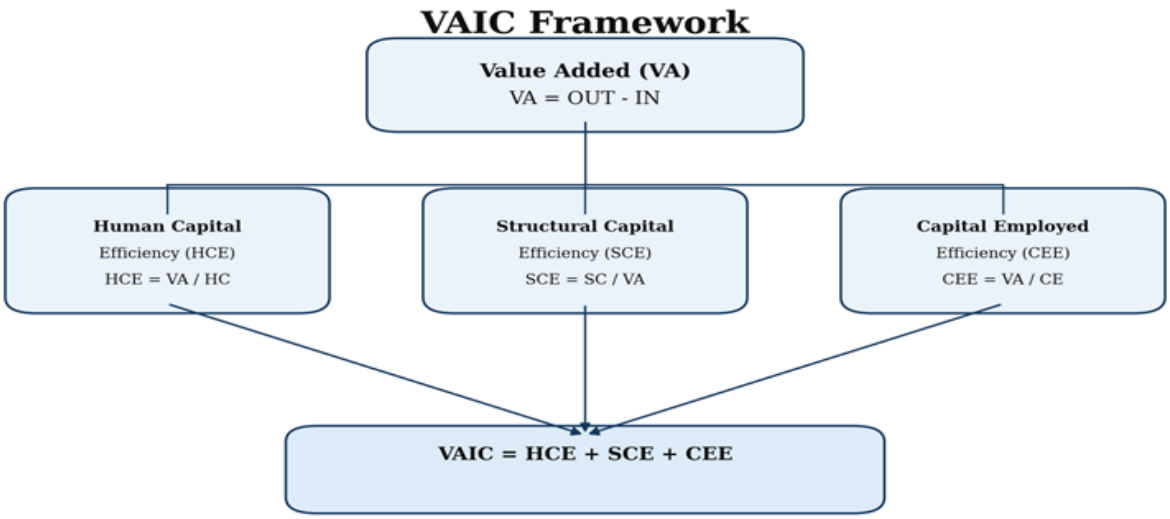

Figure 1. VAIC framework.

Source: Adapted from Pulic (2000).

3. Framework Comparison: VAIC, MVAIC and Extended VAIC (EVAIC)

The choice of framework should depend on both research objectives and data availability. VAIC is suitable when the study requires comparability across a long panel of banks because its inputs are usually obtainable from annual reports. MVAIC improves conceptual coverage by adding relational capital efficiency, while Extended VAIC (EVAIC) attempts to incorporate innovation capital efficiency as well. These broader frameworks may be more suitable for a digital-banking context, but only when the proxies used for relational and innovation capital are consistently measurable across banks and over time.

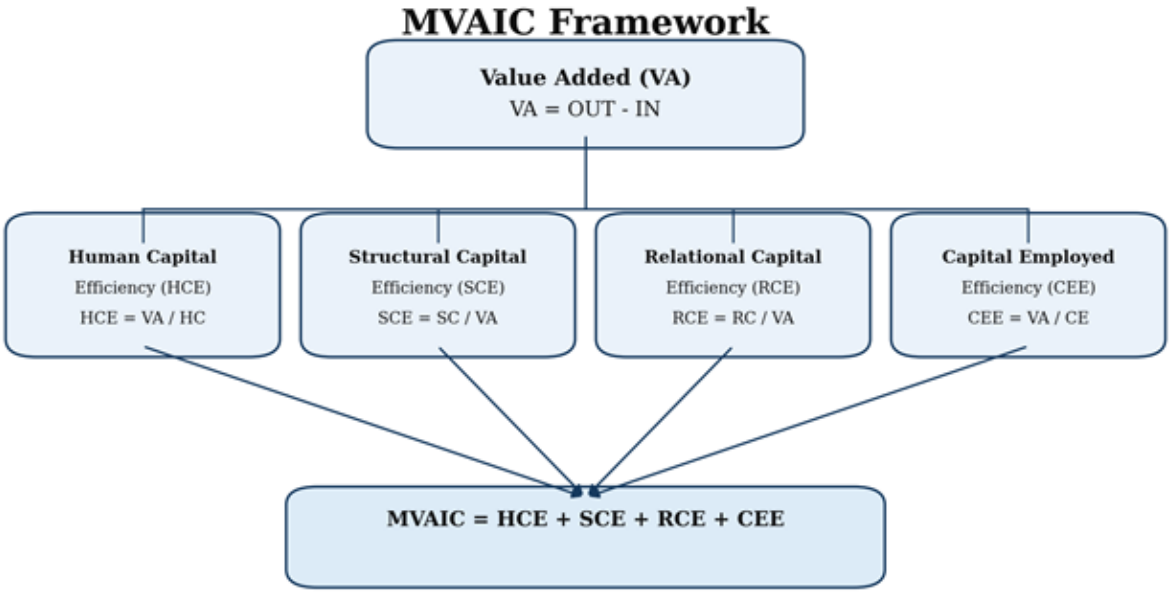

Figure 2. MVAIC framework.

Source: Compiled from the reviewed literature.

MVAIC is useful when the study intends to recognise the relational or customer-oriented dimension of banking. However, it should be used only when the relational-capital proxy is comparable across banks and across years.

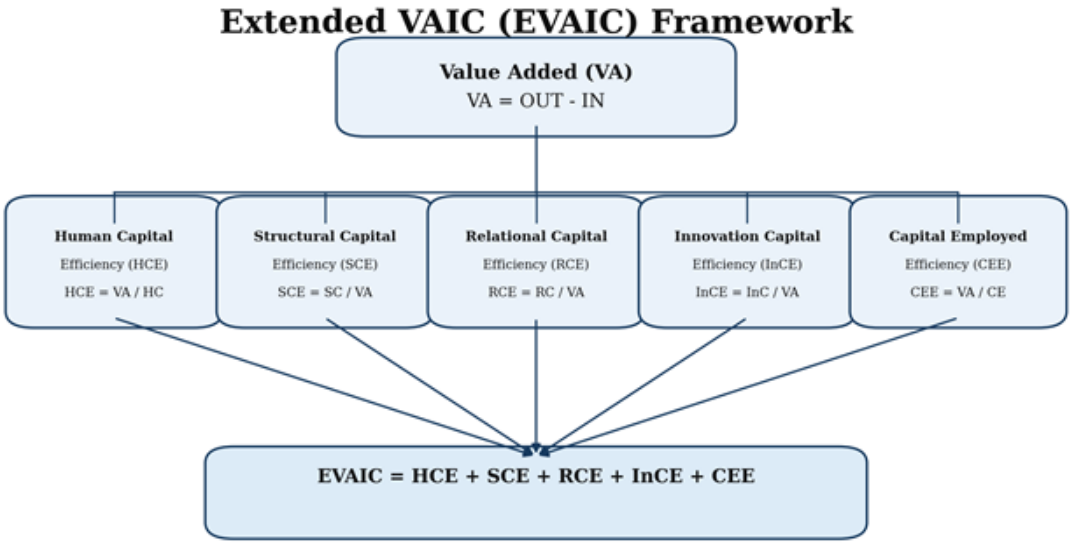

Figure 3. Extended VAIC (EVAIC) framework.

Source: Adapted from Nazari and Herremans (2007); Xu and Liu (2020).

Extended VAIC (EVAIC) is conceptually stronger for modern banking because it recognises relational and innovation-capital dimensions. Nevertheless, it should not be applied

mechanically where innovation-related expenditure is not separately and consistently disclosed.

3.1 Formula Structure for Empirical Application

OUT = Interest earned + Other income

IN = Interest expended + Operating expenses excluding employee cost

VA = OUT - IN

HC = Payments to and provisions for employees

SC = VA - HC

CE = Capital + Reserves and surplus

HCE = VA / HC

SCE = SC / VA

CEE = VA / CE

VAIC = HCE + SCE + CEE

MVAIC = HCE + SCE + CEE + RCE

Extended VAIC (EVAIC) = HCE + SCE + CEE + RCE + InCE

For Indian banking studies, VAIC can usually be computed directly from annual reports. MVAIC and Extended VAIC should be used only after confirming the availability of reliable and comparable proxies for relational and innovation capital.

Table 1. Comparative understanding of VAIC, MVAIC and Extended VAIC (EVAIC).

Framework	Components and formula	Data requirement	Usefulness and caution
VAIC	HCE, SCE and CEE VAIC = HCE + SCE + CEE	Annual-report data on income, expense, employee cost and capital employed.	Most practical for long bank panels; however, it does not explicitly capture relational or innovation capital.
MVAIC	HCE, SCE, CEE and RCE MVAIC = HCE + SCE + CEE + RCE	VAIC data plus a consistent relational/customer-capital proxy.	Adds relational/customer dimension; use only where the proxy is comparable across banks and years.
Extended VAIC (EVAIC)	HCE, SCE, CEE, RCE and InCE EVAIC = HCE + SCE + CEE + RCE + InCE	VAIC data plus consistent relational and innovation-capital proxies.	Better aligned with digital banking; avoid if innovation expenditure is not separately and consistently available.

Source: Compiled by the author from the reviewed literature.

4. LITERATURE REVIEW

The following section presents 20 literature-review paragraphs selected to support the conceptual, methodological and empirical foundations of the paper.

Edvinsson and Sullivan (1996) offered one of the early managerial foundations for recognising intellectual capital as a structured source of organisational value. Their work is relevant to banking because banks rely on employee expertise, information systems, customer confidence and institutional routines rather than on physical assets alone. This foundation supports the view that bank performance should be interpreted through knowledge-based resources alongside conventional financial capital.

Cabrita and Bontis (2008) examined intellectual capital and business performance in the Portuguese banking industry. Their work showed that human, structural and relational capital are all relevant to banking performance and that their interaction matters. For Indian banking research, this study supports the idea that intellectual capital should be treated as a multidimensional construct rather than as a single undifferentiated resource.

Nazari and Herremans (2007) advanced the discussion on extended VAIC by arguing that the original VAIC model may not adequately capture all components of intellectual capital. Their contribution is especially important because it provides the conceptual basis for comparing VAIC with broader frameworks such as MVAIC and Extended VAIC (EVAIC). The study therefore justifies framework comparison before empirical model selection.

Mondal and Ghosh (2012) investigated the relationship between intellectual capital and financial performance of Indian banks. Their study demonstrated the feasibility of using annual-report-based measures for Indian banking analysis and showed that intellectual capital can be meaningfully linked with performance. It remains one of the central Indian references for VAIC-based banking research.

Mention and Bontis (2013) analysed intellectual capital and performance within the banking sectors of Luxembourg and Belgium. Their findings supported the view that intellectual-capital resources contribute to banking performance, although the effect depends on how different knowledge resources interact. This is relevant for Indian banks, where employee capability, customer trust and process quality shape performance together.

Al-Musali and Ku Ismail (2014) studied the effect of intellectual capital on the financial performance of Saudi Arabian banks. Their work extended the VAIC literature to an emerging-market context and showed that intellectual capital is relevant beyond developed banking systems. The study is useful for the present paper because Indian banks share similar service-intensive and relationship-driven characteristics.

Chahal and Bakshi (2015) examined the relationship between intellectual capital and competitive advantage with the role of innovation and organisational learning in banking. This study broadened the discussion beyond accounting performance and highlighted that innovation and learning mechanisms help convert intellectual capital into competitive outcomes. Its relevance has increased in the context of digital banking transformation in India.

Chahal and Bakshi (2016) developed and validated the measurement of intellectual capital in the Indian banking sector. Their study is important because it supports the multidimensional treatment of intellectual capital in Indian banking and reinforces the argument that accounting-based indicators can be complemented by broader conceptual measures where appropriate.

Singh et al. (2016) compared intellectual-capital performance across public and private sector banks in India. Their study showed that ownership structure can influence intellectual-capital performance, which is important because public and private banks differ in managerial autonomy, technology adoption, customer orientation and operational flexibility. This directly supports ownership-based comparison in the present paper.

Poh et al. (2018) examined intellectual capital and financial performance of Malaysian banks. Their results suggested that intellectual capital influences banking performance, but the contribution of individual components is not always uniform. This is useful for Indian research because it cautions against interpreting VAIC as a uniformly positive aggregate without examining HCE, SCE and CEE separately.

Mohapatra et al. (2019) investigated intellectual capital and firm performance in the Indian banking sector. Their study is directly aligned with the present paper because it connected intellectual-capital efficiency with bank performance in India. It also supports the use of Indian bank-level data to examine the performance relevance of knowledge-based resources.

Oppong and Pattanayak (2019) studied whether investment in intellectual capital improves productivity in Indian commercial banks. Their work showed that intellectual-capital components have implications for productivity, thereby extending the discussion beyond profitability alone. This is important because bank growth must be understood through productivity and efficiency as well as through accounting returns.

Haris et al. (2019) analysed intellectual-capital performance and profitability of banks in Pakistan. Their study added South Asian evidence to the literature and indicated that intellectual-capital performance is relevant to profitability. The study also reinforces the

importance of examining component-level effects instead of relying only on aggregate IC measures.

Bayraktaroglu et al. (2019) employed an extended VAIC model and argued that the traditional VAIC framework may overlook certain dimensions of intellectual capital. The study is valuable because it supports the inclusion of innovation and relational dimensions in settings where such proxies are available. For banks, this is particularly relevant because customer relationships and digital innovation are central to long-run competitiveness.

Buallay et al. (2020) examined the role of intellectual capital in the efficiency of GCC banks. Their study linked IC efficiency with operational, financial and market performance, thereby showing that the performance implications of intellectual capital are multidimensional. This supports the present paper's decision to consider both financial performance and growth-related outcomes.

Le and Nguyen (2020) examined intellectual capital and bank profitability in Vietnam and reported evidence that intellectual capital affects profitability in an emerging-market banking system. Their study helps position Indian banking within a broader Asian context and suggests that proper controls are needed because profitability is also shaped by size, capital strength and asset quality.

Xu and Liu (2020) proposed a modified and extended VAIC model and showed that an expanded framework may explain performance more effectively than the original VAIC model. Their contribution is especially important for the present study because it justifies direct comparison among VAIC, MVAIC and Extended VAIC (EVAIC) rather than assuming that the original framework is always sufficient.

Gupta and Raman (2021) studied the nexus between intellectual capital and operational efficiency in the Indian financial system. Their work broadens the Indian evidence by relating intellectual capital to efficiency rather than only profitability. This is particularly useful for banking studies because efficiency measures often reflect process quality, employee productivity and technology-enabled operations.

Tiwari, Vidyarthi and Kumar (2023) examined the nexus between intellectual capital and bank productivity in India. Their study supports the view that intellectual capital is closely connected with productivity dynamics in banking. It also strengthens the case for incorporating growth and productivity dimensions alongside financial performance in a full empirical model.

Barak and Sharma (2024) provided recent Indian evidence on intellectual capital and financial performance using a dynamic empirical approach. Their study is highly relevant

because it reflects the current movement towards more rigorous panel-data techniques in intellectual-capital research. It supports the recommendation that the final full-sector study should use a panel or dynamic panel framework after ensuring measurement consistency across banks and years.

5. Summary of Selected Studies and Broad Reported Results

To complement the paragraph review, the following portrait-oriented tables summarise the selected studies and their broad reported results relevant to intellectual-capital efficiency.

Table 2. Summary of selected studies and broad reported results.

Study	Context	Focus	Broad reported result
Mondal & Ghosh (2012)	Indian banks	VAIC and financial performance	Found that intellectual capital was associated with financial performance in Indian banks.
Singh et al. (2016)	Indian public and private banks	VAIC and ownership comparison	Reported ownership-based differences in IC performance.
Chahal & Bakshi (2016)	Indian banking sector	IC measurement	Validated a multidimensional IC measurement approach for Indian banking.
Mohapatra et al. (2019)	Indian banking sector	IC and firm performance	Showed that IC has performance relevance, with variation across components.
Oppong & Pattanayak (2019)	Commercial banks in India	VAIC components and productivity	Indicated that selected IC components improve productivity.

Source: Compiled by the author from selected studies.

Table 3. Summary of selected studies and broad reported results.

Study	Context	Focus	Broad reported result
Tiwari et al. (2023)	Indian banks	VAIC and productivity	Linked intellectual-capital components with bank productivity.
Barak & Sharma (2024)	Indian public sector banks	IC and financial performance	Supported the relevance of IC for financial performance.
Maji & Saha (2024)	Indian banks	IC and bank efficiency	Reported that intellectual capital is associated with bank efficiency.
Gupta & Raman (2021)	Indian financial system	IC and operational efficiency	Showed a nexus between IC and operational efficiency.
Weqar et al. (2021)	Indian finance sector	IC and financial performance	Confirmed that IC efficiency explains financial performance variation.

Source: Compiled by the author from selected studies.

Table 4. Summary of selected studies and broad reported results.

Study	Context	Focus	Broad reported result
Al-Musali & Ku Ismail (2014)	Saudi Arabian banks	VAIC and financial performance	Reported that intellectual capital affects bank financial performance.
Alhassan & Asare (2016)	Ghanaian banks	IC and productivity	Found that intellectual capital contributes to bank productivity.
Haris et al. (2019)	Pakistani banks	IC and profitability	Indicated that IC performance is associated with profitability.
Poh et al. (2018)	Malaysian banks	IC and financial performance	Reported that IC influences bank financial performance.
Le & Nguyen (2020)	Vietnamese banks	IC and profitability	Found that IC affects bank profitability.

Source: Compiled by the author from selected studies.

Table 5. Summary of selected studies and broad reported results.

Study	Context	Focus	Broad reported result
Vo & Tran (2021)	Vietnamese banks	IC and bank performance	Confirmed that IC matters for bank performance.
Buallay et al. (2020)	GCC banks	MVAIC and performance	Linked IC efficiency with operational, financial and market performance.
Mention & Bontis (2013)	Luxembourg and Belgium banks	IC and banking performance	Showed that IC resources are relevant to banking performance.
Xu & Liu (2020)	Chinese listed firms	Modified and extended VAIC	Suggested that extended VAIC-type models may explain performance more effectively.
Bayraktaroglu et al. (2019)	Turkish firms	Extended VAIC	Demonstrated the usefulness of adding relational and innovation dimensions.

Source: Compiled by the author from selected studies.

6. Research Gap

The literature clearly shows that intellectual capital matters for bank performance, yet three gaps remain important in the Indian context. First, many Indian studies rely mainly on the original VAIC framework even though modern banking increasingly depends on customer relationships and innovation capability. Second, several studies focus primarily on profitability while giving less attention to broader growth and productivity dimensions. Third, cross-bank comparability remains a challenge when extending VAIC because relational and innovation proxies are not always uniformly disclosed in annual reports.

7. Objectives of the Study

- To compare VAIC, MVAIC and Extended VAIC (EVAIC) as frameworks for measuring intellectual capital efficiency in the Indian banking sector.
- To evaluate the impact of intellectual capital efficiency and its components on financial performance of Indian banks.
- To evaluate the impact of intellectual capital efficiency and its components on growth-related indicators of Indian banks.
- To examine ownership-based differences in intellectual capital efficiency between public and private sector banks.
- To demonstrate a transparent annual-report-based calculation trail for selected Indian banks prior to full panel estimation.

8. RESEARCH METHODOLOGY

The proposed study follows a quantitative, explanatory and longitudinal research design. It is intended to examine whether intellectual capital efficiency explains variation in financial performance and growth across Indian public and private sector banks. The final study may use bank-year panel data compiled from annual reports, audited financial statements, stock-exchange filings, RBI publications and reliable financial databases such as CMIE Prowess where available.

A full empirical model would normally include financial performance indicators such as return on assets, return on equity, return on capital employed and net interest margin, along with growth or efficiency indicators such as asset turnover, business growth or productivity-related measures. Control variables may include bank size, leverage, capital adequacy, asset quality, age and ownership. The final econometric choice should be based on specification tests and diagnostics.

Table 6. Proposed variables and measurement plan.

Category	Variable	Indicator / proxy
Independent	Intellectual capital efficiency	VAIC, MVAIC, Extended VAIC (EVAIC) and their component ratios
Dependent	Financial performance	ROA, ROE, ROCE, NIM or similar profitability indicators
Dependent	Growth / efficiency	Asset turnover, business growth, productivity or efficiency indicators
Control	Bank characteristics	Size, leverage, capital adequacy, asset quality, age and ownership
Data source	Secondary data	Annual reports, RBI publications, stock-exchange filings and CMIE Prowess

Source: Prepared by the author.

8.1 Econometric Model

Because the paper evaluates impact, an econometric model is required in the final empirical stage. However, it should be presented as a proposed model until the full bank-wise panel dataset and regression outputs are available. The baseline component-wise model may be specified as follows:

$FP_{it} = \alpha + \beta 1HCE_{it} + \beta 2SCE_{it} + \beta 3CEE_{it} + \beta 4RCE_{it} + \beta 5InCE_{it} + \gamma Controls_{it} + \mu_i + \lambda_t + \varepsilon_{it}$

$GROWTH_{it} = \alpha + \beta 1HCE_{it} + \beta 2SCE_{it} + \beta 3CEE_{it} + \beta 4RCE_{it} + \beta 5InCE_{it} + \gamma Controls_{it} + \mu_i + \lambda_t + \varepsilon_{it}$

In the baseline VAIC model, only HCE, SCE and CEE are used. In the MVAIC model, RCE is added subject to a consistent relational-capital proxy. In the Extended VAIC (EVAIC) model, InCE is added only when innovation-capital data are consistently available. For an aggregate-index specification, VAIC, MVAIC or EVAIC may replace the component variables one at a time.

Pooled OLS, fixed effects and random effects may be compared using standard panel-data tests. The Hausman test may guide the choice between fixed effects and random effects. Robust standard errors should be considered if heteroskedasticity or autocorrelation is detected. A dynamic panel model such as GMM may be used only if there is persistence in performance variables or a credible endogeneity concern.

8.2 Scope of the Study

The scope of the study is limited to intellectual-capital efficiency in the Indian banking sector, with the principal focus on public and private sector scheduled commercial banks. The illustration provided in this manuscript uses only State Bank of India and HDFC Bank to demonstrate the calculation procedure; it does not represent the final full-sample empirical result.

9. Illustrative VAIC Calculation Using Official Annual Reports

To demonstrate feasibility, this paper extracts relevant line items from the official annual reports of State Bank of India and HDFC Bank for FY2023-24 and FY2024-25. The resulting figures are used to compute value added, HCE, SCE, CEE and VAIC. The two-bank illustration is intended only as a transparent calculation demonstration.

Table 7. Illustrative VAIC calculation in portrait-friendly format.

Bank	Year	Indicator	Value
State Bank of India	FY2023-24	Value Added (INR crore)	165,034.16
State Bank of India	FY2023-24	HCE / SCE / CEE / VAIC	2.107 / 0.525 / 0.438 / 3.069
State Bank of India	FY2024-25	Value Added (INR crore)	174,931.41
State Bank of India	FY2024-25	HCE / SCE / CEE / VAIC	2.718 / 0.632 / 0.397 / 3.747
HDFC Bank	FY2023-24	Value Added (INR crore)	116,627.66
HDFC Bank	FY2023-24	HCE / SCE / CEE / VAIC	5.244 / 0.809 / 0.267 / 6.320
HDFC Bank	FY2024-25	Value Added (INR crore)	124,028.02
HDFC Bank	FY2024-25	HCE / SCE / CEE / VAIC	5.189 / 0.807 / 0.249 / 6.246

Source: Compiled from State Bank of India Annual Report 2024-25 and HDFC Bank Integrated Annual Report 2024-25.

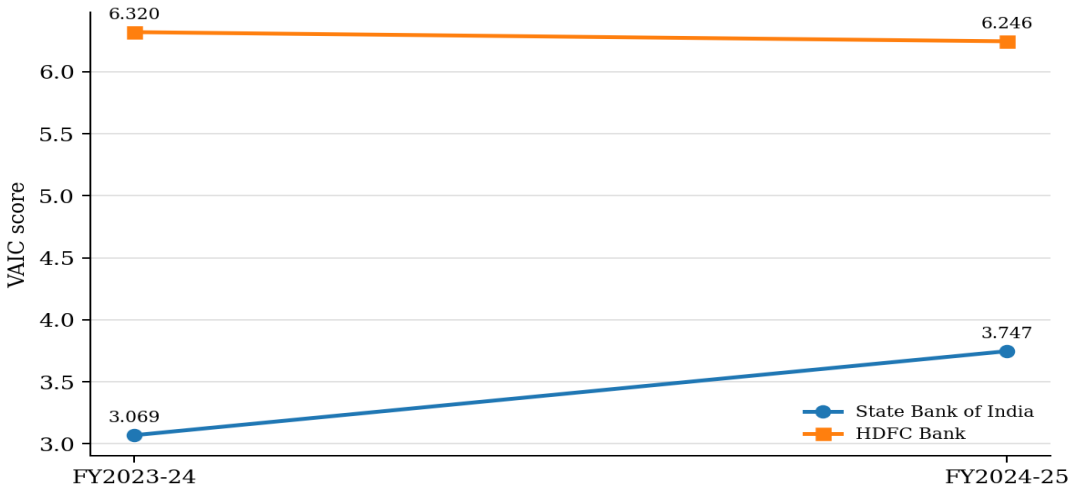

Figure 4. Illustrative VAIC trend for State Bank of India and HDFC Bank.

Source: Author's calculations from official annual reports.

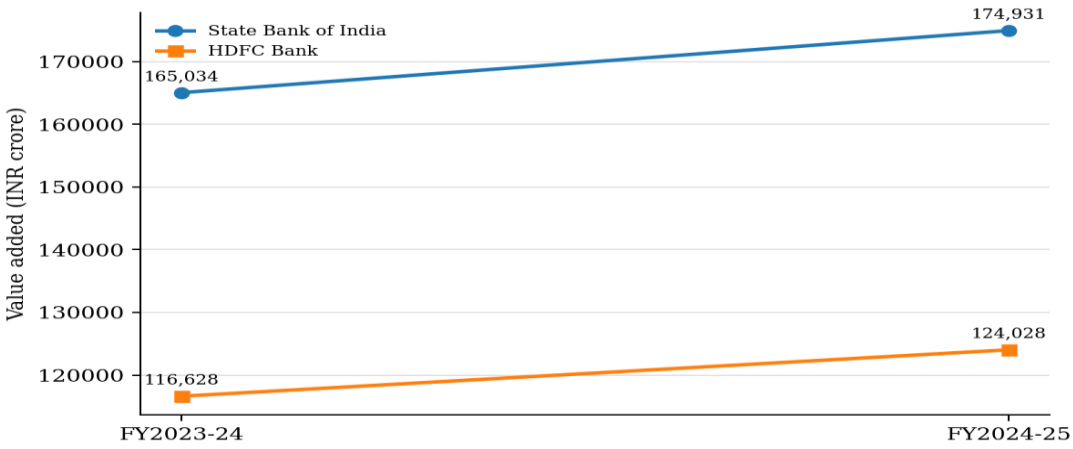

Figure 5. Illustrative value-added trend for State Bank of India and HDFC Bank.

Source: Author's calculations from official annual reports.

10. Analysis and Interpretation

The illustrative calculation indicates that both SBI and HDFC Bank generated positive value added in FY2023-24 and FY2024-25. SBI's value added increased from INR 165,034.16 crore to INR 174,931.41 crore, while HDFC Bank's value added increased from INR 116,627.66 crore to INR 124,028.02 crore.

SBI's VAIC increased from 3.069 to 3.747 over the same period. This suggests improvement in value-creation efficiency, driven mainly by higher human capital efficiency and structural capital efficiency. HDFC Bank's VAIC remained broadly stable, moving from 6.320 to 6.246. Its value added increased, but capital employed also expanded, which reduced CEE and kept overall VAIC almost unchanged.

The illustration also shows why MVAIC and Extended VAIC should not be imposed mechanically. VAIC can usually be computed directly from published financial statements. However, relational and innovation capital components require clear proxies. Where annual reports do not provide sufficiently comparable disclosures, extended frameworks may reduce comparability instead of improving it.

11. Findings

- VAIC is the most practical baseline framework for Indian banking studies because its required inputs are generally available from annual reports.
- MVAIC and Extended VAIC offer stronger conceptual coverage for modern banking, but their application depends on reliable relational and innovation-capital proxies.
- The reviewed literature broadly supports a positive link between intellectual capital efficiency and profitability, productivity or efficiency, although component-wise effects are not always uniform.
- The two-bank illustration confirms that annual-report-based VAIC calculation is feasible for Indian banks.
- Final causal claims for the Indian banking sector should be made only after full panel estimation using the selected bank sample and study period.

12. DISCUSSION

The findings support a balanced interpretation of intellectual-capital efficiency in banking. Intellectual capital should not be viewed as a soft or purely qualitative concept; rather, it can be operationalised through structured efficiency measures. At the same time, the paper also shows that a purely mechanical use of extended frameworks may be problematic if the

underlying relational or innovation proxies are weak or inconsistent. For the Indian banking sector, this means that methodological rigor is as important as conceptual breadth.

The comparative framework approach is therefore especially useful. If the objective is broad inter-bank comparability over a long period, VAIC remains the most defensible baseline. If the objective is to capture a wider knowledge architecture associated with customer orientation and digital innovation, MVAIC or Extended VAIC may be preferred, but only after checking the reliability of the additional variables.

13. CONCLUSION

This paper establishes that intellectual capital efficiency is a meaningful framework for analysing financial performance and growth in the Indian banking sector. The comparison of VAIC, MVAIC and Extended VAIC (EVAIC) shows that the choice of model should be guided by the nature of the research question and the quality of available data. The literature review supports the broad importance of intellectual capital in banking, while the illustrative calculations confirm that annual-report-based VAIC estimation is feasible in India. A fuller sector-wide study can now be undertaken by compiling panel data for the selected public and private sector banks and estimating the appropriate econometric model.

14. Implications and Recommendations

The study has implications for researchers, bank management and policymakers. Researchers should compare frameworks rather than assuming that one model is automatically superior in every context. Bank managers may use intellectual-capital indicators as supplementary signals of internal capability, especially in relation to human-resource quality, process maturity and value creation. Policymakers and regulators may encourage richer voluntary disclosure on employee capability, customer strategy, digital capability and innovation spending, which would improve future MVAIC or Extended VAIC research.

For future work, the recommended path is to compile a balanced panel of Indian public and private sector banks, test the baseline VAIC model first, and then introduce MVAIC or Extended VAIC specifications only where additional proxies are consistently measurable. Robustness checks should be used before drawing final causal conclusions.

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