Fintech Adoption, Financial Inclusion and Technological Infrastructure as Drivers of Sustainable Performance: An Integrated Perspective from Ecological Modernization and Resource-Based Theories

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Abstract

Purpose – The study examines the role of fintech adoption, financial inclusion, and technological infrastructure in sustainable performance within the SMEs. Based on the Ecological Modernization Theory (EMT), the Resource-Based View (RBV), and the Triple Bottom Line (TBL), the paper investigates the hypothesis of the interdependence between modernization mechanisms and internal technological capabilities to contribute to better economic, environmental and social sustainability achievements. **Study Design/methodology/approach** – Quantitative research design was employed and the data which was gathered through the structured survey among SMEs was used. Partial Least Squares Structural Equation Modelling (PLS-SEM) was used to analyze the data to determine both measurement and structural models. The reliability, convergent and discriminant validities as well as multicollinearity analysis were performed before hypothesis testing was conducted. **Findings** – The findings reveal that the fintech adoption, financial inclusion, and technological infrastructure have a meaningful and positive impact on sustainable performance on its three dimensions. The effect of financial inclusion on social sustainability is relatively high, although technological infrastructure has a significant impact on environmental performance. The use of fintech yields positive results of uniform economic, environmental, and social impact. The results highlight the significance of digitalizing the preparation of infrastructures in line with digital finance projects to attain multidimensional sustainability. **Research limitations/implications** – The cross-sectional design suffers from a lack of causal inference and the perceptual measures can create bias in response. However, it goes a step further to integrate theory by placing technological

infrastructure as one of strategic performances that play an important role in digital finance and sustainable performance. **Practical implications** – The policy makers and the SME managers are advised to enhance digital infrastructure and inclusive finance programs to achieve optimum sustainable development. **Originality/value** –The study also adds value to the literature by combining the perspectives of EMT, RBV, and TBL and provides a broad perspective on the manner in which the digital finance and infrastructural capabilities co-lead to sustainable performance in SMEs.

Keywords: Fintech Adoption; Financial Inclusion; Technological Infrastructure; Sustainable Performance; Triple Bottom Line; Ecological Modernization Theory; Resource-Based View; SMEs.

Introduction

Small and medium-sized enterprises (SMEs) face a dual pressure: to be competitive in the digital mediated markets, and to react to the increased environmental and social demands. The adoption of fintech (e-payments, digital lending, platform-based finance) and broader financial inclusion can reduce the costs of transaction, expansion of market access, and information asymmetries but they are unequally paid off in a sustainability manner and depend on context (Una et al., 2023). Simultaneously, technological infrastructure of hardware, software, databases, human resources, communication networks conditions digital finance as an improvement of the triple bottom line (TBL) of the economic, environmental, and social performances (Alzghoul & Al-kasasbeh, 2024). Based on the Ecological Modernization Theory (EMT) and the Resource-Based View (RBV), the proposed research creates a hybrid argument on the role that fintech adoption, financial inclusion and technological infrastructure play in leading to sustainable performance and why the impact of these elements may vary across TBL dimensions.

Problem Statement

Although it has been swiftly diffusing fintech services and policy pledges to become financially inclusive, most companies continue to fail in turning digital finance into a quantifiable sustainable result (Arner et al., 2018). The current practice tends to believe that the availability of finance, in turn, would lead to the availability of greener technology, safer work environment and stable profitability. Yet, unless there is a strong technological infrastructure base, digital add-ons may not become strategic resources, but simple transactional ones, and operational change may not be realized. Additionally, sustainability is often evaluated in a very limited (often economic) way and environmental and social aspects are viewed as secondary or symbolic

undermining managerial making of decisions and policy development (Strezov et al., 2017).

Research Gap

Previous research tends to look at the adoption of fintech or financial inclusion or think about infrastructure as a condition of existence and not an organizational resource to be measured. This leaves three gaps. First, the processes connecting digital finance with sustainability are not specified to a sufficient degree in the three TBL domains, and they do not provide the theoretical accuracy. Second, technological infrastructure is hardly represented as a multi-dimensional variable that determines the capacity of firms to internalize, assimilate, and capitalize on the information facilitated by fintech (Ganegodage et al., 2017). Third, institutional modernization and firm-level capabilities are not often combined because of the EMT and RBV focus respectively, yet their convergence can be regarded as the explanation of why similar access to fintech can lead to different sustainability patterns (Teng et al., 2025). Besides this, measurement work does not always pay attention to discriminatory validity between sustainability dimensions, and it is unclear whether companies develop one dimension or all three. This work minimizes conflation of constructs in the evaluation of sustainability of the SMEs by explicitly modelling them as environmental, economic and social performance, thus being a variation of outcomes rather than modelling interchangeably.

Research Questions

- To what extent does fintech adoption influence SMEs' sustainable performance across economic, environmental, and social dimensions?
- How does financial inclusion affect sustainable performance across the three TBL dimensions?
- How does technological infrastructure contribute to sustainable performance, and how does it condition the effectiveness of fintech-enabled and inclusive finance?

Research Objectives

- To empirically estimate the direct effects of fintech adoption on economic, environmental, and social sustainable performance.
- To assess the direct effects of financial inclusion on each sustainable performance dimension.
- To evaluate the effect of technological infrastructure on sustainable performance and clarify its role as an enabling resource that supports digital-finance-driven sustainability.

Significance of the Study

The research contributes to theory by integrating EMT and RBV in a framework of TBL outcomes, demonstrating the effect of modernization

pressures on internal resources to generate sustainability benefits. Supporting more specific managerial investment and policy prioritization, empirically it explains which of the three levers they are most predictive of: fintech adoption, inclusion or infrastructure. To managers, the results would be used to build capabilities: improving data systems, networks, digital capabilities to transform access to fintech into resource efficiencies, compliance gains, and the creation of social values (Srivastava, 2025). To policy-makers and development stakeholders, the findings indicate that unless coupled with infrastructural preparedness, inclusion efforts should proceed since otherwise, digital finance may enhance lopsided performance instead of common sustainability. Lastly, as a three-dimensional concept, the sustainability performance offers the study a better-founded evidence base to assess the aspect of green and inclusive digital finance not only in terms of profitability.

Literature review

Theoretical Framework

Sustainable Performance and the Triple Bottom Line

Sustainable performance has ceased to be based on environmental compliance or philanthropic intervention, but it is one form of strategic orientation that combines profitability, environmental responsibility, and social equity. TBL is a framework conceptualizing sustainability in three different but connected aspects, including social performance, environmental performance, and the economic performance (Nogueira et al., 2023). In the case of SMEs, which are involved in the digitally transforming markets, it is of critical importance to consider sustainability in these three aspects. Economic sustainability indicates the long term profitability, efficiency and resilience. Environmental sustainability relates to resource use, loss of pollution as well as ecological demands. The social sustainability includes the well-being of the stakeholders, fair practice, and community participation (Govindan et al., 2025).

Taking sustainable performance as a multidimensional concept enhances higher levels of analytical rigor. Better financial performance does not always mean environmental and social improvement (Epstein et al., 2015). Having the TBL dimensions explicitly differentiated, this study will not be conceptually conflated and allow evaluating the impact of the fintech adoption, financial inclusion, and technological infrastructure on each of the sustainability outcomes differently.

Ecological Modernization Theory (EMT)

According to the Ecological Modernization Theory (EMT), the enhancement of the environment can be realized by technological progress, institutional change, and market-governed mechanisms as opposed to deindustrialization or economic downturn (Janicke & Jorgens, 2023). EMT is focused on

modernization as a process, including; innovation, efficiency, and formalization, as a way of remaining sustainable. In this context, the use of fintech and financial inclusion may be regarded as forms of modernization that make transactions formal, make them more transparent, and optimize resources.

Fintech help decrease informational asymmetry, allow working with digital documents, and increase traceability (Song et al., 2023). These mechanisms correspond to the argument offered by EMT that the advancing technology can achieve growth without the deterioration of the environment. Equally, financial inclusion involves assimilation of marginalized firms into formal financial systems and this may enhance compliance with possible investment in cleaner technologies.

Nonetheless, the use of EMT should be done critically. Automated tools of modernization do not necessarily record sustainable results. Unless such institutional incentives and organizational capacity direct digital finance, it can speed up consumption or production (Feng & Zhang, 2021). Hence, even though EMT is a valid reason to anticipate sustainability benefits of fintech and inclusion, the theory suggests that the results will be affected by enabling infrastructure and governance systems.

Resource-Based View (RBV)

Resource-Based View (RBV) interprets the variations in performance by internal resources and capabilities that are valuable, rare, inimitable, and nonexchangeable (Napitupulu et al., 2021). Within the framework of this research, fintech adoption and financial inclusion are both opportunities outside the firm that lead to a possible performance improvement, but this is conditional upon internal ability to take advantage of them. Such a capability base includes technological infrastructure, i.e. hardware, software, databases, communication networks, and competent human resource.

Regarding the RBV view, the technological infrastructure plays not only a supporting role of the technical need but a strategic asset package that provides the opportunity to make data-driven decisions, integrate operations, and monitor performance. Absent proper infrastructure, fintech adoption can be transactional resulting in convenience and no transformation (Gomber et al., 2018). In the same manner, financial inclusion might lead to provision of liquidity without creation of a long-term strategic progress.

RBV is then used to supplement EMT in the application of contemporary-day modernization tools, which are translated into the measurable outcome. EMT helps better understand why digitalization and inclusion are important, whereas RBV helps understand how firms turn them into performance sustainability benefits.

Integrating EMT, RBV, and TBL

In this work, EMT, RBV and TBL are converged to form one theoretical background. EMT provides the roadmap of modernization of the pathway between digital finance and sustainability. RBV offers individual-level explanation on the heterogeneity of performance in a firm. TBL identifies sustainability as a multidimensional, and organized result. Collectively, they argue in favor of the point that fintech use and financial inclusion can lead to sustainable performance, yet they impact it through the organizational strength and can be different across economic, environmental, and social levels (Raza et al., 2024).

Conceptual Model Development

Three independent variables, i.e., Fintech Adoption, Financial Inclusion, and Technological Infrastructure, are viewed as direct determinants of Sustainable Performance (economic, environmental, and social) by the conceptual model.

The adoption of fintech means that SMEs used online financial services like electronic payment, fintech-based lending, and online platforms of transactions (Rehman et al., 2023). Fintech lowers transaction costs, shortens cash flow cycles and access to credit, which improves financial resiliency, economic wise. Digital transactions have a beneficial effect on the environment, including the utilization of less paper and traceability of supply chains, which is environmentally responsible. Fintech makes payments more transparent, faster, and fuller, socially better company, making wage payment or supplier payment delays also a thing of the past and improving inclusivity (Benedetti and Calderon, 2025). However, the sustainability effect of fintech will be affected by the degree of integration. Cosmetic adoption can benefit the ease of things without modifying the production processes or the systems of governance. Fintech is hence conceived as a variable but will have potentially extensive sustainability impacts.

The financial inclusion indicates the availability of suitable and affordable financial services (Polishchuk & Ishchuk, 2022). In the case of SMEs, the inclusion improves the investment capacity, decreases over-dependence on informal credit, and financial stability- translating to economic sustainability directly. Environmental investment, including the use of cleaner technologies, can also be facilitated by inclusion in the event financing structures favor long term capital investments. Financially, the inclusion of stakeholders enhances the equity of stakeholders, both in access to formal financial systems and asset stability of earnings (Khan et al., 2022). Nonetheless, inclusion does not necessarily lead to environmental development. Finance facilities can also be used to finance growth and not

sustainability when the governance structures are poor. The model thus presupposes positive and context-dependent sustainability effects.

Technological infrastructure is the organizational strength that has facilitated the digital transformation (Andrade & Goncalo, 2021). It comprises communication network, databases of information, hardware, software and human resource knowledge. Infrastructure is also beneficial on the economic front because it can streamline operations and make strategic decisions due to automation and analytics (Kuzior & Sira, 2025). On the environmental front, it allows monitoring and reporting of resources as well as optimization. It promotes the development of workforce and communication with stakeholders socially. Infrastructure, in contrast to the adoption fintech which is an indication of using digital financial tools, is an indication of some capability. It is a strategic resources bundle corresponding to RBV and a modernization platform corresponding to EMT. Therefore, it is supposed to have a direct and a significant impact on the sustainable performance.

The model denotes direct relationships between fintech adoption, financial inclusion, and technological infrastructure and each dimension of the TBL. Technological infrastructure can also be perceived as an advanced level of construct made of sub dimensions which interact with one another. To make it analytically clear, sustainable performance is explicitly addressed as three individual dependent variables.

Hypotheses Development

Fintech Adoption and Sustainable Performance

The use of fintech can improve the sustainability of the economy by minimizing operational frictions, managing liquidity, and accessing the market (Buckley et al., 2019). It has the potential through environmental monitoring and compliance by implementing digital records and transparency. It also promotes the sustainability of the society because it provides effective and clear financial dealings between the employees and the suppliers.

- **H1a:** The adoption of Fintech positively influences sustainable performance of the economy.
- **H1b:** There is a positive impact of the use of Fintech on environmental sustainable performance.
- **H1c:** Fintech usage positively influences social sustainable performance.

Financial Inclusion and Sustainable Performance

Financial inclusion would enhance access to capital by SMEs, resilience, and economic viability in the long term (Aninwagu & Onyema, 2025). It allows investment in clean technologies and helps to improve compliance, which leads to the sustainability of the environment. Social equity is also encouraged

through inclusion, which decreases financial exclusion and maintains a stable relationship between the stakeholders.

- **H2a:** Financial inclusion has a positive influence on the economic sustainable performance.
- **H2b:** Financial inclusion has a positive influence on the environmental sustainable performance.
- **H2c:** Financial inclusion has a positive than influence in social sustainable performance.

Technological Infrastructure and Sustainable Performance

The technological infrastructure enhances the economic sustainability because it allows its automation and optimization based on data. It assists in the environmental sustainability by using monitoring and traceability systems (Garcia-Torres et al., 2019). It improves the social sustainability through the promotion of communication, transparency, and capability development of the work force.

- **H3a:** There is a positive impact of technological infrastructure on economic sustainable performance.
- **H3b:** There is a positive impact of technological infrastructure on environmental sustainable performance.
- **H3c**: There is a positive impact of technological infrastructure on social sustainable performance.
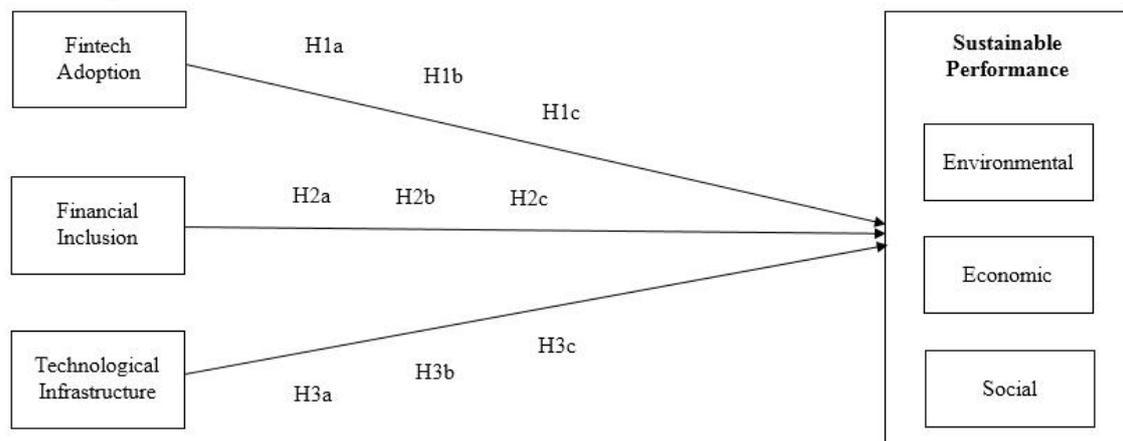
Conceptual Framework

Figure 1: Conceptual Framework Illustrating the Hypothesized Relationships between Fintech Adoption, Financial Inclusion, Technological Infrastructure, and the Three Dimensions of Sustainable Performance.

Figure 1 reflects the conceptual framework because adoption of fintech, financial inclusion and technological infrastructure has direct impact on economic, environmental, and social sustainable performance. The arrows

(H1a- H3c) depict proposed relations where that there is a mutual influence between modernization mechanisms and internal technological capabilities on the multidimensional sustainability results within SMEs.

Research Gap

The literature shows that the fintech adoption and green finance is accepted as a crucial measure of sustainable performance in the SMEs, but with technological infrastructure, it is under-theorized as a direct strategic driver of sustainability. As an example, the main emphasis in the previous literature is on fintech, competitiveness, leadership, or green-finance dynamic (Hidayat-ur-Rehman & Alsolamy, 2023), whereas online awareness and change are explored in a wide range of banking sustainability contexts. Though their works recognize the role of digital systems, they fail to conceptualize technological infrastructure as multidimensional organization capabilities that allow fintech and inclusion to be connected to environmental, economic, and social performance. Such an omission leaves a theoretical divide between the adoption of digital finance and its practical implementation to bring about sustainable results. Thus, the study fills this gap by putting technological infrastructure in the context as one of the core resource-based capabilities that have a direct positive impact on sustainable performance within the integrated EMT-RBV-TBL framework.

Methodology

Research Philosophy and Approach

The proposed research takes a post-positivist stance suitable to test the theory in the circumstances of the complexity of the real world (Malkani, 2019). It is not aimed at making the actual claim of truth but at estimating possible relationships between fintech adoption and financial inclusion and technological infrastructure and sustainable performance based on the observable indicators. The post-positivist position is explained by the fact that the constructs are operationalized using existing measurement scales, the hypotheses are directional and based on EMT, RBV and TBL, and the analysis focuses on the effect sizes and statistical significance. Simultaneously, the design takes limits into consideration: self-reported survey data is likely to be subject to the effects of perceptual bias, and a cross-sectional snapshot does not allow us to make any causal inferences. In order to address these issues, the research implements procedural and statistical solutions to common method bias, conducts stringent model diagnostics and presents such results in an associative as opposed to a strictly causal manner (Podsakoff et al., 2024).

The study adheres to a deductive and explanatory study. The hypotheses are based on the Ecological Modernization Theory (modernization and

institutional drivers of sustainability), the Resource-Based View (capability conversion through internal resources) and the Triple Bottom Line (three-dimensional sustainability outcomes). The respondent is the SME as a unit of analysis and owner-managers or high-level finance/operations staff with an authorization to make decisions and sufficient tenure necessary to respond on the usage of fintech, including experiences of inclusion and sufficient infrastructural capability.

Research Design

A quantitative survey design is adopted to be cross-sectional in order to facilitate a wide coverage of the SMEs and provide a multi-path model to be tested systematically (Watson, 2015). It is an appropriate design when the objective is explanatory estimation on a heterogeneous population and when longitudinal data collection can be impossible. It is set in the context of SMEs in the environment of an emerging economy, where diffusions and access to fintech are growing, but infrastructural constraints are still relevant - creating a context that is theoretically relevant to test the EMT-RBV complementarities (Kanga et al., 2022). The sample (where possible) cuts across sectors (e.g., manufacturing, services, retail) to eliminate sector-specific inference, as well as to enhance the external validity.

The conceptual framework is operationalized into three independent constructs directing to three dependent dimensions, Fintech Adoption - Sustainable Performance (economic, environmental, social); Financial Inclusion - Sustainable Performance (economic, environmental, social); Technological Infrastructure - Sustainable Performance (economic, environmental, social). Technology infrastructure is addressed as a multidimensional resource set that is pegged on its sub-units (hardware, software, database, communication/network, human resources) in line with the complementary nature of assets (RBV).

Population, Sampling and Sample Size

The target population is SMEs that have a criterion that is national or study-consistent (employee size and or turnover threshold). The respondents should show (i) a managerial position and require the financial or operation decisions, and (ii) a length of tenure to give accurate answers. The assessment relies on access realities, where purposive sampling (to include SMEs currently involved in fintech and formal finance) is used to reach the target population with snowballing to widen its scope (Tajik et al., 2025). In a bid to resolve the issue of representativeness, respondent distributions of sectors and sizes and non-response bias assessed through early-late respondent matches are reported in the study.

Justification of sample size is with the use of PLS-SEM. The 10-times rule is just a minimum rule but the ideal is power analysis, which guarantees sufficient power to identify weak-to-moderate effects at standard levels of significance. Exclusions of data are based on clearly defined criteria (too high levels of missingness, were not paying attention, response patterns are implausible, and so on). Handling of missing data is pre-specified (e.g. expectation-maximization in cases of minimal missingness or list wise deletion on cases of substantial and non-ignorable missingness).

Instrument Development and Measurement

They are structured as a questionnaire where there are sections that will deal with demographics/control variables, independent constructs and sustainable performance outcomes. Reaction is measured using Likert scale (5-, or 7-, point scale anchored on strongly disagree to strongly agree). A back-translation process is relied on when the conceptual equivalence of the language needs to be maintained and then the clarity is pre-tested in the event of bilingual administration.

It is measured according to the scales of validations: Fintech Adoption (7 items); Financial Inclusion (14 items, including access/usage/barriers as appropriate); Technological Infrastructure (15 items in its sub dimensions); Sustainable Performance Financial (4), social (5) on environmental. Expert review (academics and practitioners) is important to enhance content validity by determining the relevance, redundancy and wording. Pilot test (about 20-30 SMEs) is also conducted to test the understanding, time to complete and initial reliability to make adjustments to full deployment.

Data Collection and Ethics

Data utilized through the application of online and/or field distribution, where it is backed by follow-ups to enhance response rates and eliminate systematic non-response. The informed consent is presented right out, at the start of the survey, making it clear that the survey is voluntary and anonymous. Ethical protection is ensured by their confidentiality, right to withdraw and protection of data in an encrypted form with limited access.

Data Screening and Preparation

Values of the data are filtered against missing, outliers and response quality. Leverage and distance are used to measure the presence of the outliers (Mahalanobis distance where necessary). Although the normality is tested (skewness/kurtosis), the use of PLS-SEM is selected partially due to its robustness against non-no normative data. Procedural (anonymity, randomization of items, psychological separation of constructs) and statistical (Harman single-factor test, full collinearity VIF) forms of common method bias are dealt with (Aguirre-Urreta & Hu, 2019).

Data Analysis Strategy (PLS-SEM)

The use of PLS-SEM is occasioned by the fact that it is used when prediction-based complex models are used, in which a large number of dependent variables, and possible higher-order constructs are accepted. The analysis (in SmartPLS) is carried out in two phases. To measure the internal consistency (Cronbachs alpha, rhoA, composite reliability), convergent validity (AVE), and discriminant validity, measurement model, HTMT is applied with thresholds and confidence intervals (Yusoff et al., 2020). Where HTMT is beyond recommended cut-offs, remedies (item refinement, or higher order specification) which are theoretically justified are considered.

Second, structural model is tested: inner VIF is collinearity, bootstrapped path coefficients (b, t, p), explanatory power (R2), effect sizes (f2) and predictive relevance (Q2 and /or PLSpredict). Additional robustness test options can be multi-group test based on sector/size, non-response bias early-late response tests, and feasible endogeneity test.

Control Variables and Reporting Standards

Other controls that are justified like firm size, age, and industry and owner digital capability are justified at the point of inclusion as plausible determinants of sustainability performance. Reporting is done in best practices of SEM, and it shows descriptive statistics, results of reliability/validity, HTMT, VIF, path coefficients, and R2/Q2/f2, which is in a clear tabular order.
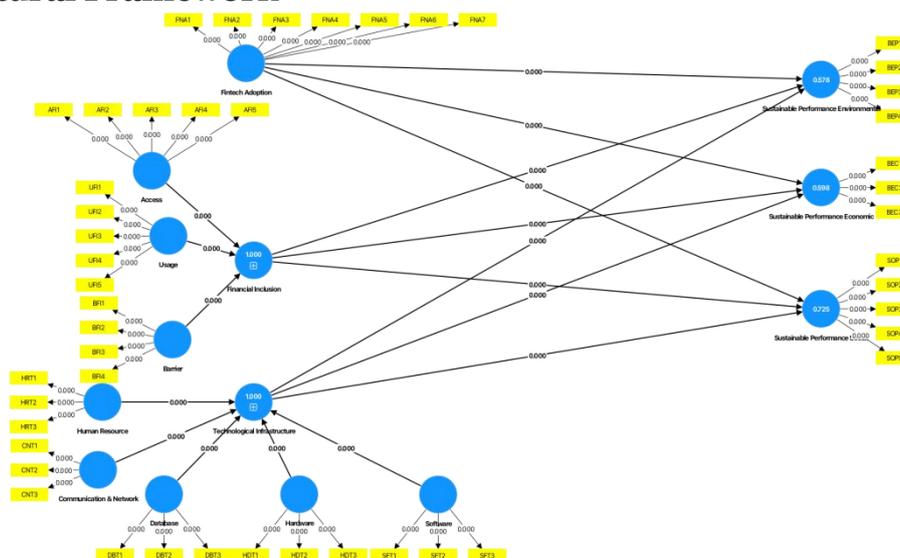
Structural Framework

Figure 2: Structural Model Illustrating the Effects of Fintech Adoption, Financial Inclusion, and Technological Infrastructure on Economic, Environmental, and Social Sustainable Performance

The figure 2 presents Structural Model, depicts the proposed links between fintech adoption, and financial inclusion, technological infrastructure, and the three elements of sustainable performance.

Results

This section shows the results of the empirical research in a structured order according to the measurement measures and structural assessment procedures. The transparency and analytical rigor of the study are claimed to be provided in five tables.

Table 1: *Measurement Scales*

All the constructs are operationalized in Table 1 with the number of items and literature sources. The measurement was done using Fintech Adoption (7 items), Financial Inclusion (14 items) and Technological Infrastructure (15 items) with Sustainable Performance being broken down into Environmental (4 items), Economic (3 items) and Social (5 items) items. The validity and reliability of multi-item scales used enhance the construct validity and further the theoretical integration of the EMT, RBV and TBL.

	Variables	No. of Items	Source
Independent	Fintech Adoption		Dwivedi et al. (2021); Siddik, Rahman, et al. (2023)
		7	
	Financial Inclusion		Cámara and Tuesta (2014); Lontchi et al. (2022)
		14	
	Technological Infrastructure	15	Turban et al. (2008); Jabbouri et al. (2016)
Dependent	Environmental Sustainable Performance	4	Sajan et al. (2017); (Siddik, Rahman, et al., 2023)
	Economic Sustainable Performance	3	Zhu et al. (2008); Siddik, Rahman, et al. (2023)
	Social Sustainable Performance	5	Paulraj, (2011); Siddik, Rahman, et al. (2023)

Table 2: *Composite Reliability*
Mean, STDEV, T values, p values

Table 2 provides a report on Cronbachs alpha, rho A, composite reliability (CR) and average variance extracted (AV) The internal consistency of all constructs was high since all of them surpassed the suggested reliability levels (a and CR > 0.70). There has been convergent validity in AVE values, which exceeded the 0.50 mark. Such results demonstrate that the indicators are suitable

reflecting the underlying latent constructs and can be passed on to discriminant validity testing.

	rho_c	rho_a	Cronbach's alpha	AVE
Access	0.908	0.874	0.874	0.664
Barrier	0.918	0.882	0.881	0.738
Communication & Network	0.918	0.867	0.866	0.789
Database	0.866	0.784	0.766	0.685
Financial Inclusion	0.955	0.951	0.949	0.605
Fintech Adoption	0.919	0.896	0.896	0.618
Hardware	0.929	0.885	0.885	0.813
Human Resource	0.921	0.873	0.872	0.796
Software	0.914	0.861	0.860	0.781
Sustainable Performance Economic	0.815	0.664	0.658	0.595
Sustainable Performance Environmental	0.868	0.809	0.798	0.623
Sustainable Performance Social	0.879	0.829	0.827	0.594
Technological Infrastructure	0.958	0.955	0.953	0.607
Usage	0.908	0.878	0.872	0.666

Table 3: *Discriminant Validity (HTMT)*

Heterotrait-Monotrait Ratio (HTMT) - Matrix

Table 3 shows the Heterotrait-Monotrait (HTMT) matrix. The majority of the HTMT values were less than the conservative value of 0.90, which supported the discriminant validity. Nevertheless, some of the higher figures such as those of the sustainability sub-dimensions portray conceptual close relationship between the economic and environmental outcomes and social outcomes. Though this is evidence of theoretical interrelatedness on the TBL construct, most of the values did not go beyond reasonable limits, by which they show that constructs are empirically differentiable.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Access														
Barrier	0.9													
Communication & Network		0.71												
Database			0.78											
Financial Inclusion				0.73										
Fintech Adoption					0.84									

Hardware	0.75
Human Resource	0.82
Software	0.90
Sustainable Performance Economic	0.82
Sustainable Performance Environmental	1.04
Sustainable Performance Social	0.94
Technological Infrastructure	0.86
Usage	0.79

Table 4: *Path Coefficients*
Mean, STDEV, t values, p values

According to Table 4, the results of bootstrapped structural model have been reported. All of the hypothesized paths were statistically significant (p < 0.001) and meaningful t-values. Financial Inclusion had the highest positive impacts on Social Sustainable Performance whereas Technological Infrastructure had a relatively strong impact on Environmental Performance. The adoption of Fintech revealed moderate effects in all the three dimensions of TBL. The results of these studies are empirical evidence of integrated EMT-RBV framework, which indicates that a combination of modernization processes and infrastructural capabilities can increase sustainability results.

	Original sample (O)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
Access -> Financial Inclusion	0.356	0.006	55.978	0.000
Barrier -> Financial Inclusion	0.334	0.007	51.147	0.000
Communication & Network -> Technological Infrastructure	0.229	0.005	49.871	0.000
Database -> Technological Infrastructure	0.194	0.005	36.594	0.000
Financial Inclusion -> Sustainable Performance Economic	0.356	0.057	6.280	0.000
Financial Inclusion -> Sustainable	0.294	0.058	5.106	0.000

Performance Environmental Financial Inclusion -> Sustainable Performance Social	0.444	0.046	9.695	0.000
Fintech Adoption -> Sustainable Performance Economic	0.183	0.048	3.847	0.000
Fintech Adoption -> Sustainable Performance Environmental	0.217	0.048	4.540	0.000
Fintech Adoption -> Sustainable Performance Social	0.206	0.041	4.977	0.000
Hardware -> Technological Infrastructure	0.241	0.005	52.810	0.000
Human Resource -> Technological Infrastructure	0.234	0.005	46.298	0.000
Software -> Technological Infrastructure	0.231	0.004	54.446	0.000
Technological Infrastructure -> Sustainable Performance Economic	0.303	0.050	6.036	0.000
Technological Infrastructure -> Sustainable Performance Environmental	0.319	0.047	6.747	0.000
Technological Infrastructure -> Sustainable Performance Social	0.274	0.042	6.544	0.000
Usage -> Financial Inclusion	0.375	0.006	61.522	0.000

Table 5: *Multi Collinearity*

Inner Model - List

Both Table 5 reports variance inflation factors (VIF) at all of the structural paths. All VIF were less than the conservative threshold of 5 (and mostly less than 3.5), which presupposes the non-existence of the multicollinearity issues. This guarantees the stability and dependability of the model under estimation.

	VIF
Access -> Financial Inclusion	3.884
Barrier -> Financial Inclusion	3.708
Communication & Network -> Technological Infrastructure	3.675
Database -> Technological Infrastructure	2.213
Financial Inclusion -> Sustainable Performance Economic	2.986
Financial Inclusion -> Sustainable Performance Environmental	2.986
Financial Inclusion -> Sustainable Performance Social	2.986
Fintech Adoption -> Sustainable Performance Economic	2.987
Fintech Adoption -> Sustainable Performance Environmental	2.987

Fintech Adoption -> Sustainable Performance Social	2.987
Hardware -> Technological Infrastructure	3.473
Human Resource -> Technological Infrastructure	3.537
Software -> Technological Infrastructure	3.750
Technological Infrastructure -> Sustainable Performance Economic	2.734
Technological Infrastructure -> Sustainable Performance Environmental	2.734
Technological Infrastructure -> Sustainable Performance Social	2.734
Usage -> Financial Inclusion	4.292

In general, results show positive measurement features and strong structural relationships, which confirm the test model and confirm the fact that the adoption of fintech, financial inclusion, and technological infrastructure are one of the strongest contributors to economic, environmental, and social sustainable performance.

Discussion

Interpreting the Findings through EMT, RBV and TBL

This study aimed to describe the influence of fintech adoption, financial inclusion and technological infrastructure to determine the sustainable performance of SMEs in the economic, environmental and social aspects. The findings include regular enlightenment of the combined theoretical framing. According to the Ecological Modernization Theory (EMT), the existence of positive associations suggests that modernization processes through digitized transactions, formal financial accessibility and infrastructural upgrading can balance competitiveness and sustainability instead of using a trade-off approach (Julkovski et al., 2021). What is more, there is also the trend of both coefficients that perhaps indicate that modernization is not even, against the suggestion that some levers seem more significant to various TBL dimensions. This reaffirms one of the major EMT messages: sustainability gains become possible once modernization in the operational systems is not adopted symbolically as a strategy itself.

Using the Resource-Based View (RBV) perspective, the results suggest that fintech and inclusion are resources the value of which is achieved through complementary capabilities (Oshodin, 2024). Technological infrastructure, which can be viewed as a multi-dimensional bundle of resources, displays a high predictive effectiveness in terms of sustainability outcomes, which contributes to the fact that SMEs transform digital finance into performance only in those situations when they have the systems and capabilities that allow them to incorporate it into decision-making, monitoring operations, and

execution. Practically, the use of fintech without databases, networks, software integration and digitally able personnel can enhance the convenience of transactions but is not always able to produce environmental tracking, process redesign or social accountability.

Differential Effects Across TBL Dimensions

One of the main contributions that this research makes is showing that sustainability is not a one-dimensional result. The relationships involving financial inclusion indicate that the strongest linkage is social performance, which implies that the inclusion programs can initially be reflected in the stakeholder-related results, including greater fairness in transactions, higher payment stability, and more involvement of smaller suppliers or marginalized stakeholders Bharti & Malik, 2022). This is consistent with social logic of inclusion: lessening the exclusion will be a social gain on sustainability. Nevertheless the findings also suggest inclusion is good economic and environmental performance, and this suggests that access to formal finance can facilitate both resilience as well as cleaner investment-as long as firms have the capacity to use finance in a strategic manner than in increase expansion only.

The relatively high impact of technological infrastructure on the environmental performance is theoretically consistent (Wang et al., 2015). The continuous improvement routines, traceability and measurement is often needed to ensure environmental sustainability. These can be made possible by infrastructure with data capture, reporting capability and process visibility. This helps EMT argue that modernization can make the environment a better place, as well as the view by RBV that internal capabilities will dictate whether the tools of modernization will lead to their end results.

The moderate yet meaningful impacts of fintech adoption on all the three dimensions create an impression that fintech is used as a general facilitator and not an instrument. It enhances the efficiency and transparency of cash flow (economic), facilitates the documentation and traceability (environmental) and the reputability and assurance of payments (social). Nevertheless, its effect sizes are, again, relatively smaller than inclusion or infrastructure which means that fintech maximally effective when incorporated into broader financial access and organizational capability systems.

Measurement and Model Implications

The findings of the HTMTs concerning the close relationships between the dimensions of the sustainable performance help mark out the methodological and conceptual fact: the TBL dimensions are interdependent in practice (Afum et al., 2020). With economic gains, it is possible to invest in the

environment and with social stability, there can be a lower operation risk. However, the constructs are still analytically useful when considered as discrete outcomes as the patterns of coefficient observed are different. This further buttresses the fact that indeed SMEs can experience sustainability in a lopsided manner, depending on the lever that is highlighted; that is, fintech, inclusion, or infrastructure lever.

The fact that the inner-model VIF values are low also confirms the confidence in the structural result that the detected effects do not occur because of the multicollinearity effects. Thus, the correlations are, probably, subsidiary explanatory direction but not statistical fluctuation.

Theoretical Contribution and Strategic Meaning

Altogether, the discussion appears to be consistent with a subtle conclusion that digital finance helps to achieve sustainable performance in the event that modernization (EMT) is accompanied by the capability conversion (RBV), measured with the help of the multi-dimensional lens of TBL. The findings go beyond naive arguments that the sustainability is an automatic result of fintech. On the contrary, they demonstrate the fact that inclusion and infrastructure are not peripheral attributes; they are core forces that can make fintech a transformative capacity or a facade.

Conclusion

This study explored the connections between fintech use, financial inclusion, and technological infrastructure and its role in supporting the sustainable performance of SMEs on both economic, environmental, and social aspects. The results confirm that the three drivers are having a great impact, which is positive on Triple Bottom Line albeit unevenly. It turns out that financial inclusion can be particularly effective in terms of social performance, so the extension of the coverage to formal finance may empower stakeholder stability and equity. Technological infrastructure has a relatively high contribution to environmental performance, and the result enhances that the achievement of sustainability is most believable when backed by data and systems and internal ability, as opposed to symbolic digital usage. The application of fintech is generally conducive to all three areas, although the impact of fintech is moderate meaning that fintech can provide significant sustainability inflows where it is integrated in inclusive finance and a ready infrastructural mitigation. In theory, the findings confirm a combined EMT-RBV-TBL viewpoint, in that, the sustainability instruments, through modernization, can develop, but the results might be achieved through the ability of firms to transform digital opportunities into work routine and quantifiable performance enhancements.

Recommendations

- To managers of SMEs: Focus on infrastructural capability building (databases, software integration, connectivity and digital skills) and take-up of fintech. Regard fintech as a procurement operation system, inventory, compliance, and payroll operation and not a payment add on. Make financing choices in line with TBL aspirations by attempting to assign threatening credit to cleaner technologies, resource productivity, and workforce enhancements.

- To policymakers and financial institutions: Combine financial inclusion efforts with infrastructural assistance (digital connections, training, SME advisory services) or not only to avoid inequitable gains, but also so that the environmental monitoring and reporting is made possible. Create fintech and SME credit solutions that cause incentive towards sustainable investment (e.g. preferential pricing on proven green upgrades or social compliance practices).

- For future research: Take a longitudinal or mixed research design to enhance the causal conclusion and examine boundary conditions including sector, firm size and intensity of regulations. Research processes (e.g., transparency, traceability, absorptive capacity) through which digital finance is converted to each sustainability area.

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