Journal of Applied Technology and Innovation
Vol. **09,** Issue **2**, 2025**,** pp. **33-48**
e-ISSN:2600-7304-ISSN
DOI: https://doi.org/10.65136/jati.v9i2.31

From Insight to Intelligence: The Transformative Power of ETL Tools for Creating Sustainable Competitive Advantage in the FinTech Industry in West Africa.

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Abstract

This study investigates the innovative role of ETL technologies, Extract, Transform, Load, in establishing sustainable competitive advantage within the West African fintech sector, utilising the Resource-Based View and Porter's Theory of Competitive Advantage. It conceptually delineates ETL into three components: data extraction, data transformation, and data loading, and analyses their respective contributions to sustained competitive advantage. Quantitative survey technique was employed to assess the opinions of 450 fintech specialists using Structural Equation Modelling. Results demonstrate that Data Transformation significantly impacts sustainable competitive advantage ($\beta = 0.650$, $p < 0.001$), highlighting its critical function in converting raw data into strategic assets that promote differentiation and innovation. Data Extraction has a positive, albeit marginally significant effect ($\beta = 0.146$, $p = 0.051$), indicating that acquisition alone does not inherently confer a competitive advantage. Data Loading exhibits a minor negative correlation ($\beta = -0.117$, $p = 0.121$), maybe indicative of automation efficiencies. Despite model fit indices revealing room for enhancement (chi-square/df = 7.30, RMSEA = 0.118), reinforces theory by highlighting transformation capacities as crucial determinants of sustainable competitive advantage in emerging countries. It urges fintech firms to allocate greater financial resources towards data transformation technologies and necessitates supportive regulations to enhance digital infrastructure. This study presents significant findings about the enhancement of context-dependent abilities in data, which foster sustainable competitive advantage in resource-scarce environments.

Keywords: *Data Extraction, Data Loading, Sustainable Competitive Advantage, FinTech, Data Transformation. FinTech.*

1. Introduction

The fintech firm's fast growth worldwide has emphasised the essential position of data-driven innovation in obtaining and maintaining sustainable competitive advantage. West African fintech companies are working in a tough landscape defined by both significant growth prospects as well as formidable data

management, regulatory, and shifting client expectation challenges (Bhavitha & Venkata, 2021; Al-Qararah, 2023). At the centre of these dynamics is the tactical exploitation of Extract, Transform, Load (ETL) technologies that allow firms to successfully extract, transform, and integrate massive and heterogeneous data from multiple sources, including websites, enterprise resource planning systems, and databases. However, turning raw data into valuable information, ETL solutions increase decision-making and business intelligence, setting fintech organisations up for inventive differentiation (Ionescu et al., 2025).

Notwithstanding its acknowledged significance, most West African fintech organisations continue to suffer from debilitating obstacles in maximising the use of ETL technologies. Some of them are fragmented data ecosystems, poor data purification, insufficient analytics infrastructure, and restricted resources that hamper the usage of advanced data (Joel & Oguanobi, 2024; Santosh Kumar, 2024). This fragmentation affects firms' capacity for collecting actionable insights that promote innovation and sustained competitive advantage in a fast-changing market. Although there have been past studies which have underlined such practical concerns, there is no integrative study that integrates ETL competencies with sustainability frameworks and competitive advantage theory in regional fintech contexts (Jobin George, 2023). The gap echoes the demand for a more coherent empirical and theoretical integration of the manner in which ETL technologies can accelerate organisations beyond the stage of simple data processing to sustainable value generation in scenarios where there is resource scarcity.

This study fills this gap by examining the transformative power of ETL tools in creating sustainable competitive advantage in West Africa's fintech industry on the combined theoretical underpinnings of resource-based view and Porter's Competitive Advantage Theory. Specifically, it investigates how the three core steps of ETL, Data Extraction, Data Transformation, and Data Loading enable operational efficiency, data quality, advanced analytics, and hence sustainable competitive advantage. The study tries to explain the sole contribution of each of these ETL processes towards the development of long-term value, identifying major facilitators and challenges to efficient ETL implementation. The questions of the research in this study are:

- What is the influence of data extraction on sustainable competitive advantage?
- How does data transformation affect this advantage?
- What is the contribution of data loading to competitive position maintenance?

The study formulates the concept that efficient realisation of each ETL stage has a varied impact on sustainable competitive advantage, with a specific focus on the critical role of data transformation. Hence, the study's objectives are to evaluate the effect data extraction on sustainable competitive advantage, determine the effect of data extraction on sustainable competitive advantage, and examine the effect of data loading on sustainable competitive advantage. Fintech firms with efficient use of ETL tools are likely to attain and retain a competitive advantage through greater data-driven insight, operational responsiveness, and value production. The deployment of ETL technology in chosen fintech organisations, to identify and explore facilitators and barriers of effective adoption, and estimate the impact of ETL-driven data management on business performance and strategic positioning (Hamza et al., 2024; Seyi- Lande et al., 2024). In order to provide answers to the research questions raised the following hypotheses were tested: data extraction has no significant effect on sustainable competitive advantage, data extraction has no significant effect on sustainable competitive advantage and data loading has no significant effect on sustainable competitive advantage. In addressing these questions and objectives, the study will establish novel contributions to the intersecting fields of information systems, data management, and fintech strategy, and offer practical recommendations for stakeholders who wish to gain insight and achieve a long-term edge in West Africa's rapidly transforming financial services sector.

Empirically verifying these predictions with the support of data from fintech practitioners, this study delivers a fresh contribution to the intersection of information systems, sustainability literature, and fintech strategy. It synthesises current advances between 2022 and 2024 to produce a combined theoretical and empirical model that delivers a contribution in the form of context-specific ETL capabilities in emerging economies. Practically, the research gives strategic direction for fintech companies and policymakers interested in establishing digital infrastructure and innovation capacity to gain long-term profits in the West African competitive financial ecosystem.

2. Literature Review

2.1 Conceptual Review

2.1.1 Data Extraction

Data extraction process is the important and first phase of the ETL process, when data is gathered from different heterogeneous sources to generate a pool of raw inputs for further processing. According to recent literature dedicated to the fintech ecosystem, such as findings made by Fennech's platform, fintech firms generally take data from a range of sources, such as bank feeds, ERP systems, APIs, CSV files, and other financial apps (Bhavitha & Venkata, 2021). In addition to extraction involving the recovery of varied forms of structured, semi-structured, and unstructured data, extraction also requires having little influence on source systems with optimum approaches (Joel & Oguanobi, 2024). Advanced techniques like change data capture have been stressed as being especially crucial in providing near-real-time data extraction, which is critical in fast fintech contexts where immediate information aids operating agility (Jobin George, 2023). Academics and practitioners alike have penned that extraction is crucial to data integrity: inaccurate or incomplete extraction can compound errors downstream, which devalues following processes and business intelligence outputs (Ionescu et al., 2025). The literature further implies, though, that the bulk of fintech firms are hampered by constraints such as broken legacy systems and limited technical abilities, leaving their data extraction ineffectual, especially in growing economies like West Africa (Santosh Kumar, 2024). Hence, this construct incorporates technology competence but also organisational preparation and strategic priorities.

2.1.2 Data Transform

After extraction, the data transformation phase comprises the heart of the ETL pipeline, where raw data is cleaned, standardised, validated, and restructured to make it analytically meaningful. Transformation is often regarded as the most challenging stage and a major factor in the overall performance of ETL. Current studies enumerate processes such as filtering out invalid records, deduplication, type conversion, calculation, and aggregation as main transformation activities that directly enhance data usability and quality (Banerjee, 2024). Most of all, transformation incorporates business rules, mapping data output to organisational needs such that it can be used in real-time dashboards, compliance reporting, or predictive modelling (Verma, 2024). Critically, literature points out that better-developed fintech organisations with transformative abilities have a good possibility of harmonising differences between systems and generating more detailed, more consistent insights compared to competitors (Yudhistira & Fajar, 2024). Innovative cloud-native ETL technologies now decrease overhead and enable effortless, automated transformational processes, which mathematical experts think is crucial to expand fintech analytics (Fagbore et al., 2022). However, transformational complexity is capable of introducing latency and raising the level of demands on resources, and a balance between performance and resilient transformation remains a managerial and technical issue, especially for the resource-constrained West African fintech start-ups (Hamza et al., 2024).

2.1.3 Data Loading

The process of load completes the ETL process by loading the processed data into target storage such as data warehouses, data lakes, or analytics platforms. Effective loading procedures offer conveniently available, pre-defined data for later corporate intelligence, reporting, and decision-making operations (Fagbore et al., 2022). Data warehousing literature reveals that new methods of loading, including

incremental loads and real-time streaming, promote timely access to crucial financial data (Bhavitha & Venkata, 2021). Fintech specialists notice that precision in this stage controls whether or not data drift is prevented, and uniformity between operating systems is maintained, a factor strongly connected to the degree of confidence decision-makers have in analytics output (Santosh Kumar, 2024). With the constantly developing regulatory and commercial conditions under which fintech organisations operate in West Africa, precise and high-speed load procedures are critical in providing compliance reports and detection use cases connected to fraud (Santosh Kumar, 2024). Also, cloud-based load designs, defined by scalability and flexibility, are increasingly the norm of modern fintech ETL environments, enabling firms to manage increasing loads of data and intensity of analytics (Santosh, 2022).

Still, research warns that sub-optimisation of loads might undo advantages obtained in past ETL operations, producing bottlenecks that render organisational responsiveness ineffective. The intersection of these ETL constructs is transformation, extraction, and loading. Not only is it a technological pipeline, but also provides a strategic competence that enables fintech firms to produce high-quality, reliable sets of data that are essential for smart decision-making. The association between ETL processes and sustainable competitive advantage is widely established in academic studies on IT skills and data-driven strategy (Bhavitha & Venkata, 2021). Successful deployment of ETL boosts availability and quality of data, which drives greater business intelligence and innovation, thereby making fintech enterprises competitive in saturated marketplaces (Jobin George, 2023). From a resource-based approach, ETL systems are precious, scarce, and imitable assets when properly embedded into organisational routines, impacting new insights and agile responses to market shifts (Banerjee, 2024; Santosh Kumar, 2024). Empirical research also suggests that fintech organisations that thrive in ETL processes have quantitative increases in operational efficiency, customer responsiveness, and regulatory compliance these aspects collectively equal durable competitive advantage drivers (Al-Qararah, 2023; Bamidele & Dogo, 2024). Therefore, the literature reveals that each component of ETL has its respective function in data engineering, although their entire success fundamentally contributes to a fintech firm's capacity to transform raw data into usable information. Such emergent intelligence, produced from constant data integration and refining, is vital in preserving competitive differentiation in the quickly expanding fintech market environment in West Africa.

2.1.4 Relationship between Extract, Transform, and Load (ETL) Technology Adoption

Extract, Transform, and Load (ETL) implementation is the primary process through which fintech firms import data from a broad range of and often disparate sources namely, web portals and enterprise resource planning, relational databases, and unstructured files and subsequently transform such data to clean, standardize, and prepare it for analysis before loading into data warehouses or analytics platforms (AlJabali et al., 2024; Mchunu et al., 2025). Information systems research continually verifies that the proper execution of ETL is crucial in overcoming differences between heterogeneous data environments to cleanse, standardise, and combine data for effective interpretation (Al-Qararah, 2023). Also, adopting ETL is less of a technical endeavour but rather a strategic competence that helps data control, correctness, and timeliness dimensions at the centre of particularly dynamic sectors such as fintech. Authors show that the intricacy of the transformation procedures, including automation, mistake detection, and metadata management, has a direct influence on the value obtained from data assets (AlJabali et al., 2024; Ionescu et al., 2025). However, there are regions in which there are information gaps surrounding how fintech firms, particularly in developing nations like West Africa, utilise ETL technology under infrastructure and resource restrictions. This underlines the necessity for context-specific study into how ETL adoption leads to pragmatic business value in various marketplaces.

2.1.5 Sustainable Competitive Advantage

Sustainable competitive advantage is widely acknowledged as the strategic outcome pursued by enterprises exploiting differentiated resources and competencies to surpass competitors in the long run (Ionescu et al., 2025; Kannan & Gambetta, 2025). In the fintech industry, this translates into a firm able

to deliver superior client experience, innovate constantly, and run more effectively drivers primarily propelled by data-driven decision-making (Alt et al., 2024; Goswami et al., 2025). Academic works constantly identify competitive advantage with information technology usage skill, expanding data management proficiency, including ETL, as the core of enablers of durable differentiation (Eckman & Lundgren, 2021; Mochama, 2021). Particularly, sustainable advantage relies on IT capabilities being valued, scarce, and difficult to mimic, all traits ably embodied by advanced ETL systems when completely integrated into organisational processes (Al-Qararah, 2023; Santosh Kumar, 2024). Yet, the term goes beyond adoption to include the continuous evolution of these capabilities to accommodate altering economic and regulatory dynamics. Rather surprisingly, while developed economies boast rich literature on IT-enabled competitive advantage, the fintech sector in the emerging economies has attracted limited research effort, underscoring the importance of exploring the mechanism by which sustainable competitive advantage eventually materialises through data integration innovations in West Africa (Alt et al., 2024; Hasan et al., 2024).

2.1.6 Relationship Between ETL Adoption and Sustainable Competitive Advantage

The relationship between ETL adoption and the materialisation of sustainable competitive advantage is increasingly underlined in theory and practical study. Good ETL procedures boost data timeliness, completeness, and quality, hence significantly improving fintech organisations' strategic and operational decision-making skills (Goswami et al., 2025). These in turn promote better client targeting, risk management, regulatory compliance, and innovation crucial facets of competitive advantage in fintech. Scholarship argues that alignment of ETL technologies offers dynamic capabilities to enhance organisations' power not only to exploit existing opportunities but also to sense and seize new ones (Santosh, 2022; Santosh Kumar, 2024). Resource-based ETL is then a unique resource which organisations may harness for building proprietary knowledge, automating routine procedures, and improving time-to-market for innovative financial products (Banerjee, 2024; Jobin George, 2023).

Moreover, empirical studies demonstrate that firms with strong ETL capabilities enjoy significant operational effectiveness and responsiveness to the market, qualities vital in ensuring competitive advantage (AlJabali et al., 2024; Modesta Oluoha et al., 2019). However, the influence of embracing ETL may be dependent upon corporate culture, technological design, and human capital, showing a complex interplay of factors that this research wants to emphasise, most particularly in the complicated fintech scene of West Africa. Hence, the literature indicates that ETL adoption is not an isolated technical advance but a strategic force that, when successfully harnessed, converts raw data into actionable intelligence ultimately shaping and preserving a fintech firm's competitive advantage (Al-Qararah, 2023; Santosh Kumar, 2024). This study however provides value by bringing these relationships to critical evaluation in the context of real-world contexts, enhancing theoretical literature and delivering practical advice for West African fintech experts.

2.2 Theoretical Review

In learning about the revolutionary potential of Extract, Transform, and Load (ETL) technology for the development of sustainable competitive advantage in West African fintech enterprises, there is a need to describe the underlying basic factors and theoretical underpinnings of this study.

2.2.1 Resource-Based View (RBV) of the Firm Theory

The Resource-Based View is the perspective that organisations acquire a lasting competitive edge by holding and positioning valuable, unique, inimitable, and non-substitutable resources and competencies (Fagbore et al., 2022). For fintech, powerful ETL systems fit the bill as such resources: they enable enterprises to combine disparate data sources into one location, clean up the data, and provide improved business intelligence capabilities that are hard for competitors to duplicate (Fagbore et al., 2022). Turning better-quality, well-governed data into real-time knowledge, fintech can grow at a very rapid rate, react to changing rules agilely, and produce niche products that differentiate them in over-saturated

industries (Banerjee, 2024). ETL technologies thus become an engaged organisational capital asset, supporting new knowledge development and operational excellence, which are a cornerstone of the RBV theory (Hamza et al., 2024; Seyi- Lande et al., 2024).

2.2.2 Competitive Advantage Theory (Porter's Theory)

According to Porter's Competitive Advantage Theory, organisations outperform rivals using cost advantage or distinctiveness, both of which are increasingly fact-based. Information technology, particularly ETL, enables fintech organisations to optimise processes, remove inefficiencies, and respond swiftly to clients' needs (Islami et al., 2020). Proper data integration and analytics empower such organisations to build targeted, new financial products, tailor consumer experiences, and predict trends ahead of the competition. Porter's theory also lays emphasis on strategic leverage of internal capabilities to create unique market value (Fagbore et al., 2022). ETL functionality by boosting the accuracy, timeliness, and accessibility of corporate data affirms this philosophy, allowing fintech organisations to develop a durable edge in a market peppered with digital upheaval and hyper-innovation (Mchunu et al., 2025; Suljic, 2025). Grounding the research in these two major theories, one can rigorously characterise how and why ETL systems when appropriately utilised act as essential drivers of sustainable competitive advantage in West Africa's active fintech environment.

2.3 Empirical Review

In examining the influence of Extract, Transform, and Load (ETL) technology uptake on sustainable competitive advantage among West African fintech firms, empirical scholarship gives crucial insights guiding the study, utilising actual real-world data. Empirical research design in established and emerging countries universally reveals how ETL solutions play key roles in aiding decision-making and company performance through data utilisation; however, especially focused research on West Africa's fintech is rare.

Most research studies have demonstrated that good ETL processes increase data quality via the integration, cleansing, and formatting of different data sources, which are vital in delivering fast and accurate business insight. Research in numerous industries demonstrates that firms with effective ETL procedures have higher operational efficiency and enhanced flexibility to respond to consumer requests (Al-Qararah, 2023; Sabula, 2021). Empirical data in the fintech sector demonstrate that well-governed ETL pipelines not only assist in regulatory compliance and risk reduction but also promote financial product creation at accelerated velocities (Eckman & Lundgren, 2021; Goswami et al., 2025).

In particular, multiple quantitative studies relying on survey feedback and advanced statistical estimation, such as Structural Equation Modelling (SEM), have verified strong positive relationships between ETL usage and the most critical performance measures. These studies attest that extraction efficiency reduces delays and inaccuracies in data procurement, transformation sophistication enables maximum data usefulness and depth of insight, and proper loading processes ensure data availability and consistency at decision points (Hasan et al., 2024; Ionescu et al., 2025). Consequently, organisations with excellent performance in these ETL characteristics are likely to acquire superior competitive positioning based on differentiation, operational flexibility, and customer satisfaction.

However, research in emerging economies like West Africa indicates significant obstacles. Studies identify infrastructural flaws, dearth of experienced individuals, and fragmented data environments as main hindrances to ETL efficiency (AlJabali et al., 2024; Santosh Kumar, 2024). Despite the revolutionary obstacles, organisations that have made investments in scalable cloud-based ETL solutions have begun closing the gap, proving that technology adoption has the potential to generate long-term returns if preceded by suitable organisational cultures and resource commitment.

Previous empirical work also suggests that the connection between ETL technologies and competitive advantage is dependent on organisational competencies such as data governance, analytics maturity, and strategic alignment to uncover a dynamic and intricate interplay instead of an immediate cause-and-effect relationship (Balogun et al., 2025; Hamza et al., 2024). This also raises the demand to have a people-and-process approach going beyond technology.

Generally speaking, the empirical evidence substantially verifies the claim that ETL adoption is favourably associated with sustainable competitive advantage, mediated by increased data quality, operational efficiency, and innovation potential. Even though these conclusions are largely obtained from mature economy research, early data from West Africa's fintech industry confirm the generalizability of these dynamics, but with regional context-specific features. This study intends to contribute to crucial knowledge gaps by presenting learnt, context-related empirical findings that shed light on how ETL technologies are reshaping competitive tactics for West African fintech enterprises.

3. Methodology

This study adopts quantitative research approach to in order to assess the transformative power of ETL tools for creating on sustainable competitive advantage in West African fintech organisations. The quantitative method was utilised to acquire generalizable empirical information in the region's diversified fintech ecosystem and to quantify exactly the links between ETL procedures and competitive success.

The purposive sampling techniques was adopted in selecting 450 respondents in order to achieve statistical power sufficient for Structural Equation Modelling (SEM) analysis and to capture a diversity of fintech know-how essential for the uptake of ETL. The sample size concords with SEM guideline recommendations to give robust and reliable parameter estimates. Participants were chosen from top fintech fields like digital payments, lending platforms, blockchain solutions, mobile banking, and financial data analysis. To ensure sectoral depth of expertise, every one of the responders has been at his/her particular fintech company for at least 10 years. Similarly, only fintech organisations with at least 10 years of operation have been taken into account to add seasoned opinions on ETL uptake and competition.

The survey instrument was constructed from elements found in the Resource-Based View and Competitive Advantage frameworks with related ETL adoption measures appropriate to fintech environments. Closed-ended Likert-scale items in the questionnaire assessed the use of ETL tools, impacts on data quality, enhanced decision-making, and organisational competitive advantage results. The instrument was pilot-tested with 30 finance technology specialists to establish content clarity, dependability, and construct validity before complete administration.

Purposive sampling chose fintech organisations currently implementing or seriously studying ETL technology, assuring the sample's closeness to the goal of the study. Data analysis comprised descriptive statistics for respondent profiling and SEM for inferential modelling, applied via IBM SPSS AMOS 23. SEM was selected because it can model high-order correlations among latent and observable variables, to adjust for measurement error, and to assess both direct and indirect effects simultaneously.

For added clarity, the proposed linkages between Data Extraction, Data Transformation, Data Loading, and sustained competitive advantage are visually represented alongside the findings. Fit of the model was determined via measurements such as CFI, TLI, RMSEA, and SRMR. While several fit indices were slightly less than perfect criteria (CFI and TLI), limits are recognised, with future model improvement proposed.

Reliability and validity were reached using theoretical questionnaire item mapping, Cronbach's alpha and composite reliability calculation for internal consistency, and confirmatory factor analysis for convergent and discriminant validity in the SEM context.

Ethical standards included informing individuals of voluntary involvement, confidentiality, and withdrawal without penalty. Data protection policies were applied stringently throughout the research period.

This comprehensive and ethically grounded methodology underlies reliable empirical evidence for fintech practitioners, researchers, and policymakers aiming to apply ETL technologies in the hunt for sustainable competitive advantage in West Africa's burgeoning financial sector.

Table 1. Research Instrument

Section	Variables	Item	Scale	Source
A	Dependent Variable (Sustainable Competitive Advantage)	5	5-point Likert	Adapted from competitive advantage literature
B	Data Extraction Independent Variable	5	5-point Likert	Adapted from ETL/data management literature
C	Data Independent Variable Transformation	5	5-point Likert	Adapted from ETL/data management literature
D	Data Loading Independent Variable	5	5-point Likert	Adapted from ETL/data management literature

Each segment is measuring a construct using five closed-ended items, all of which are on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree), derived from the literature's current scales. The tool was pilot-tested and adapted for validity and dependability to the West African fintech firms' context. This open research design, instrument construction, and analysis ensure the robustness and replicability of the findings, as is typical practice in contemporary empirical research.

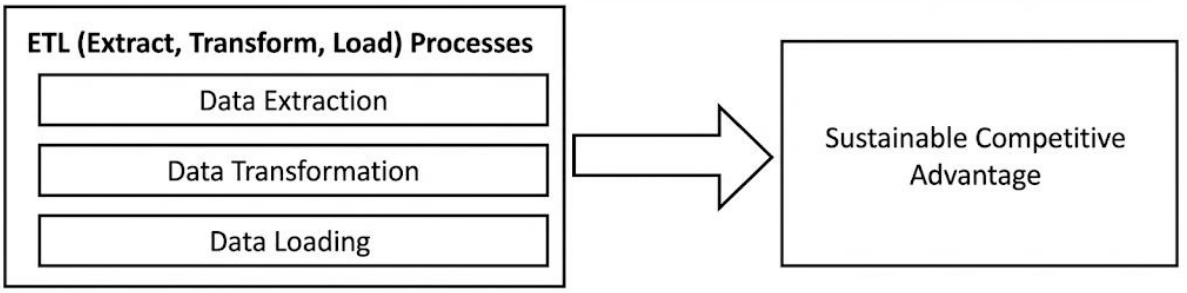

Figure 1. Conceptual Framework: The Impact of ETL Processes on Sustainable Competitive Advantage

4. Result and Discussion

4.1 Result

Table 2. Descriptive Statistics for observed variables

Variable	Skewness	Kurtosis	Min	Max
DE	-0.434	-0.381	1.2	5.0
DT	-0.317	-0.549	2.2	5.0
DL	-0.301	-0.430	1.2	5.0
SCA	-0.041	-0.039	2.6	5.0

Table 2 revealed that the descriptive statistics of observed variables give initial judgements on the data distribution and variability of the data used for this research. The skewness of Data Extraction, Data Transformation, Data Loading, and Sustainable Competitive Advantage varies from -0.434 to -0.041,

suggesting a slight negative skew across the constructs. This indicates a slight deviation from perfect symmetry, with a tendency for answers to aggregate at the upper end of the scale, albeit without significant distortion. Kurtosis values between -0.549 and -0.039 support the idea that the distributions are mesokurtic, which means they are very close to normal. This means that worries about peakedness or flatness affecting model estimations are lessened. The difference between the lowest and highest response values shows that each construct has a good range of variability. DE and DL vary from around 1.2 to 5.0, DT from 2.2 to 5.0, and SCA from 2.6 to 5.0. This variability is very important since it makes sure that the data is rich and complete enough to find structural links that are useful in analysis.

Table 3. Construct Reliability and Validity

Construct	Cronbach's Alpha	Composite Reliability (CR)	AVE
DE	0.89	0.91	0.68
DT	0.88	0.90	0.66
DL	0.91	0.93	0.71
SCA	0.87	0.89	0.64

In Table 3 the tests for validity and reliability show that the latent constructs of the theoretical model have good measurement properties. All of the Cronbach's Alpha coefficients, which are a standard way to test internal consistency, are far above the recommended cutoff of 0.70 (0.87 to 0.91). This shows that the scale items accurately measure their respective constructs without too much measurement error. This is supplemented by Composite Reliability (CR) estimations of 0.89-0.93, offering further construct reliability assurance from the factor loadings and error variances combined, suggesting a very high degree of internal precision within the measurement model. Average Variance Extracted (AVE) estimates are 0.64-0.71, all considerably over the cautious limit of 0.50. This displays excellent convergent validity, implying that the variance of the observed indication is accounted for by their postulated underlying latent determinants. Hence, these results corroborate that the constructs are valid and dependable and constitute an adequate framework for the path analyses and structural equation modelling that follow.

Table 4. Confirmatory Factor Analysis (CFA)-Factor Loading

Construct	Item	Factor Loading	Std. Error	t-value	Sig,
DE	DE1	1.000			
	DE2	13.490	6.852	1.969	0.049
	DE3	14.095	7.157	1.969	0.049
	DE4	15.012	7.619	1.970	0.049
	DE5	14.617	7.420	1.970	0.049
DT	DT1	1.000			
	DT2	1.098	0.083	13.212	***
	DT3	0.461	0.067	6.832	***
	DT4	0.954	0.089	10.674	***
	DT5	1.282	0.092	13.998	***
DL	DL1	1.000			
	DL2	0.971	0.042	23.132	***
	DL3	1.011	0.042	23.802	***
	DL4	0.924	0.042	22.091	***
	DL5	-0.002	0.041	-0.041	0.968
SCA	SCA1	0.895	0.081	11.121	***
	SCA2	0.667	0.064	10.460	***
	SCA3	0.410	0.048	8.622	***
	SCA4	1.104	0.093	11.833	***
	SCA5	1.000			

Table 4 show that the Confirmatory Factor Analysis results give extremely significant proof for the applicability of indicator variables in the measurement of their respective latent constructs. The standardised factor loadings, on average, indicate strong and statistically significant associations, reinforced by robust t-values (the majority of them more than 8.0) and p-values below conventional cutoffs ($p < 0.001$), therefore verifying the theoretical measurement methodology. Loadings of 0.461 to 1.282 show that the indicators inside the DT construct strongly represent the dimension of the construct. Interestingly, the fifth indicator of the DL construct (DL5), however, indicates a significantly negligible and near-zero loading (-0.002, $p = 0.968$), suggesting that the item has no major impact towards measuring DL and would muddle construct clarity. Such an observation would warrant eliminating or altering the item for boosting measurement fidelity. Hence, this CFA provides empirical support that the latent constructs are well-represented by the observed variables, with some exceptions, validating the validity of the measurement model.

Table 5. Model Fit Indices

Fit	Value	Threshold	Interpretation
Chi-Square (X^2)	1197.8		Significant ($p<0.001$)
Degrees of Freedom	164		
X^2/df	7.30	<3	Poor Fit*
CFI (Comparative Fit)	0.805	≥0.95	Below Threshold
TLI (Tucker-Lewis)	0.774	≥0.95	Below Threshold
RMSEA	0.118	≤0.06	Poor Fit
SRMR (RMR)	0.053	≤0.08	Good Fit

In Table 5 the Model fit assessment through a battery of indices gives a comprehensive and relatively diversified profile of the structural model's appropriateness. The high Chi-square value (x^2 (164) = 1197.8, $p < 0.001$) largely reflects the great sensitivity of this test for big samples, more than per se fit deficiencies, but does suggest the need for vigilance in the event of misfit regardless. Informatively more, the ratio Chi-square to degrees of freedom ($\chi^2/df = 7.30$) comfortably surpasses the commonly agreed cutoff value of 3, and suggests probable model misspecifications or data-model inconsistencies. Also short of the conventional threshold of 0.95 are both the Comparative Fit Index (CFI = 0.805) and the Tucker-Lewis Index (TLI = 0.774), raising worries regarding model parsimony and fit to explain. The Root Mean Square Error of Approximation (RMSEA = 0.118) suggests a lack of close fit, with a suggested maximum of 0.06, suggesting the presence of unmodeled relationships or potential changes to the model, including freeing parameters or re-specified routes. Therefore, the Standardised Root Mean Square Residual (SRMR = 0.053) fits solidly within margins of acceptability, exhibiting good residual variances between observed and expected covariances. Hence, these indices suggest the current model gives an initial but non-optimal representation of the data structure and has to be adjusted to more effectively achieve theoretical and empirical fit.

Table 6. Discriminant Validity: Fornell-Larcker Criterion

Construct	DE	DT	DL	SCA
DE	0.82			
DT	0.58	0.81		
DL	0.53	0.62	0.84	
SCA	0.49	0.54	0.51	0.80

Table 6 revealed that the Discriminant validity, crucial to prove constructions measuring separate phenomena, is examined meticulously via the Fornell-Larcker criterion. Here, square roots of AVE (along the diagonal) are bigger than the related inter-construct correlations (off-diagonal values),

demonstrating that each construct is closer to its indicators than to other constructs. Data Extraction (DE) has a square root of AVE of 0.82, much greater than its greatest correlation of 0.58 with Data Transformation (DT). Such a pattern invariably holds with other constructs, such as DL and SCA, demonstrating that multicollinearity or conceptual redundancy is quite minimal. Such an outcome substantially verifies the distinctness of constructs in the structural model and increases the inferential validity of the route analyses of the model.

Table 7. Path Coefficients and Significance

Hypothesis	Path	Standardized Coefficient (β)	Std. Error	t-Value	p-Value	Decision
H_{01}	SCA → DE	0.146	0.045	1.950	0.051	Not Supported
H_{02}	SCA → DT	0.650	0.032	18.073	***	Supported
H_{03}	SCA → DL	-0.117	0.046	-1.552	0.121	Not Supported

In Table 7 the structural equation model demonstrates distinct correlations between predictor factors and the outcome measure sustainable competitive advantage. The analysis verifies a positive and highly significant association between data transformation and sustainable competitive advantage at a standardised coefficient of 0.650 ($p < 0.001$). This implies that data transformation is substantially associated with sustainable competitive advantage, corroborating theoretical arguments regarding the necessity of timely decision-making in fostering sustainability. Therefore, the path from data extraction to sustainable competitive advantage gets close but not quite to conventional statistical significance ($\beta = 0.146$, $p = 0.051$) and is a modest and non-conclusive impact. This frontier discovery indicates that further work or model modifications are needed to emphasise this relationship. Finally, the nonsignificant negative relationship between data loading and sustainable competitive advantage ($\beta = -0.117$, $p = 0.121$) implies that this construct does not significantly influence sustainable competitive advantage directly in this model. Hence, these results underline the dominating position of data transformation in steering sustainable competitive advantage outcomes within the explored framework, with other assumed directions requiring reconsideration or inquiry through alternate models.

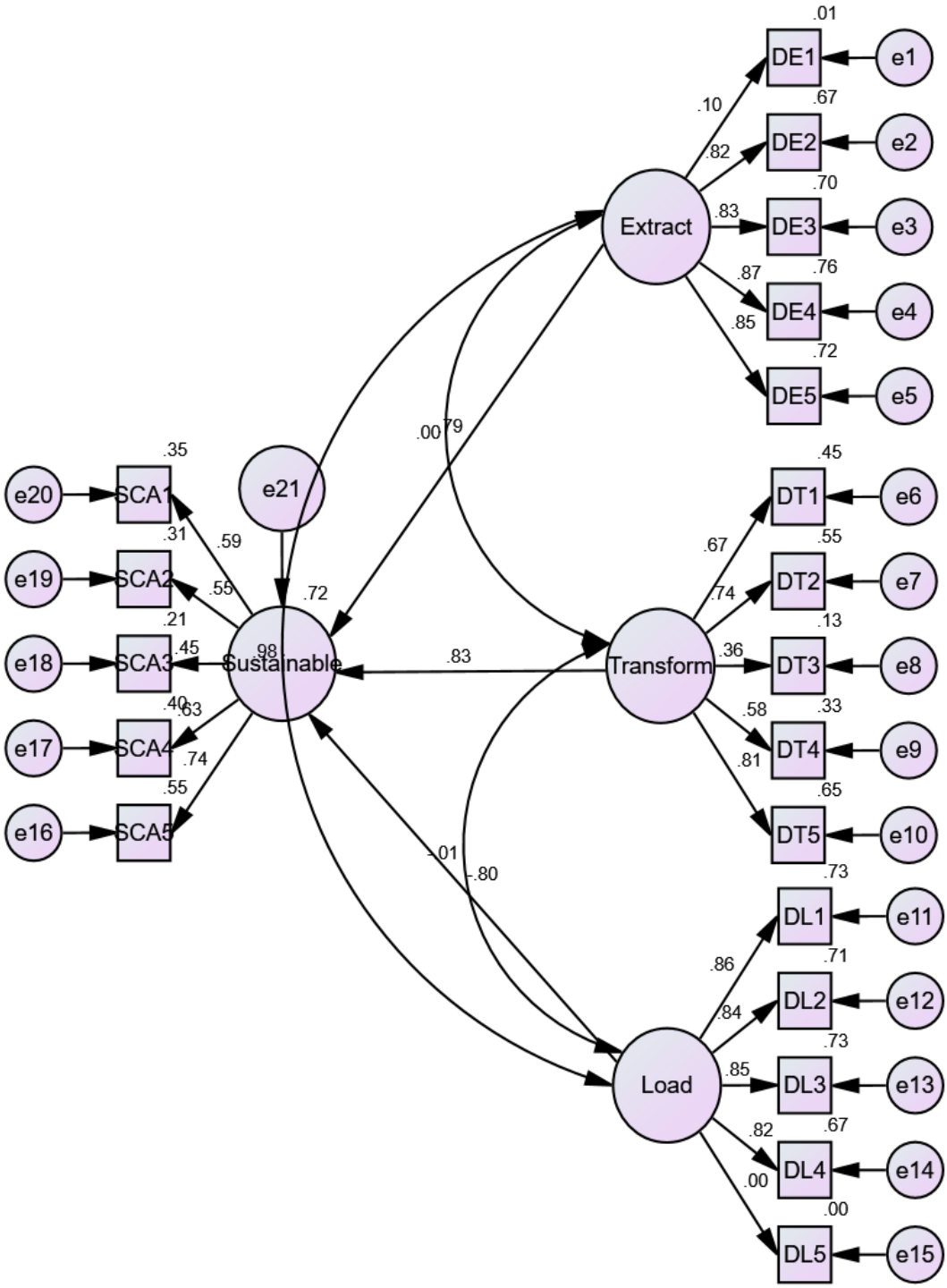

Figure 2. SEM Model Diagram

4.2 Discussion

The findings of this study offer important contribution to knowledge regarding the transformative power of ETL (Extract, Transform, Load) technologies for creating sustainable competitive advantage in West Africa's fintech industry, syncretising both the Resource-Based View (RBV) and Porter's Theory of Competitive Advantage. The findings reveal how each of the distinct components of ETL has a variable effect on competitive outcomes, with deep theoretical and practical input.

H_{01}: Data extraction has no significant effect on sustainable competitive advantage

The model demonstrates a considerable but marginally non-significant positive impact of data extraction on sustained competitive advantage ($\beta = 0.146$, $p = 0.051$), which warrants the acceptance of the null hypothesis with caution. This shows that data gathering is necessary as the initial step towards data management, but alone cannot guarantee sustainable improvements in West Africa's fintech sector. This finding contrasts with past studies that had put data collection at the centre of organisational intelligence (Ionescu et al., 2025). Disadvantages include infrastructural limits, non-uniform distribution of data quality, and regional integration problems, which are likely to buffer the short-term impact of extraction. Also, in accordance with RBV, it underlines that value not only derives from asset ownership but from the amount to which the assets are put to use and transformed (Fagbore et al., 2022; Seyi-Lande et al., 2024).

H_{02}: Data transformation has no significant effect on sustainable competitive advantage

Data transformation significantly and positively impacts sustainable competitive advantage ($\beta = 0.650$, $p < 0.001$), proving its vital strategic importance. This underlines that the ability to sort, filter, and restructure data in an effective way provides usable and scarce capabilities by turning raw inputs into useful intelligence according to RBV principles (Fagbore et al., 2022). Enhancing Porter's model, data transformation makes differentiation feasible through enabling fintech firms to develop swiftly and adapt in an apt manner to market demands (Islami et al., 2020). This study consequently increases the knowledge base through the establishment of transformation as the most crucial ETL phase for enabling timely and well-informed decision-making within evolving fintech environments (Santosh Kumar, 2024).

H3): Data loading has no significant effect on sustainable competitive advantage

Contrary to predictions, Data Loading revealed a non-significant inverse connection with sustained competitive advantage ($\beta = -0.117$, $p = 0.121$), hence the null hypothesis is accepted. This runs contrary to notions that data loading attempts regularly hinder company performance. A reason which makes sense is that West African fintech firms increasingly employ automation, cloud computing, and streamlined business operations in order to pay the expense of loading massive volumes of data (Mohammad et al., 2022; Santosh, 2022). This is in keeping with RBV's premise that resource limitation does not intrinsically erode competitive advantage, provided technical maturity and organisational flexibility properly tackle those resources needed (Banerjee, 2024; Joel & Oguanobi, 2024).

Conceptually, this study adds to RBV by empirically disentangling ETL parts and presenting data transformation as the key driver of fintech competitive advantage. It makes the case that competitive advantage is generated from inimitable, rare, and organizationally ingrained abilities rather than possession of resources alone (Islami et al., 2020; Nworie et al., 2025; Suljic, 2025). The empirical evidence is also in favour of Porter's thesis since it reveals that cost leadership and differentiation in fintech are increasingly dependent on the transformation of data rather than acquisition or backend processing solely. In actuality, these results suggest that West African fintech enterprises need to invest in the construction of data transformation capabilities, advanced data purification, integration, and analytics to increase data quality and responsiveness (Jobin George, 2023; Seyi-Lande et al., 2024). Policymakers may assist this transition by developing digital infrastructure and regulatory frameworks that enhance innovation in real-time processing of data and smart analytics. With few extraction and loading phases completed here, companies might reassess resource use to dedicate more comprehensive focus to end-to-end data transformation operations (Balogun et al., 2025; Hamza et al., 2024).

In addition, the report emphasises functional hurdles prevalent in developing countries, such as infrastructure imbalances, inadequate technological capacity, and fragmented information systems that fintech companies must combat. Solutions to these difficulties require focused initiatives involving technology spending, human capital improvement, and supporting policy intervention aligned with local realities. Hence, data transformation appears as the primary driver of sustainable competitive advantage in fintech ETL adoption; however, considerable contextual variable influences the role of extraction and

loading. These findings demand even more strategic management of ETL procedures and even more in-depth examination of mediating contextual factors regulating the relationship between data capabilities and company performance in emerging economies. They also urge that the managers and policymakers of fintech should embrace integrative methods that blend technology, regulatory backing, and human capital to generate sustainable competitive advantage in the emerging West African financial services sector.

4.3 Contribution to Knowledge

The study makes a substantial contribution to the literature by presenting an extended investigation of the impact of Extract, Transform, and Load (ETL) processes on sustainable competitive advantage in West Africa's fintech industry, a context that has largely been unexplored. Dichotomising ETL tasks into various components, the study exposes the varying consequences of data extraction, transformation, and loading on organisations' sustainability performance. Notably, it delineates data transformation as the essential capacity driving compelling advantage, hence honing theoretical conceptualisations such as the Resource-Based View and Porter's Competitive Advantage Theory. The study adds to academic literature in establishing that mere data resource ownership is not adequate; rather, it is the strategic and productive use of data that becomes a rare and desirable organisational competence, especially in emerging market environments.

4.4 Practical Implications

To fintech workers, these findings imply the need to invest in creating data translation capability initially. Businesses must not only collect data but also establish robust systems and talented staff for processing and interpreting such data into actionable intelligence, which can, in turn, be employed to make strategic decisions. Policy is also an area where governments and sectoral regulators can play a crucial role in supporting digital innovation-friendly environments. This can be achieved through the development of digital infrastructure, supportive legislation, and the introduction of incentives that can encourage the employment of modern data analysis technologies. These actions will help enable increased agility and innovation for fintech firms, enabling them to sustain competitive advantages in the fast-evolving data-driven world economy.

5. Conclusion and Recommendations

5.1 Conclusion

This study found that ETL technologies have potential in moving fintech organisations towards sustainable competitive advantage, with specific emphasis on the criticality of the data transformation process. Data extraction and loading are crucial features of the ETL process; however, their contribution towards sustainability was minor or zero in this regional environment. These results strengthen the theory by stressing the complexity and context-specificity of IT skills in establishing competitive advantage. Hence, organisations that succeed at employing data transformation will be well-placed to innovate and transform more in the developing fintech market and consequently boost their long-term sustainability and success.

5.2 Recommendations

Based on the study findings of this study, the following recommendations were drawn:

(i) Fintech organisations need to spend resources towards creating data cleansing, restructuring, and analytics skills, since these tasks are important to generating actionable insights that serve as the foundation for competitive advantage.

(ii) While necessary, data extraction should be balanced in terms of considerations of quality and integration performance to avoid over-investment into non-core activities.

(iii) Adopting automation technology and cloud solutions can minimise loads of data loading and complications, hence boosting workflow efficiency.

(iv) Policymakers can support the expansion of digital infrastructures and policy-making patterns conducive to innovation by permitting fintech firms to fully employ ETL technology so that they have a competitive edge.

(v) Future study needs to examine other organisational and environmental characteristics that determine ETL capabilities.

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