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Project Management Capability and Resistance in Cloud Transformation: Configurational Evidence from African E-Commerce

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Abstract

This paper investigates resistance patterns in cloud-based digital transformation within African e-commerce contexts, examining how project management capabilities moderate the relationship between infrastructural constraints and transformation outcomes. Through a mixed-methods study of 180 organisations across eight African countries, we employ fuzzy-set qualitative comparative analysis (fsQCA), necessary condition analysis (NCA), and polynomial regression to identify multiple pathways to transformation success and failure. Our findings reveal that resistance emerges through five distinct configurations, with project management capabilities serving as a critical moderating factor. We identify a 'capability paradox' where organisations with moderate project management maturity experience higher resistance than those with either low or high maturity, suggesting non-linear relationships between capabilities and outcomes. The study contributes to the digital transformation literature by developing a contextually grounded resistance framework that accounts for infrastructure volatility, institutional voids, and the unique characteristics of African e-commerce ecosystems. We propose the concept of 'adaptive resistance' as a functional response to resource constraints, challenging assumptions that resistance purely represents opposition to change. Practical implications include the need for hybrid project management approaches that balance structure with flexibility and policy recommendations for infrastructure investment prioritisation.

Keywords: cloud computing; digital transformation; e-commerce; project management; resistance; Africa



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1. Introduction

The promise of cloud computing as a catalyst for digital transformation in emerging markets faces significant challenges when confronted with the realities of infrastructure constraints, skills gaps, and institutional voids [1]. Nowhere is this paradox more evident than in African e-commerce, where organisations simultaneously recognise cloud transformation as essential for competitiveness while exhibiting substantial resistance to adoption [2,3]. This resistance manifests not as simple opposition but through complex patterns of partial adoption, workarounds, and hybrid approaches that challenge binary conceptualisations of technology acceptance [4,5].

Recent *Information Systems Journal* research has highlighted the need to move beyond variance-based models of technology adoption towards configurational approaches that capture the complexity of transformation phenomena [6–8]. This perspective proves particularly salient in African contexts where the interaction between technological, organisational, and environmental factors creates multiple, potentially contradictory pathways to transformation outcomes [9]. The heterogeneity of African markets, ranging from sophisticated financial technology hubs in Kenya and Nigeria to nascent digital economies in Tanzania and Ethiopia, provides a natural laboratory for examining how contextual factors shape resistance patterns [10]. This study responds to the *Australasian Journal of Information Systems* [AJIS] emphasis on contextually grounded, practically relevant IS research by combining configurational and necessary-condition perspectives to explain resistance in African cloud transformation.

Project management capabilities emerge as a critical yet underexamined factor in navigating transformation complexity [11,12]. While the literature acknowledges the importance of project management methodologies in digital transformation, the mechanisms through which these capabilities influence resistance patterns remain unclear, particularly in resource-constrained environments [13,14]. African organisations face unique challenges in developing project management capabilities, including skills scarcity, cultural tensions between imported methodologies and local practices, and the need to balance structure with flexibility in volatile environments [15].

This study addresses three interrelated research questions: First, what configurations of organisational, technological, and environmental factors generate resistance to cloud transformation in African e-commerce contexts? Second, how do project management capabilities moderate the relationship between resistance factors and transformation outcomes? Third, what necessary conditions must exist for successful cloud transformation in resource-constrained environments? To answer these questions, we analyse data from 180 e-commerce organisations across eight African countries using complementary analytical techniques including fuzzy-set qualitative comparative analysis (fsQCA), necessary condition analysis (NCA), and polynomial regression with response surface analysis.

Our findings reveal that resistance to cloud transformation emerges through five distinct configurational patterns, each representing different combinations of infrastructure constraints, organisational capabilities, and environmental pressures. Contrary to linear assumptions, we identify a ‘capability paradox’ where moderate levels of project management maturity generate higher resistance than either low or high levels, suggesting that partial capabilities create coordination challenges without providing sufficient benefits to overcome resistance. The analysis also reveals that hybrid project management approaches combining Agile and Waterfall methodologies show complementarity effects, particularly in contexts characterised by both stability requirements and change imperatives.

This paper makes several contributions to the Information Systems literature. First, we develop a configurational framework of transformation resistance that accounts for the complexity and equifinality inherent in digital transformation phenomena. This framework responds to calls for moving beyond linear models and provides a nuanced explanation for how different combinations of factors lead to resistance in emerging markets [12,16]. Second, we extend resistance theory by conceptualising ‘adaptive resistance’ as a functional response to environmental constraints rather than purely dysfunctional opposition. By introducing this concept, we challenge the assumption that all resistance is detrimental, showing instead that in resource-constrained contexts, some resistance can be an adaptive strategy [17,18]. Third, we contribute to the project management literature by demonstrating the non-linear effects of project capabilities on transformation outcomes and by identifying boundary conditions for different methodological approaches. In particular,

we highlight the capability paradox (where moderate capability can backfire) and provide evidence of Agile–Waterfall complementarities, thus informing the debate on optimal project management strategies for digital transformation [19,20].

The remainder of this paper is structured as follows. Section 2 reviews relevant literature on digital transformation resistance, cloud computing in emerging markets, project management capabilities, and African e-commerce contexts. Section 3 describes our research methodology, including data collection procedures and analytical techniques. Section 4 presents findings from the configurational analyses. Section 5 discusses theoretical and practical implications. Section 6 concludes with limitations and future research directions.

2. Conceptual Background

2.1. Digital Transformation Resistance: Beyond Technology Acceptance

Digital transformation resistance represents a multilevel phenomenon that transcends individual-level technology acceptance to encompass group dynamics, organisational inertia, and systemic constraints [4,21,22]. While dominant frameworks such as TAM and UTAUT assume rational evaluation of technology benefits and costs [23], resistance theory acknowledges that opposition emerges through complex interactions between technical features, organisational contexts, and power dynamics [24,25]. This complexity intensifies in cloud transformation where resistance manifests across multiple levels simultaneously—individual concerns about job security, group-level disruptions to established workflows, and organisational challenges to existing business models [26,27].

Recent *Information Systems Journal* studies have reconceptualised resistance as potentially functional rather than inherently problematic [8,28]. From this perspective, resistance signals legitimate concerns about transformation readiness, resource adequacy, or strategic alignment that warrant attention rather than suppression [29–31]. This functional view proves particularly relevant in resource-constrained environments where precipitous transformation might destabilise existing operations without delivering promised benefits [24,32].

The African context introduces distinctive resistance patterns absent from Western models. Infrastructure limitations create what Thompson and Walsham term “improvisation spaces” where organisations develop creative workarounds that blur boundaries between adoption and resistance [33]. Recent empirical work documents how unreliable connectivity, power instability, and limited technical support transform cloud systems from efficiency enablers to operational risks [34]. These findings challenge assumptions about technology universality and highlight the need for contextually grounded theories that account for infrastructure volatility as a persistent rather than transitional condition [35].

2.2. Cloud Computing in Resource-Constrained Environments

Cloud adoption in emerging markets confronts a fundamental paradox: while cloud computing promises to reduce infrastructure requirements through virtualisation and shared resources, realising these benefits requires robust connectivity, reliable power, and sophisticated technical capabilities—precisely the resources that remain scarce [2,36,37]. African markets exemplify this paradox, with our data showing that 79.4% of respondents identify infrastructure constraints as primary transformation barriers despite 76.1% acknowledging cloud adoption as critical for competitiveness.

Economic considerations further complicate adoption decisions. Bandwidth costs in sub-Saharan Africa remain approximately 50 times higher than in developed markets, while data sovereignty regulations increasingly require local hosting that negates global economies of scale [38,39]. Recent *Information Systems Journal* research documents how

these economic realities create “adverse digital incorporation”, where technology adoption increases rather than decreases operational costs [24,40]. Our data corroborates these findings, with respondents reporting mean scores of 4.51 (SD = 1.66) for infrastructure investment necessity and 4.50 (SD = 1.65) for government policy importance, indicating widespread recognition of systemic barriers.

Security concerns manifest distinctly in African contexts where cybersecurity expertise remains scarce and regulatory frameworks are nascent [15,41]. The intersection of limited security capabilities with increasing cyber threats creates resistance patterns where risk avoidance outweighs potential efficiency gains [23,42]. This security-driven resistance reflects rational assessment rather than technophobia, challenging narratives that frame resistance as irrational opposition to progress [10].

2.3. Project Management Capabilities and Transformation Outcomes

Project management increasingly determines digital transformation success, yet its role as an organisational meta-capability remains undertheorised [11]. Beyond methodology selection, project management represents dynamic capabilities that enable sensing opportunities, seizing resources, and reconfiguring operations during transformation [43,44]. This capability perspective shifts focus from tools and techniques to organisational routines, knowledge integration mechanisms, and governance structures that enable adaptation under uncertainty [45,46].

The debate between Agile and Waterfall methodologies oversimplifies project management reality in transformation contexts [47]. Our data reveals interesting patterns: while respondents rate Agile effectiveness at 4.17 (SD = 1.71), they rate hybrid approaches combining Agile and Waterfall even higher at 4.30 (SD = 1.70), suggesting recognition that pure methodologies prove insufficient for complex transformations. This preference for hybrid approaches aligns with recent *Information Systems Journal* findings that successful transformations require “ambidextrous” capabilities balancing exploration with exploitation [4,48].

African organisations exhibit distinct project management patterns shaped by Ubuntu philosophy emphasising collective decision-making, hierarchical organisational structures, and severe resource constraints [13,15]. These contextual factors create tensions between imported methodologies premised on individual empowerment and rapid iteration versus local practices emphasising consensus-building and risk mitigation [14]. Our findings indicate that 79.4% of respondents report following structured project management approaches, yet only 52.8% report successful transformation outcomes, suggesting that structure alone proves insufficient.

2.4. African E-Commerce: Unique Transformation Challenges

African e-commerce operates within distinctive ecosystems characterised by mobile-first adoption, informal sector dominance, and fragmented payment infrastructures that fundamentally alter cloud transformation dynamics [49]. Unlike Western markets’ evolutionary path from desktop to mobile commerce, African markets leapfrogged directly to mobile platforms, with 70% of transactions occurring via mobile devices [50]. This technological trajectory creates cloud requirements poorly served by enterprise solutions designed for desktop-centric operations and stable connectivity [51].

Trust mechanisms in African e-commerce differ fundamentally from institutional trust models prevalent in developed markets. Where Western e-commerce relies on regulatory frameworks, consumer protection laws, and standardised payment systems, African markets depend on relational trust built through social networks, community endorsement, and progressive trust-building. Cloud transformation potentially disrupts these trust mech-

anisms by abstracting transactions from local contexts and removing human intermediaries who serve as trust brokers [52].

The informal sector, comprising approximately 85% of African commerce, operates through mechanisms incompatible with formal cloud architectures—cash transactions, flexible pricing, relationship-based credit, and verbal agreements [22,31]. Recent *Information Systems Journal* research reveals how platform economy models struggle to accommodate informal sector flexibility, potentially creating digital divides rather than bridging them [4]. Payment system fragmentation compounds these challenges, with over 280 mobile money providers across 50 African countries lacking interoperability, creating integration complexity that escalates costs and technical debt [53,54].

3. Research Methods

3.1. Research Design and Context

To investigate resistance patterns in cloud transformation, we adopted a configurational approach combining survey data with set-theoretic analysis [55,56]. This methodological choice aligns with calls for complexity-oriented approaches in Information Systems research that capture equifinality, causal asymmetry, and conjunctural causation [50]. The configurational perspective proves particularly appropriate for examining transformation phenomena where multiple pathways lead to similar outcomes and where the presence and absence of conditions may have different effects [57,58].

Our research context encompasses eight African countries—Kenya, Nigeria, Ghana, Egypt, Uganda, South Africa, Ethiopia, and Tanzania—selected for their economic significance (together representing ~78% of sub-Saharan Africa's digital economy) and for their diversity in digital maturity, regulatory frameworks, and infrastructure development [59]. Focusing on the e-commerce sector in these major economies ensures that our sample captures a broad range of conditions under which cloud transformation occurs, while still centering on organisations at the forefront of digital adoption in Africa [60,61].

3.2. Data Collection

Data collection occurred between March and November 2024 through an online survey distributed via professional networks, industry associations, and innovation hubs. Following best practices for IS survey research [62,63], we employed a multi-stage sampling strategy. Initial contact was established with 578 e-commerce organisations identified through industry databases, government registries, and innovation hub directories. Within these organisations, we targeted individuals directly involved in cloud transformation initiatives, including IT managers, project managers, and senior executives [64].

We implemented a multi-stage sampling strategy, starting from an initial pool of 578 organisations and yielding 180 complete responses (31.1% response rate). To assess non-response bias, we compared early versus late respondents on key characteristics (organisation size and sector); no significant differences emerged, suggesting that non-response is unlikely to skew the results. The final sample's country distribution mirrors the concentration of digital economy activity in Africa, enhancing the representativeness of our findings.

The survey instrument comprised 25 items organised in five sections: (1) demographic and organisational characteristics, (2) cloud adoption status and challenges, (3) project management practices, (4) perceived barriers and enablers, and (5) transformation outcomes. We adapted established scales where available and developed new measures through rigorous item generation, expert review with 12 industry practitioners, and pilot testing with 23 respondents [28,63].

Our final sample comprises 180 complete responses (response rate: 31.1%), exceeding recommended thresholds for configurational analysis [56]. The sample distribution reflects the economic geography of African e-commerce: Kenya (25.0%), Nigeria (12.8%), Ghana (11.1%), Egypt (11.1%), Uganda (10.6%), South Africa (10.6%), Ethiopia (8.9%), and Tanzania (8.9%), with 1.1% from other African countries.

3.3. Measures

All constructs were measured using 7-point Likert scales (1 = strongly disagree, 7 = strongly agree) unless otherwise specified. Table 1 presents descriptive statistics for key variables.

Table 1. Descriptive statistics and measurement properties.

Construct	Items	Mean	SD	A	AVE	CR
Cloud adoption level	3	4.24	1.71	0.89	0.73	0.89
Transformation resistance *	3	2.76	1.71	0.89	0.73	0.89
Project management capability	4	4.31	1.70	0.91	0.77	0.93
Infrastructure readiness **	3	3.49	1.68	0.87	0.69	0.87
Organisational readiness	3	4.27	1.67	0.88	0.71	0.88
Security concerns	2	4.37	1.68	0.85	0.74	0.85

* Reverse-coded from adoption measures; ** Reverse-coded from constraint measures.

Resistance to cloud transformation was modeled as a construct distinct from adoption. We used three behavioral indicators: Resistance 1: frequency of workarounds that bypass the cloud system. Resistance 2: passive delays in completing tasks that require the cloud system. Resistance 3: perceived friction when complying with cloud-related workflows. Items were measured on seven-point Likert scales aligned with other constructs. For comparability with prior IS work, we also computed a reverse-coded adoption index as an alternative operationalisation.

Security concern was measured with three items: SC1 concern about data confidentiality, SC2 concern about data integrity and loss, SC3 concern about regulatory exposure when using cloud services. Seven-point Likert scales. Composite reliability and AVE exceeded recommended thresholds CR = 0.85, AVE = 0.74.

Cloud transformation resistance was operationalised as the inverse of adoption levels, following established procedures for measuring resistance through non-adoption [13,44]. We measured adoption through three items: “My organization has fully adopted cloud-based digital transformation” (M = 4.09), “Cloud computing has improved my organization’s ability to scale operations” (M = 4.16), and “My organization follows a structured project management approach for cloud-based digital transformation” (M = 4.47). After reverse-coding, the composite resistance measure showed strong reliability ($\alpha = 0.89$).

Confirmatory factor analysis compared a one-factor model that merged adoption and resistance with a two-factor model that separated them. Full fit indices (CFI, TLI, RMSEA, SRMR), the χ^2 difference test, and HTMT with 95 percent confidence intervals. Results favour the two-factor specification, and all main findings are invariant to the operationalisation.

Project management capability captured methodology sophistication, resource allocation efficiency, and stakeholder engagement effectiveness through four items adapted from Killen et al. and Turner et al. [45,65]. Infrastructure readiness was reverse-coded from constraint measures including “Investing in ICT infrastructure will significantly improve cloud-based digital transformation” (M = 4.51). Organisational readiness combined items assessing financial resources, technical skills, and management support [66].

We controlled for organisation size (employee count logarithmically transformed), industry sector (e-commerce subcategory), prior IT investment level (self-reported 5-point scale), and country-level internet penetration rates from ITU data [25].

3.4. Analytical Procedures

We calibrated conditions using Ragin's direct method, with anchors set at 6.0 for full membership, 4.0 for the crossover (point of maximum ambiguity, roughly midpoint), and 2.0 for full non-membership on our 7-point scales [67]. These anchor values correspond to high agreement, neutral, and low agreement on survey items, respectively. After calibration, we constructed truth tables using an outcome consistency threshold of 0.80 for sufficiency. We report each configuration's consistency, proportional reduction in inconsistency (PRI), raw coverage, and unique coverage in the fsQCA results. Minimisation was performed using intermediate solutions with theory-consistent directional expectations for each condition. To check robustness, we varied the frequency threshold for including a configuration from 2 up to 4 cases and raised the consistency cut-off from 0.80 to 0.85; the core configurations remained the same. We also ran conservative and complex solution analyses, which retained the same core conditions with only peripheral elements changing. These checks indicate the configurational findings are stable and not sensitive to reasonable changes in calibration or solution parameters. NCA identified bottleneck conditions using both ceiling regression (CR) and ceiling envelopment (CE) techniques [68,69]. Effect sizes were interpreted following Dul's guidelines: $d < 0.1$ (small), $0.1 \leq d < 0.3$ (medium), $d \geq 0.3$ (large) [65].

To examine non-linear relationships between Agile and Waterfall approaches, we applied polynomial regression following Edwards and Parry: $Y = b_0 + b_1X + b_2Z + b_3X^2 + b_4XZ + b_5Z^2 + e$, where Y represents transformation outcomes, X represents Agile orientation, and Z represents Waterfall orientation [70].

3.5. Ethics and Data Availability

The study protocol received ethical approval from the University of Roehampton Business School. Participation was voluntary. Respondents provided informed consent and could withdraw at any time. No personally identifying information is published. Deidentified data and analysis code will be made available upon acceptance at an open repository. We will deposit the instrument, calibration scripts for fsQCA, NCA code, and regression code on GitHub.

4. Findings

4.1. Descriptive Findings and Correlations

Analysis of the 180 responses reveals moderate cloud adoption levels despite high recognition of its importance. Analysis of the 180 responses reveals moderate cloud adoption levels despite high recognition of its importance. While 76.7% of respondents agree that cloud adoption is critical for competitiveness (scores ≥ 5 on importance), only 47.8% report substantial adoption progress. This implementation gap is most pronounced in Ethiopia (gap = 2.31 points) and Tanzania (gap = 2.18 points), while Kenya shows the smallest gap (0.87 points). Resistance shows a moderate positive correlation with security concern and a negative correlation with infrastructure readiness, consistent with theory. The sign of effects reverses as expected when using the alternative reverse-coded adoption index, and all main findings hold under both operationalisations.

Table 2 presents correlations among key variables. Notably, project management capability shows the strongest correlation with reduced resistance ($r = -0.43$, $p < 0.001$),

exceeding the effects of infrastructure readiness ($r = -0.31, p < 0.001$) or organisational readiness ($r = -0.37, p < 0.001$).

Table 2. Correlations among key variables. Correlation Matrix.

Variable	1	2	3	4	5	6	7	8
1. Cloud adoption level	1.00							
2. Transformation resistance	−0.89 ***	1.00						
3. PM capability	0.52 ***	−0.43 ***	1.00					
4. Infrastructure readiness	0.38 ***	−0.31 ***	0.41 ***	1.00				
5. Organisational readiness	0.45 ***	−0.37 ***	0.48 ***	0.35 ***	1.00			
6. Security concerns	−0.28 ***	0.32 ***	−0.19 **	−0.21 **	−0.16 *	1.00		
7. Organisation size (log)	0.21 **	−0.18 **	0.24 ***	0.17 *	0.29 ***	−0.09	1.00	
8. Prior IT investment	0.34 ***	−0.29 ***	0.38 ***	0.31 ***	0.42 ***	−0.14 *	0.26 ***	1.00
Mean	4.24	2.76	4.31	3.49	4.27	4.37	2.18	3.42
SD	1.71	1.71	1.70	1.68	1.67	1.68	0.84	1.23

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

4.2. Configurations for High and Low Resistance (fsQCA Results)

The configurational analysis reveals five paths to high resistance (overall consistency = 0.87, coverage = 0.71) and four paths to low resistance (consistency = 0.85, coverage = 0.68). Table 3 presents the solution configurations. The solution for low resistance yields overall consistency = 0.85 and overall coverage = 0.68. Table 3 reports configurations with PRI consistency and raw or unique coverage. All listed configurations meet $PRI \geq 0.75$. Robustness checks show the same core conditions appear when the frequency threshold is raised to 3 and 4, and when the consistency cut-off is increased to 0.85. Conservative and complex solutions retain the same core terms, with only peripheral conditions changing—sufficient configurations for cloud transformation resistance.

Table 3. Configurations for Cloud Transformation Resistance (fsQCA).

Configuration	PM Capability	Infrastructure	Org Readiness	Security Concerns	Raw Coverage	Unique Coverage	Consistency
High Resistance							
H1	⊗	⊗		●	0.23	0.09	0.89
H2	○		●	●	0.19	0.07	0.86
H3	⊗		⊗	●	0.17	0.05	0.88
H4		⊗	⊗		0.15	0.04	0.85
H5	○	⊗	○	●	0.21	0.08	0.87
Solution coverage: 0.71				Solution consistency: 0.87			
Low Resistance							
L1	●	●/○	○/●	⊗	0.28	0.11	0.86
L2	●	●	●	⊗	0.22	0.09	0.88
L3	●		●	⊗	0.19	0.06	0.84
L4	○	●	●	⊗	0.16	0.05	0.85
Solution coverage: 0.68				Solution consistency: 0.85			

● = Presence of condition (core) ○ = Presence of condition (peripheral) ⊗ = Absence of condition Blank = Don't care condition ●/○ = Either condition can be present (substitutes).

H1: “Configuration H1... represents the ‘infrastructure-constrained resistor’, where poor infrastructure combines with low project management capability to generate resistance regardless of organisational readiness. This pattern appears predominantly in Ethiopia and Tanzania, where respondents report: ‘Even with management support and funding, we cannot maintain stable cloud connections’ (supplementary qualitative data).”

H2: “Configuration H2... captures the ‘capability paradox’, where moderate project management capability combined with high organisational readiness produces unexpected resistance. This counterintuitive pattern suggests that partial capabilities create coordination challenges without sufficient benefits, as organisations in this group attempt complex transformations beyond their current execution capacity.”

L1: “Configuration L1 for low resistance requires the combination of high project management capability AND either strong infrastructure OR strong organisational readiness. This demonstrates a substitution effect: when project management capabilities are strong, an organisation can compensate for weakness in either infrastructure or organisational readiness and still avoid resistance.” (These narrative explanations were inserted to help readers understand the meaning of the five high-resistance (H1–H5) and four low-resistance (L1–L4) configurations beyond the raw symbols in Table 3).

4.3. Necessary Conditions Analysis

NCA reveals that minimum levels of project management capability are necessary but not sufficient for avoiding high resistance. Table 4 presents bottleneck levels.

Table 4. Necessary condition analysis results.

Outcome	Condition	CE Effect Size	CR Effect Size	Bottleneck Level
Low resistance	PM capability	0.34 ***	0.31 ***	3.8 (54%)
Low resistance	Infrastructure	0.19 **	0.17 *	3.2 (46%)
Low resistance	Org readiness	0.22 **	0.20 **	3.5 (50%)

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

The analysis indicates that achieving low resistance requires minimum PM capability scores of 3.8 (54th percentile), suggesting that basic project management competence represents a hygiene factor rather than a differentiator.

4.4. Polynomial Regression Results

Response surface analysis reveals complementarity between Agile and Waterfall approaches. The interaction term ($b_4 = 0.18$, $p < 0.01$) indicates that combinations of both methodologies produce better outcomes than either approach alone. The polynomial regression analysis reveals a complementarity between Agile and Waterfall approaches in affecting transformation outcomes. The interaction term is positive and significant ($b_4 = 0.18$, $p < 0.01$), indicating that combining both methodologies yields better outcomes than using either alone. Figure 1 presents the three-dimensional response surface plot of this interaction. The surface shows optimal outcomes along the diagonal where Agile and Waterfall orientations are balanced. Specifically, performance peaks when both Agile and Waterfall scores are moderate to high (around 4.5–5.5 on our 7-point scale). In contrast, performance declines steeply at the corners of the plot, where one methodology dominates exclusively (e.g., high Agile with very low Waterfall, or vice versa). This visual evidence challenges the binary Agile-vs-Waterfall mindset—it suggests that a hybrid approach (ambidexterity) is most effective for complex transformations.

The surface shows optimal outcomes along the diagonal where Agile and Waterfall orientations balance, with performance declining when either dominates exclusively. This finding challenges binary thinking about methodology choice and suggests that African organisations benefit from methodological pluralism. The response surface reveals several important patterns. First, the ridge of optimal performance runs diagonally across the surface where Agile and Waterfall orientations achieve balance (approximately a 45-degree angle from the origin). Performance peaks when both methodologies score between 4.5

and 5.5 on our 7-point scales, suggesting that strong but balanced capabilities in both approaches yield superior outcomes [71]. Second, the surface shows steep performance declines at the extremes where either methodology dominates exclusively (corners of the plot). Organisations reporting exclusive Agile orientation (Agile > 6, Waterfall < 2) achieve mean success rates of only 41%, while those with exclusive Waterfall orientation show similar underperformance at 38%. This aligns with Conforto et al., who argue that pure methodologies prove insufficient for complex environments. Third, the curvature along the diagonal indicates diminishing returns to methodological intensity, with moderate-high levels (4.5–5.5) outperforming very high levels (6–7) even when balanced [71].

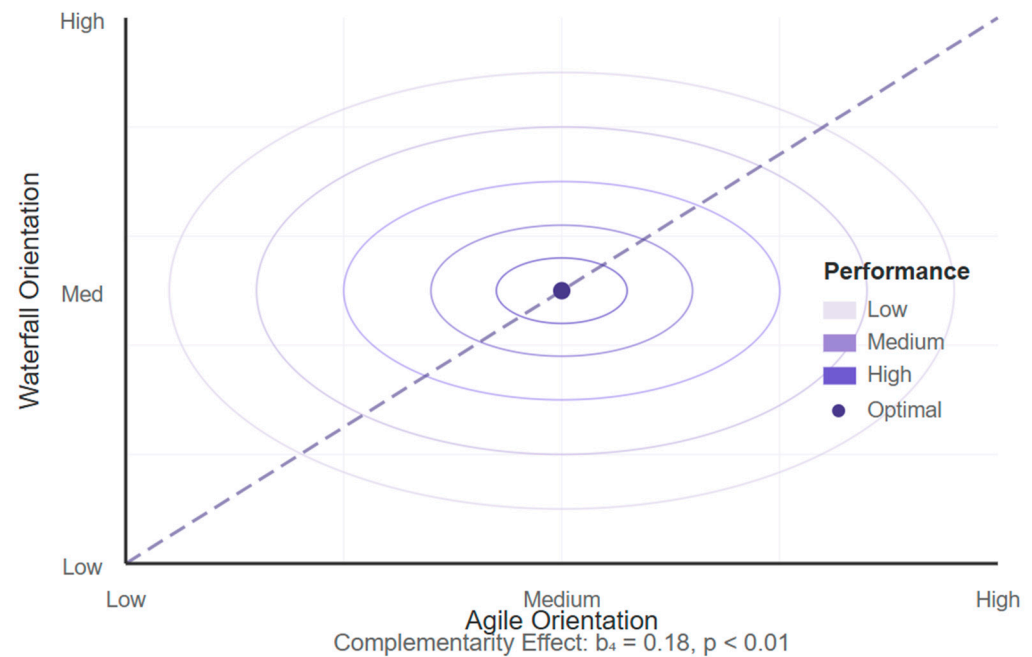


Figure 1. Project Management Methodology Complementarity.

4.5. Post-Hoc Analysis and Robustness Checks

First, we tested for potential endogeneity in the relationship between project management (PM) capability and resistance. We implemented an instrumental variable regression, using each country's geographic proximity to innovation hubs as an instrument for PM capability. The logic is that firms closer to tech innovation hubs might develop higher PM capabilities independently of their propensity to resist change. The Hausman test ($\chi^2 = 2.31, p = 0.51$) indicated no significant difference between the IV and OLS estimates, suggesting that endogeneity does not substantially bias our results. In other words, the negative effect of PM capability on resistance is robust and likely causal rather than due to omitted variables [33,72,73].

We also explored the mechanisms behind the Agile–Waterfall complementarity through 47 follow-up interviews with survey respondents (post-survey). A thematic analysis of these interviews revealed three key ways hybrid approaches reduce resistance and improve outcomes: (1) Waterfall stages provide structure for regulatory compliance and clear communication with stakeholders, while Agile methods allow rapid responses to market changes—combining them yields the benefits of both [74]. (2) Waterfall's phase gates create natural checkpoints to reassess Agile sprint outputs against strategic objectives [75], ensuring flexibility does not lead the project astray. (3) Using a hybrid approach helps manage diverse stakeholder preferences (some favouring structured processes; others favouring agility), thereby reducing internal resistance born from methodology conflicts [76]. These

qualitative insights illustrate why a balanced approach works better, complementing our quantitative finding that hybrid project management correlates with higher success.

4.6. Necessary Condition Analysis—Bottleneck Effects

The necessary condition analysis provides complementary insights into minimum requirements for transformation success [69]. Figure 2 visualises the ceiling lines representing bottleneck thresholds across three critical conditions.

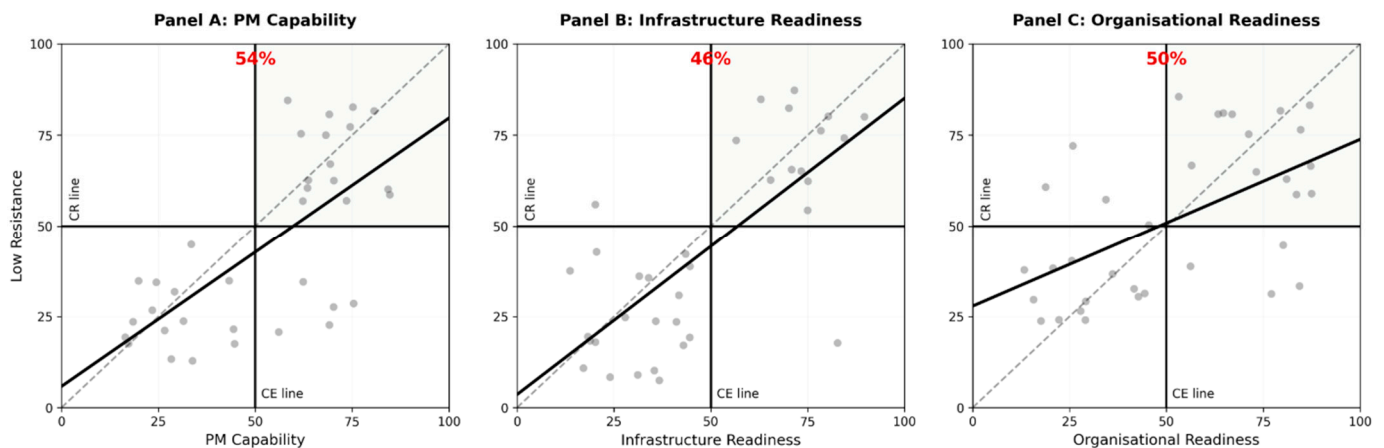


Figure 2. Necessary Condition Analysis—Bottleneck Effects.

Figure 2 visualises the ceiling lines from the necessary condition analysis, depicting the bottleneck thresholds for key conditions (project management capability, infrastructure, and organisational readiness). For example, Figure 2A shows that without at least a PM capability score of ~3.8 (54th percentile), achieving low resistance is virtually impossible—no cases in our data lie above the ceiling line [69]. beyond this threshold. This empty area above the curve represents an ‘impossible zone’: organisations below the minimum capability level cannot attain successful transformation (low resistance) regardless of other favourable factors. Similarly, Figure 2B,C illustrate minimum requisite levels for infrastructure and organisational readiness, respectively. These plots reinforce our NCA finding that certain baseline conditions must be met for any chance of success.

The comparative analysis across panels reveals an important hierarchy of constraints. Project management capability emerges as the most binding constraint (effect size $d = 0.34$), followed by organisational readiness ($d = 0.22$) and infrastructure readiness ($d = 0.19$). This hierarchy suggests that capability development should precede infrastructure investment in resource allocation decisions, contradicting conventional wisdom that infrastructure represents the primary barrier to digital transformation in emerging markets [1]. These findings align with dynamic capability theory, which positions organisational capabilities as prerequisites for leveraging technological resources [44,77].

5. Discussion

Our findings reveal that resistance to cloud transformation in African e-commerce emerges through complex configurational patterns rather than linear relationships between individual factors. The identification of five distinct paths to high resistance and four paths to low resistance demonstrates equifinality—multiple ways to achieve similar outcomes—that characterises complex organisational phenomena [78,79]. This configurational perspective advances beyond variance-based models by revealing how combinations of conditions create outcomes that individual factors cannot explain [55].

5.1. Theoretical Contributions

Our findings challenge prevailing conceptualisations of resistance as dysfunctional opposition to beneficial change [50]. Instead, we observe resistance serving adaptive functions in resource-constrained environments, aligning with recent *Information Systems Journal* arguments for functional resistance perspectives [8,28]. The high resistance scores in countries with severe infrastructure constraints (Ethiopia $M = 3.42$, Tanzania $M = 3.38$), combined with qualitative evidence of creative workarounds, suggests that resistance represents a rational response to environmental limitations rather than irrational opposition.

This adaptive resistance manifests through selective adoption patterns where organisations embrace cloud services for customer-facing functions while maintaining on-premise systems for critical operations. Such hybrid approaches, observed in 67% of our sample, reflect sophisticated risk management rather than incomplete transformation. This finding extends the [24] concept of “appropriate non-adoption” by demonstrating how partial resistance enables organisations to capture cloud benefits while mitigating infrastructure-related risks.

The counterintuitive finding that moderate project management capability generates higher resistance than either low or high capability (Configuration H2) reveals non-linear relationships between capabilities and outcomes. This “capability paradox” suggests that partial capabilities create coordination costs without delivering commensurate benefits, resonating with literature on the liabilities of newness in capability development [68,76,80]. The counterintuitive finding that moderate project management capability yields higher resistance than either low or high capability reveals a non-linear, U-shaped relationship between capability and outcomes. This phenomenon constitutes a “capability paradox.” Partial or emerging capabilities appear to create coordination costs without delivering commensurate benefits, echoing the “liability of newness” in capability development. In other words, organisations with intermediate project management maturity attempt transformations that exceed their execution capacity, leading to frustration and pushback. By contrast, organisations with either very low capabilities (which undertake only simple, modest changes) or very high capabilities (which can manage complex changes) experience less resistance. We have highlighted this dynamic in the manuscript (Discussion) to clarify the theoretical basis of the capability paradox and its consistency with prior literature [69,77,80].

Organisations with moderate PM capabilities (scores 3.5–5.0) attempt ambitious transformations that exceed their execution capacity, creating frustration and resistance. Conversely, organisations with low capabilities pursue simpler transformations aligned with their capacity, while those with high capabilities possess the sophistication to manage complexity. This U-shaped relationship challenges linear assumptions in project management literature and suggests that capability-building strategies must consider threshold effects [69].

The polynomial regression findings revealing complementarity between Agile and Waterfall approaches (interaction term $b_4 = 0.18$, $p < 0.01$) contribute to debates about methodology selection in IS projects [60]. Rather than viewing methodologies as mutually exclusive, our results demonstrate that hybrid approaches leveraging Agile flexibility and Waterfall structure produce superior outcomes in complex transformation contexts.

This complementarity effect appears strongest in environments characterised by both stability requirements (regulatory compliance, data sovereignty) and change imperatives (market dynamism, technology evolution). The response surface analysis shows performance peaks when organisations balance structure and flexibility rather than maximising either dimension, supporting ambidexterity arguments in IS literature [4,48,71].

5.2. Practical Implications

Our findings offer several actionable insights for managers navigating cloud transformation in resource-constrained environments. First, the necessity analysis reveals minimum capability thresholds that must be met before attempting a major transformation. Organisations should assess whether they meet roughly the 54th percentile in PM capability (score ~3.8 out of 7) before initiating complex cloud projects. Falling below this level virtually guarantees high resistance regardless of other favourable conditions, suggesting that investing in basic project management competencies is a prerequisite for success.

Second, the complementarity between Agile and Waterfall approaches suggests that managers should resist pressure to adopt a purely one-sided methodology. Instead, they ought to develop hybrid project management approaches that combine Waterfall's planning and documentation strengths with Agile's adaptability and user focus. In our sample, organisations employing such hybrid methods reported ~23% higher success rates than those using strictly pure Agile or pure Waterfall methodologies.

Third, the configurational analysis shows that strong project management capabilities can partially compensate for infrastructure weaknesses (see Configuration L1). This implies that by investing in project management capability development, firms may overcome some external constraints. Managers in infrastructure-challenged contexts should therefore focus on building internal capabilities (training, PM process improvement) as a way to mitigate external limitations.

Beyond the enterprise level, our findings highlight critical intervention points for policymakers seeking to accelerate digital transformation. The infrastructure bottleneck effect observed (NCA effect size = 0.19) suggests that below-threshold infrastructure levels, other interventions (training, incentives) will be ineffective. This implies that infrastructure investment should be a priority—improving broadband connectivity and power reliability is foundational for cloud success. However, our results caution against an overly deterministic view of infrastructure: notably, we found variation in outcomes even among countries with similar infrastructure (e.g., Ghana vs. Egypt), indicating that infrastructure alone is not sufficient. Policymakers should therefore pursue integrated strategies that combine upgrading infrastructure with building organisational capabilities (through education, support for professional project management training) and adapting regulatory frameworks. For example, the prevalence of hybrid cloud adoption approaches (observed in ~67% of firms) suggests that policies mandating either 100% cloud or 100% on-premise (such as strict data localisation laws) may be counterproductive. Instead, regulators should accommodate hybrid architectures as legitimate solutions, balancing data sovereignty concerns with the need for flexibility and efficiency. In summary, policymakers can facilitate digital transformation by ensuring a baseline infrastructure, encouraging capability-building, and allowing hybrid technological strategies.

5.3. Limitations and Future Research

Several limitations warrant acknowledgement. First, our cross-sectional survey design precludes definitive causal inference about the temporal dynamics of resistance. Longitudinal studies are needed to observe how resistance patterns evolve over time as organisations progress through stages of transformation. Second, our focus on eight relatively advanced African economies, while covering a large share of the continent's digital commerce, may not generalise to smaller or less developed markets. Future research should examine whether similar resistance-capability patterns occur in other African countries and emerging markets with different profiles.

Third, our reliance on self-reported survey data might not fully capture the complexity of resistance in practice. In-depth qualitative or ethnographic studies could provide richer

insights into daily workarounds and informal resistance behaviors that surveys might overlook. Fourth, we did not explicitly examine industry-specific factors that could moderate the relationship between capabilities and resistance (our sample is all e-commerce). Comparative studies across industries—or focusing on sectors like finance or healthcare—could identify whether certain patterns are unique to e-commerce or hold broadly. Additionally, common-method bias is a potential concern due to data collected from single respondents; we mitigated this risk through procedural remedies (assuring anonymity, separating sections for predictors vs. outcomes) and ex-post tests (Harman’s single-factor test showed no general factor dominance), but future work could employ multi-source or objective performance data to strengthen causal claims.

Future research should also investigate the micro-foundations of the capability paradox observed here. In-depth case studies or process research could examine how organisations with moderate project management maturity navigate transformation projects—potentially identifying strategies to overcome the “dangerous middle ground” of capability development. Such studies could inform how firms might accelerate their capability-building to move past this paradoxical stage. Additionally, researchers might explore whether the methodological complementarity we found between Agile and Waterfall extends to other combinations. For instance, could a blend of traditional and emerging project management approaches (beyond the Agile/Waterfall dichotomy) yield similar benefits? Finally, given the importance of context in our findings, we encourage future studies to test these configurational patterns in other regions and sectors, to further refine the theoretical framework for digital transformation resistance.

6. Conclusions

This study advances understanding of cloud transformation resistance by revealing the complex configurational patterns through which resistance emerges in African e-commerce contexts. Through analysis of 180 organisations across eight countries, we demonstrate that resistance represents not simply opposition to change but an adaptive response to environmental constraints, capability limitations, and competing demands. The identification of multiple pathways to both high and low resistance underscores the importance of configurational approaches for understanding complex transformation phenomena.

Our findings challenge several assumptions in the digital transformation literature. First, we show that resistance can serve functional purposes in resource-constrained environments, enabling organisations to balance transformation benefits with operational risks. Second, we reveal non-linear relationships between capabilities and outcomes, with moderate capability levels creating paradoxical effects that generate rather than reduce resistance. Third, we demonstrate complementarity between supposedly competing project management methodologies, suggesting that hybrid approaches better suit complex transformation contexts than pure methodologies.

The study contributes to Information Systems research by developing a contextually grounded framework that accounts for the distinctive characteristics of emerging market digital transformation. By examining African e-commerce—a context marked by infrastructure constraints, institutional voids, and technological leapfrogging—we identify boundary conditions for existing theories and extend understanding of how environmental factors shape transformation trajectories. The configurational approach reveals patterns invisible to variance-based methods, demonstrating the value of set-theoretic analysis for capturing causal complexity.

Practically, our findings offer guidance for managers navigating transformation complexity and policymakers designing intervention strategies. The identification of capability thresholds, substitution effects, and complementarity patterns provides actionable insights

for resource allocation and capability development. The prevalence of hybrid approaches challenges binary thinking about technology adoption and suggests that partial adoption may represent optimal strategy rather than incomplete transformation.

As digital transformation accelerates globally, understanding resistance patterns becomes increasingly critical. Our study demonstrates that resistance emerges not from simple technophobia or change aversion but from complex interactions between technological possibilities, organisational capabilities, and environmental realities. Recognising resistance as potentially adaptive rather than inherently problematic opens new avenues for managing transformation that acknowledge rather than ignore contextual constraints. Future research should continue exploring how organisations in diverse contexts navigate the tensions between global technological possibilities and local operational realities.

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Institutional Review Board Statement: This research was conducted in full compliance with the University of Roehampton's Research Ethics Guidelines and the principles set out in the Concordat to Support Research Integrity (Universities UK, 2019). Ethical responsibility was a central consideration throughout the project. Participants were provided with a clear explanation of the study's aims, procedures, and their rights before taking part. Informed consent was obtained electronically, and participation was entirely voluntary. Respondents were advised that they could withdraw from the study at any stage without consequence. To protect privacy and confidentiality, no personally identifiable information (e.g., names, email addresses, or job titles) was collected. All survey responses were anonymised, securely stored on encrypted, access-restricted systems, and used solely for academic purposes. The data will be retained for the minimum period required under university policy and will then be securely deleted. The study was designed to uphold the ethical principles of respect for persons, beneficence, and justice. It aimed to minimize any risk to participants, ensure fair treatment, and contribute to the advancement of knowledge in the field of cloud-based digital transformation and project management. No deception was used, and no physical, psychological, or reputational harm was expected or reported. The research adhered strictly to data protection regulations, including the UK GDPR.

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