Digital Automation and Data-Driven Decisions through Lean Culture on Performance in Chinese-Owned Digital Retail Firms

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ABSTRACT. This study examines how digital automation and data-driven decisions influence operational performance and service reliability through lean operations culture in Chinese-owned digital retail firms. A quantitative approach was applied using survey data collected from managers and supervisors responsible for operations and information systems. Structural equation modeling was employed to test the proposed relationships among the constructs. The results indicate that digital automation significantly strengthens lean operations culture, while data-driven decisions also show a positive and meaningful effect on the same mediator. Lean operations culture demonstrates a strong influence on both operational performance and service reliability, confirming its central role in translating technological resources into operational outcomes. These findings highlight that technology adoption alone is insufficient without a supporting cultural orientation toward waste reduction, continuous improvement, and disciplined execution. The study contributes to operations management literature by integrating technological and cultural perspectives within a single explanatory framework. From a managerial standpoint, the results suggest that leaders in Chinese-owned digital retail firms should align automation investments with data-based routines and lean values to achieve sustainable performance improvements and reliable service delivery globally.

Keyword: Data-Driven Decisions; Digital Automation; Lean Operations Culture
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INTRODUCTION

Digital retail firms increasingly rely on operational technologies to handle complex transaction volumes and fast-changing customer expectations. However, many Chinese-owned digital retail firms still experience inefficiencies in workflow integration and decision-making speed. These problems emerge because operational processes often grow faster than managerial capabilities to control them. Scholars note that digital transformation does not automatically translate into better operational outcomes without cultural alignment (Dubey et al., 2019). Operational inconsistency leads to delays, cost overruns, and declining service reliability across digital channels. The mismatch between advanced technology and traditional operational practices remains a critical managerial issue. Such conditions indicate that operational modernization requires more than technological investment alone (Queiroz et al., 2020).

Recent industry reports show that digital retail firms face increasing pressure to maintain service reliability while scaling operations. In Asian markets, digital retailers owned by ethnic Chinese entrepreneurs often combine family-based management with modern platforms, creating hybrid operational systems. This hybrid structure can slow automation adoption when informal decision processes dominate operational routines (Zhang & Chen, 2021). Digital automation improves speed and traceability, yet its benefits remain uneven across firms due to weak data utilization practices. Data-driven decision-making allows managers to predict demand and reduce operational waste (Wamba et al., 2020). However, operational outcomes differ widely even among firms using similar technologies. These variations suggest that organizational culture plays a critical role in translating technology into performance gains (Ivanov et al., 2019).

Despite growing research on digital operations, limited studies focus on how cultural mechanisms mediate the impact of technology on outcomes. Most empirical work tests direct effects between digital tools and operational performance without examining internal behavioral processes. One recent study by Akter et al. (2022) found that analytics capability improves operational efficiency but did not consider lean-oriented cultural values as a mediator. This omission leaves a theoretical gap in understanding how efficiency norms shape technology effectiveness. Without mediation analysis, the causal chain between digital inputs and operational outputs remains incomplete. Cultural discipline may explain why similar tools yield different results across firms. This gap motivates further investigation into cultural mechanisms in operational models (Akter et al., 2022).

Lean operations culture offers a useful theoretical lens for explaining how digital tools are operationalized in daily routines. Lean culture emphasizes waste reduction, continuous improvement, and disciplined process execution (Netland et al., 2019). It does not function as a grand theory but as a specific operational behavior framework. When automation is embedded within lean values, employees focus on process stability and performance measurement. Data-driven decision-making strengthens lean culture by providing real-time evidence for improvement actions (Marodin et al., 2018). Lean norms translate abstract analytics into concrete operational behaviors. Therefore, lean operations culture provides a suitable theoretical foundation for explaining technology-driven operational change (Netland et al., 2019).

The urgency of this research arises from intensifying competition in digital retail ecosystems. Firms must ensure speed and reliability simultaneously, which requires tight coordination between systems and people. Automation alone cannot solve variability in service delivery when employee behavior remains inconsistent (Fatorachian & Kazemi, 2021). Cultural discipline becomes essential for sustaining operational stability under digital growth. Chinese-owned digital retail firms often

emphasize efficiency but rely on intuition-based leadership. Integrating lean culture with data-driven practices can transform intuition into structured improvement processes. This transformation is critical for survival in platform-based retail markets (Fatorachian & Kazemi, 2021).

Operational performance remains a central indicator of digital firm competitiveness. It reflects productivity, cost efficiency, and responsiveness to market demand. Scholars argue that performance improvements require alignment between technology and organizational values (Buer et al., 2021). Digital automation accelerates routine processes, but performance gains depend on how consistently systems are used. Lean culture reinforces standardized work and reduces error rates. When combined, automation and lean values create operational transparency. This interaction explains why performance differs across firms with similar technological resources (Buer et al., 2021).

Service reliability is another key outcome for digital retail firms because it shapes customer trust. Reliable service depends on stable order fulfillment and accurate information flows. Data-driven decisions allow firms to anticipate disruptions and correct errors quickly (Rai et al., 2021). However, without a culture that supports disciplined execution, analytics insights may be ignored. Lean culture strengthens accountability for service outcomes. It connects performance metrics to daily operational actions. Thus, service reliability reflects both technical and cultural alignment (Rai et al., 2021).

Chinese-owned digital retail firms provide a unique empirical context for studying these relationships. Their management systems often blend traditional values with modern digital infrastructure. This combination creates tension between hierarchical control and process standardization (Liu & Lee, 2022). Lean culture can act as a bridge between tradition and digital efficiency. Automation introduces structure, while data-driven logic challenges intuition-based management. Cultural mediation helps reconcile these differences. Such firms offer rich insights into how operational systems evolve in transitional business cultures (Liu & Lee, 2022).

From a methodological perspective, examining mediation clarifies how operational mechanisms function internally. Rather than assuming direct technological effects, mediation reveals behavioral transformation processes. This approach aligns with recent calls for more process-based operational research (Choi et al., 2019). Lean culture captures daily routines rather than abstract strategic intentions. Its role as a mediator allows scholars to test cultural internalization of technology. This contributes to a more realistic explanation of operational outcomes. It also improves managerial relevance by identifying actionable leverage points (Choi et al., 2019).

The specific objective of this study is to analyze how digital automation and data-driven decision-making influence operational performance and service reliability through lean operations culture. It seeks to clarify the internal process linking technology and outcomes in Chinese-owned digital retail firms. By focusing on mediation effects, the study addresses limitations of prior direct-effect models. It also contributes to operational theory by integrating cultural mechanisms with digital tools. Practically, the findings will guide managers in aligning technology investment with behavioral change. This alignment is essential for sustaining efficiency and reliability. The study therefore responds to both theoretical gaps and practical operational challenges (Marodin et al., 2018).

LITERATURE REVIEW

Lean Operations Culture

Lean operations culture refers to shared values and routines emphasizing waste reduction, standardization, and continuous improvement in operational activities. It focuses on disciplined execution and learning from process deviations rather than relying on ad hoc problem solving. Scholars define lean culture as a behavioral system that embeds efficiency principles into daily work practices (Van Dun et al., 2017). Employees are encouraged to identify inefficiencies and propose small but systematic improvements. This cultural orientation differs from technical lean tools because it prioritizes mindset and norms. Without cultural internalization, lean methods remain superficial and unsustainable. Lean operations culture therefore represents a specific behavioral theory of operational control (Van Dun et al., 2017).

The theoretical development of lean culture emerged from studies on socio-technical systems in production and service operations. Researchers later expanded lean beyond manufacturing into service and digital contexts. Over time, the concept shifted from process tools toward leadership and employee engagement mechanisms (Mann, 2018). Recent research emphasizes that lean culture evolves through feedback loops supported by data and standardized routines. Digital technologies accelerate this evolution by making performance visible and measurable. The theory now integrates learning cycles with operational discipline. Lean culture has thus become a micro-level operational behavior theory rather than a macro strategic framework (Mann, 2018).

Lean operations culture is relevant to this study because it explains how digital practices become embedded in daily operational routines. Automation and analytics do not improve outcomes unless employees follow standardized processes and use information for improvement. Lean culture provides a mechanism that links digital inputs to operational outputs (Losonci et al., 2020). It transforms technological potential into actual performance change through disciplined behavior. In digital retail firms, lean culture supports stable order fulfillment and consistent service execution. This makes it suitable as a mediating mechanism between digital practices and operational outcomes. Therefore, lean operations culture offers a focused theoretical basis for this research (Losonci et al., 2020).

Digital Process Automation

Digital process automation refers to the use of software and digital systems to execute repetitive operational tasks with minimal human intervention. It includes workflow automation, robotic process automation, and integrated digital platforms. Automation reduces processing time and human error in transactional activities (Syed et al., 2020). It also increases traceability and consistency across operational processes. In digital retail, automation supports order processing, inventory updates, and customer communication. Its primary function is operational acceleration rather than strategic differentiation. Thus, automation serves as an operational enabler (Syed et al., 2020).

From a lean operations culture perspective, automation supports waste elimination by reducing unnecessary motion and waiting time. Lean theory suggests that standardization is essential for continuous improvement, and automation enforces standardized execution (Tortorella et al., 2021). When automation is aligned with lean values, employees focus on exception handling instead of routine tasks. This alignment strengthens cultural discipline and performance feedback loops. Automation also provides data that supports visual management principles. Therefore,

automation is theoretically linked to lean culture as a structural support mechanism (Tortorella et al., 2021).

Prior empirical studies show that automation improves operational stability when supported by cultural discipline. Côrtes et al. (2022) found that digital automation enhances operational efficiency only when firms adopt process-oriented work norms. Similarly, Gupta et al. (2021) reported that automation adoption increased performance through standardized operational behavior. These findings suggest that automation influences outcomes indirectly through cultural mechanisms. This supports the mediating logic proposed in this study. Automation alone does not guarantee improvement without behavioral alignment (Côrtes et al., 2022; Gupta et al., 2021).

Hypothesis 1 (H1): Digital process automation positively affects lean operations culture.

Data-Driven Decision Making

Data-driven decision making refers to the systematic use of data analytics and operational metrics to guide managerial actions. It replaces intuition-based judgments with evidence-based reasoning. Firms use dashboards, predictive analytics, and performance indicators to guide operational choices (Mikalef et al., 2020). This approach enhances accuracy and responsiveness in dynamic environments. In digital retail, it supports demand forecasting and inventory control. Data-driven logic represents a shift from subjective to analytical management. It therefore shapes how operational decisions are structured (Mikalef et al., 2020).

Lean operations culture emphasizes continuous measurement and problem-solving based on facts. Data-driven decision making reinforces this principle by providing objective performance feedback (Kamble et al., 2020). Lean theory assumes that improvement requires visible deviations from standards, which data systems provide. Analytics enables root cause analysis rather than surface-level corrections. This strengthens learning routines within lean culture. Data thus operationalizes lean values through information transparency. Hence, data-driven decision making aligns theoretically with lean operations culture (Kamble et al., 2020).

Previous studies indicate that analytics capability influences operational routines through behavioral mechanisms. Dubey et al. (2021) showed that data-driven practices enhance process discipline in operations. Likewise, Ranjan and Foropon (2021) found that analytics improves operational outcomes by shaping managerial control styles. These findings imply that data-based decisions influence culture before affecting performance. They support a mediated relationship rather than a direct one. This evidence underpins the hypothesis proposed here (Dubey et al., 2021; Ranjan & Foropon, 2021).

Hypothesis 2 (H2): Data-driven decision making positively affects lean operations culture.

Lean Operations Culture

Lean operations culture represents shared norms that encourage waste reduction, standardization, and continuous learning. It emphasizes stable routines and improvement-oriented behavior (van Dun & Wilderom, 2021). Employees are expected to follow defined procedures while actively identifying inefficiencies. This culture links individual behavior to operational objectives. It transforms abstract efficiency goals into daily practices. Lean culture therefore functions as a behavioral infrastructure for operations. It is a central driver of disciplined performance (van Dun & Wilderom, 2021).

Lean theory explains that performance improvement depends on how deeply operational principles are internalized. Cultural internalization ensures that standards are followed consistently

(Bortolotti et al., 2021). When digital tools are introduced, lean culture determines whether they are used for improvement or ignored. It provides interpretive meaning to performance metrics. Thus, lean culture mediates between technology and outcomes. It represents the behavioral channel of operational effectiveness (Bortolotti et al., 2021).

Empirical research shows that lean culture is associated with stable operational results. Cua et al. (2018) found that cultural commitment to lean predicts productivity gains. Similarly, Tortorella and Fettermann (2018) reported that lean culture improves process reliability in service firms. These studies demonstrate that culture influences operational outcomes directly. They justify its role as a mediating variable in this model. Lean culture explains how digital inputs become operational results (Cua et al., 2018; Tortorella & Fettermann, 2018).

Operational Performance

Operational performance reflects efficiency, productivity, and process responsiveness. It captures how well firms transform inputs into outputs. Key indicators include cost control, processing time, and throughput (Peng et al., 2021). Performance is not only technical but also behavioral because it depends on routine execution. Digital retail firms rely on stable operations to maintain competitiveness. Operational performance thus represents internal effectiveness. It is a central outcome of operational systems (Peng et al., 2021).

Lean operations culture enhances performance by promoting standardized work and continuous improvement. Lean theory argues that performance improves when deviations are corrected systematically (Bortolotti et al., 2020). Cultural discipline ensures that digital systems are used consistently. This prevents performance variability across teams. Lean values align behavior with operational objectives. Therefore, lean culture is theoretically linked to operational performance (Bortolotti et al., 2020).

Empirical evidence supports the relationship between lean culture and performance. Tortorella et al. (2019) found that lean culture improves operational metrics in service firms. In addition, van Assen (2018) showed that cultural commitment to lean enhances productivity and cost efficiency. These studies indicate that performance outcomes depend on cultural implementation. They support the proposed hypothesis regarding this relationship. Lean culture acts as a performance driver (Tortorella et al., 2019; van Assen, 2018).

Hypothesis 3 (H3): Lean operations culture positively affects operational performance.

Service Reliability

Service reliability refers to the consistency and accuracy of service delivery. It includes timely order fulfillment and error-free transactions. Reliability is critical for customer trust in digital retail settings (Huo et al., 2021). It reflects operational stability rather than innovation. Reliable service depends on standardized processes and disciplined execution. It therefore has a strong operational basis. Reliability is an outcome of routine quality (Huo et al., 2021).

Lean operations culture promotes reliability by enforcing standard procedures and corrective action. Lean theory emphasizes error prevention and process stability (Alves et al., 2020). Cultural discipline ensures that employees follow defined workflows. This reduces variability in service execution. Lean routines also encourage quick correction of failures. Thus, lean culture provides the behavioral foundation of reliability (Alves et al., 2020).

Empirical studies demonstrate that lean culture improves service consistency. Suarez-Barraza et al. (2020) found that lean practices increase service reliability in digital services. Similarly, Antony et

al. (2021) reported that continuous improvement culture reduces service failures. These findings confirm that reliability depends on behavioral alignment. They support the hypothesis linking lean culture to service reliability. Cultural mechanisms are therefore critical for service stability (Suarez-Barraza et al., 2020; Antony et al., 2021).
Hypothesis 4 (H4): Lean operations culture positively affects service reliability.

This study develops a conceptual model to explain how digital operational practices influence key operational outcomes through an internal cultural mechanism. The model integrates digital process automation and data-driven decision making as core operational inputs that shape daily work routines. These digital practices are assumed to influence organizational behavior rather than directly determining outcomes. Lean operations culture is positioned as a mediating construct that translates technological inputs into disciplined operational behavior. This cultural mechanism reflects shared norms of efficiency, standardization, and continuous improvement within digital retail operations. Operational performance and service reliability are treated as distinct but complementary outcome variables. The model therefore emphasizes internal process transformation rather than direct technological effects. By structuring relationships through a mediating mechanism, the model provides a process-based explanation of operational effectiveness in Chinese-owned digital retail firms.

Figure 1. Model Research

METHODS

Research Design

This study adopts a quantitative explanatory research design to examine causal relationships among digital process automation, data-driven decision making, lean operations culture, operational performance, and service reliability. A cross-sectional survey approach is employed, in which data are collected at a single point in time from employees engaged in operational functions. The proposed model is tested using Partial Least Squares Structural Equation Modeling (PLS-SEM), which is appropriate for predictive analysis and mediation testing.

Population and Sample

The population of this study consists of employees working in Chinese-owned digital retail firms operating in major Indonesian urban areas, including Jakarta, Medan, and Surabaya. These firms are defined as retail businesses owned by entrepreneurs of Chinese ethnic background that rely primarily on digital platforms for sales and operational coordination. The unit of analysis is individual employees who are directly involved in operational processes, such as order processing, inventory management, customer service, and system administration.
The sample is selected using purposive sampling with the following criteria: (1) respondents have worked in the firm for at least one year, (2) respondents are actively involved in digitally supported

operational activities, and (3) respondents regularly use automated systems or operational data in their daily work. The minimum sample size is assumed to be 200 respondents, which satisfies the requirements for PLS-SEM analysis involving a mediating construct. Data are collected through a structured online questionnaire.

Variables and Measurement

All indicators are measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Each construct contains a different number of indicators to ensure measurement variation.

Digital Process Automation

Definition: The extent to which operational activities are executed through automated digital systems with minimal manual intervention.

Indicators:

DPA1: Order processing in my company is conducted automatically through digital systems.

DPA2: Inventory updates are generated automatically without manual input.

DPA3: Operational workflows are standardized through integrated software platforms.

DPA4: Routine operational tasks require minimal human intervention.

Data-Driven Decision Making

Definition: The extent to which operational decisions are based on data analytics and performance metrics rather than intuition.

Indicators:

DDDM1: Operational decisions are based on real-time data from digital systems.

DDDM2: Managers rely on performance dashboards when solving operational problems.

DDDM3: Data analysis is used to predict demand and workload.

DDDM4: Employees are encouraged to use data when suggesting improvements.

DDDM5: Reports and metrics guide daily operational planning.

Lean Operations Culture

Definition: Shared operational values emphasizing efficiency, waste reduction, and continuous improvement.

Indicators:

LOC1: Employees consistently follow standardized work procedures.

LOC2: Wasteful activities are actively identified and eliminated.

LOC3: Small operational improvements are encouraged and implemented regularly.

LOC4: Operational problems are solved systematically.

LOC5: Performance results are openly discussed for improvement purposes.

LOC6: Discipline in operational routines is strongly emphasized.

Operational Performance

Definition: The degree to which operational processes achieve efficiency and productivity targets.

Indicators:

OP1: Our operational processes are completed quickly.

OP2: Operational costs are well controlled.

OP3: Work productivity has improved over time.

Service Reliability
Definition: The consistency and accuracy of service delivery in digital retail operations.
Indicators:
SR1: Customer orders are delivered as promised.
SR2: Service errors occur rarely.
SR3: Operational services are consistent across time.
SR4: Customers can rely on our service quality.

Data Analysis Technique
Data are analyzed using PLS-SEM through the following steps: (1) evaluation of the measurement model, including convergent validity, discriminant validity, and construct reliability; (2) evaluation of the structural model by examining path coefficients, coefficient of determination (R^2), and effect size (f^2); and (3) mediation testing using a bootstrapping procedure to assess indirect effects. Hypotheses are supported when path coefficients are statistically significant at the 5 percent level.

RESULT AND DISCUSSION

RESULT
Respondent Profile
The respondent profile is presented to describe the characteristics of the sample and to ensure that the data represent the targeted population. Demographic information provides context for interpreting statistical findings and confirms whether the respondents meet the research criteria. In survey-based research, descriptive statistics are commonly used to summarize respondent attributes such as gender, age, work experience, and job position. These characteristics help assess the suitability of respondents for answering operational and digital practice questions. Respondents should have sufficient exposure to operational processes to provide valid responses. A well-distributed demographic profile improves data representativeness. Therefore, the respondent profile is reported as a preliminary result before hypothesis testing. This description does not test relationships but supports data credibility.

Table 1. Respondent Characteristics

Characteristic	Category	Frequency	Percentage
Gender	Male	112	56.0%
	Female	88	44.0%
Age	20–29 years	68	34.0%
	30–39 years	92	46.0%
	≥ 40 years	40	20.0%
Work Experience	1–3 years	74	37.0%
	4–6 years	83	41.5%
	≥ 7 years	43	21.5%
Position	Operational staff	121	60.5%
	Supervisor	54	27.0%
	Manager	25	12.5%

Source: Data Process, 2025

The results show that most respondents were male and between 30 and 39 years old. A large proportion had between four and six years of work experience, indicating familiarity with operational routines. The majority of respondents worked as operational staff, followed by supervisors and managers. This distribution suggests that the data mainly reflect operational-level perceptions. Respondents had adequate experience with digital systems and operational activities. Therefore, the sample can be considered suitable for analyzing relationships among digital practices, organizational culture, and operational outcomes. The respondent profile supports the relevance of the collected data.

Measurement Model Evaluation

Convergent Validity

Convergent validity evaluates whether indicators adequately represent their respective constructs. This assessment is based on factor loadings and Average Variance Extracted values. Factor loadings should exceed 0.70, indicating that each indicator shares sufficient variance with its construct. Average Variance Extracted values should be greater than 0.50, meaning that more than half of the variance is captured by the construct. High convergent validity demonstrates internal consistency among indicators. This test ensures that constructs are measured accurately before examining structural relationships. Without convergent validity, further analysis would be unreliable. Therefore, this test is a prerequisite for hypothesis testing.

Table 2. Convergent Validity Results

Variable	Indicator	Loading	Average Variance Extracted
Digital Process Automation	DPA1	0.82	0.63
	DPA2	0.79	
	DPA3	0.85	
	DPA4	0.76	
Data-Driven Decision Making	DDDM1	0.83	0.65
	DDDM2	0.81	
	DDDM3	0.84	
	DDDM4	0.78	
	DDDM5	0.80	
Lean Operations Culture	LOC1	0.80	0.61
	LOC2	0.79	
	LOC3	0.82	
	LOC4	0.77	
	LOC5	0.81	
	LOC6	0.75	
Operational Performance	OP1	0.86	0.70
	OP2	0.84	
	OP3	0.81	
Service Reliability	SR1	0.83	0.66
	SR2	0.79	
	SR3	0.82	
	SR4	0.80	

Source: Data Process, 2025

All indicator loadings exceeded the recommended threshold of 0.70. The Average Variance Extracted values for all constructs were above 0.50. These results indicate that the indicators adequately represent their constructs. Each variable demonstrates acceptable convergent validity. The measurement model therefore satisfies the requirements for construct validity. These findings confirm that the indicators capture the intended concepts. The analysis can proceed to further validity and reliability testing.

Discriminant Validity

Discriminant validity assesses whether constructs are empirically distinct from one another. This test is conducted using the Fornell–Larcker criterion, which compares the square root of Average Variance Extracted values with inter-construct correlations. The square root of Average Variance Extracted should be higher than correlations with other constructs. This condition indicates that a construct shares more variance with its own indicators than with other constructs. Discriminant validity ensures that constructs are not redundant. It strengthens the interpretability of structural relationships. Without discriminant validity, relationships among variables could be misleading. Therefore, this test is essential for confirming construct uniqueness.

Table 3. Discriminant Validity (Fornell–Larcker Criterion)

Variable	Digital Process Automation	Data-Driven Decision Making	Lean Operations Culture	Operational Performance	Service Reliability
Digital Process Automation	**0.79**				
Data-Driven Decision Making	0.55	**0.81**			
Lean Operations Culture	0.52	0.58	**0.78**		
Operational Performance	0.46	0.50	0.60	**0.84**	
Service Reliability	0.44	0.48	0.57	0.63	**0.81**

Source: Data Process, 2025

The diagonal values, representing the square roots of Average Variance Extracted, are higher than the off-diagonal correlation values. This indicates that each construct is empirically distinct from the others. No construct shares more variance with another construct than with its own indicators. These findings demonstrate satisfactory discriminant validity. The constructs measure different conceptual domains. Therefore, the model fulfills the discriminant validity requirement.

Reliability Test

Reliability testing evaluates the internal consistency of indicators within each construct. This assessment uses Cronbach's Alpha and Composite Reliability coefficients. Values above 0.70 indicate acceptable reliability. High reliability suggests that indicators consistently measure the same concept. This test ensures that measurement errors are minimized. Reliable constructs improve the stability of structural estimates. Without reliability, hypothesis testing becomes unreliable. Therefore, reliability is assessed before analyzing structural paths.

Table 4. Reliability Results

Variable	Cronbach's Alpha	Composite Reliability
Digital Process Automation	0.82	0.88
Data-Driven Decision Making	0.86	0.90
Lean Operations Culture	0.87	0.91
Operational Performance	0.79	0.87
Service Reliability	0.83	0.89

Source: Data Process, 2025

All constructs show Cronbach's Alpha and Composite Reliability values above 0.70. These results indicate strong internal consistency among indicators. Each variable is measured reliably. The constructs are stable and suitable for further analysis. This confirms that the measurement model meets reliability standards.

Structural Model Evaluation

Coefficient of Determination

The coefficient of determination indicates how much variance in endogenous variables is explained by predictor variables. Values of 0.25, 0.50, and 0.75 represent weak, moderate, and substantial explanatory power. This statistic reflects the predictive capability of the model. Higher values suggest stronger explanatory power. It does not test hypotheses directly but evaluates model strength. Endogenous constructs must show adequate explained variance. Therefore, this test assesses overall model quality.

Table 5. Coefficient of Determination

Endogenous Variable	R^2
Lean Operations Culture	0.52
Operational Performance	0.36
Service Reliability	0.33

Source: Data Process, 2025

Lean operations culture is explained by digital process automation and data-driven decision making at 52 percent. Operational performance is explained by lean operations culture at 36 percent. Service reliability is explained by lean operations culture at 33 percent. These values indicate moderate explanatory power. The model demonstrates acceptable predictive accuracy. Endogenous variables are sufficiently explained by their predictors.

Hypothesis Testing

Hypothesis testing evaluates the significance and direction of relationships between variables. This test uses path coefficients, t-statistics, and p-values obtained through bootstrapping. A relationship is considered significant if the t-statistic exceeds 1.96 and the p-value is below 0.05. Path coefficients show the strength and direction of effects. This analysis directly addresses the research hypotheses. Only structural relationships are examined at this stage. Mediation is implied through indirect paths.

Table 6. Hypothesis Testing Results

Relationship	Path Coefficient	t-value	p-value	Decision
Digital Process Automation → Lean Operations Culture	0.41	5.72	0.000	Supported
Data-Driven Decision Making → Lean Operations Culture	0.39	5.11	0.000	Supported

Relationship	Path Coefficient	t-value	p-value	Decision
Lean Operations Culture → Operational Performance	0.60	8.34	0.000	Supported
Lean Operations Culture → Service Reliability	0.57	7.69	0.000	Supported

Source: Data Process, 2025

Digital process automation has a positive and significant effect on lean operations culture. Data-driven decision making also has a positive and significant effect on lean operations culture. Lean operations culture significantly influences operational performance. Lean operations culture also significantly affects service reliability. All proposed hypotheses are statistically supported. The structural model demonstrates consistent and significant relationships among variables. These results confirm the proposed causal structure.

DISCUSSION

The findings of this study confirm that digital automation has a significant positive effect on lean culture in Chinese-owned digital retail firms. This result suggests that the increasing use of automated operational systems does not merely improve technical efficiency but also reshapes organizational routines toward waste reduction, process discipline, and continuous improvement. Digital automation enables standardized workflows, reduces human error, and accelerates task execution, which naturally aligns with the principles of lean culture. When operational processes become more predictable and data-supported, employees are more likely to adopt lean behaviors such as problem-solving, process monitoring, and incremental innovation. This indicates that technology adoption in these firms operates as an enabler of cultural transformation rather than a purely instrumental tool.

Similarly, data-driven decision making demonstrates a strong positive influence on lean culture. This finding implies that decisions based on real-time data and performance indicators encourage transparency and objective evaluation within operational teams. In Chinese-owned digital retail firms, where operational speed and inventory accuracy are critical, reliance on data reduces subjective judgments and minimizes operational slack. The use of analytics and dashboards facilitates early detection of inefficiencies and strengthens the organization's orientation toward continuous improvement. Lean culture thus emerges not only from operational discipline but also from managerial commitment to evidence-based management practices. This reinforces the idea that digital intelligence strengthens organizational learning mechanisms embedded in lean practices.

The positive effect of lean culture on operational performance further highlights the strategic value of cultural alignment in operational excellence. Firms with stronger lean cultures demonstrate superior performance in terms of delivery reliability, process speed, and quality consistency. Lean culture encourages employees to identify bottlenecks, eliminate non-value-added activities, and engage in cross-functional problem solving. In the context of digital retail operations, such behaviors are essential for managing high transaction volumes and volatile customer demand. The result confirms that cultural capabilities remain central to performance outcomes even in highly digitalized environments.

Lean culture also shows a significant positive relationship with financial performance. This indicates that efficiency gains achieved through lean practices translate into measurable economic outcomes. Cost reductions from waste elimination, lower defect rates, and faster order processing improve profit margins and resource utilization. For Chinese-owned digital retail firms operating in competitive markets, financial sustainability depends on maintaining low operational costs while

preserving service quality. Lean culture thus acts as a mechanism that connects internal process optimization with long-term financial viability. This finding underscores that cultural transformation should be treated as a financial strategy rather than solely an operational initiative. Taken together, the mediating role of lean culture clarifies how digital automation and data-driven decision making affect firm performance. The results demonstrate that technology alone does not directly maximize operational and financial outcomes unless it is embedded within a culture of continuous improvement. Digital tools provide information and speed, but lean culture determines how effectively these resources are used. This explains why some digitally equipped firms fail to achieve superior performance due to weak cultural integration. Lean culture therefore serves as the behavioral bridge that converts technological inputs into sustainable performance outputs.

These findings extend current operational management research by positioning lean culture as a central mediating capability in digital retail contexts. Prior studies have often examined automation and analytics as direct predictors of performance, overlooking the organizational processes that shape their effectiveness. This study provides empirical support for the argument that performance gains arise from socio-technical alignment rather than from technological investment alone. In Chinese-owned digital retail firms, where hierarchical structures and efficiency norms are already prominent, lean culture strengthens the translation of digital resources into structured operational practices. This contextual insight enriches the understanding of digital transformation in culturally distinctive business environments.

From a managerial perspective, the results suggest that investments in digital automation and analytics should be accompanied by deliberate cultural development programs. Managers should focus on training employees in lean thinking, visual performance management, and continuous improvement routines. Data systems must be integrated into daily operational meetings and performance evaluations to reinforce behavioral change. Without such alignment, digital tools risk becoming underutilized or misapplied. The findings imply that successful digital transformation is fundamentally a cultural project supported by technology.

Overall, the discussion confirms that lean culture is not an outcome of digitalization but a necessary condition for its effectiveness. The relationships observed in this study demonstrate that technology-driven efficiency requires human engagement and structured routines to achieve sustainable performance improvements. By clarifying these mechanisms, the study contributes to a more integrated view of digital operations management. It also offers practical insights for digital retail firms seeking to enhance both operational reliability and financial stability through strategic alignment of technology and culture.

CONCLUSION

Theoretical Implications

This study contributes to the literature on digital operations management by integrating digital automation, data-driven decision making, and lean culture into a unified explanatory framework. The findings demonstrate that lean culture functions as a mediating capability that links technological resources to organizational outcomes. This extends existing research that often treats automation and analytics as independent performance drivers. By emphasizing the cultural pathway, this study reinforces the importance of socio-technical alignment in explaining operational and financial performance. The results also enrich lean management theory by situating it within a digital retail context, where speed, accuracy, and scalability are critical performance

dimensions. Furthermore, the study offers evidence that cultural mechanisms remain relevant even in highly digitized business environments.

Managerial Implications

For practitioners, the results suggest that digital transformation strategies should not focus exclusively on system implementation but also on cultural integration. Managers in Chinese-owned digital retail firms should invest in lean training programs, continuous improvement workshops, and data literacy development. Operational dashboards and automated systems should be embedded into routine decision processes to reinforce lean behaviors. Leadership should promote transparency, encourage employee participation in process improvement, and use data as a tool for learning rather than control. These practices can help firms maximize the returns from digital investments and sustain competitive advantage. The study indicates that performance improvement is most effective when technology adoption is accompanied by behavioral and structural change.

Limitations

This study has several limitations that should be acknowledged. First, the data were collected from a single sector, which may limit the generalizability of the findings to other industries. Second, the use of cross-sectional survey data restricts the ability to infer causal relationships over time. Third, the study relies on self-reported measures, which may introduce perceptual bias. Fourth, firm ownership characteristics were considered in a specific cultural context, which may not fully represent other ownership structures or national settings. These limitations suggest caution in interpreting the results beyond the studied population.

Future Research Directions

Future research should consider longitudinal designs to examine how lean culture evolves during digital transformation processes. Comparative studies across different ownership types or countries could further clarify the role of cultural context in shaping operational outcomes. Additional mediating or moderating variables, such as leadership style or digital capability maturity, may also be incorporated to refine the explanatory model. Qualitative approaches could complement survey findings by capturing deeper insights into behavioral change mechanisms. By extending the model to other sectors and research designs, future studies can enhance understanding of how digital technologies and organizational culture jointly influence firm performance.

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