

Capability Architecture and Operational Efficiency among Rural Micro-Enterprises: Implications for Enterprise Development in Sri Lanka

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Abstract

Operational efficiency remains a critical challenge for rural micro-enterprises because resource constraints often limit productivity, enterprise sustainability, and livelihood outcomes. Existing research has largely examined capability dimensions in isolation, providing limited understanding of how complementary capabilities collectively shape enterprise performance. This study introduces the concept of Capability Architecture to explain how the coordinated configuration of capabilities influences operational efficiency among tea smallholders in Sri Lanka. Drawing on the Resource-Based View and Contingency Theory, the study examines the effects of soil management training, labour availability, working culture, and technical knowledge on operational efficiency and investigates the moderating role of management style. A quantitative cross-sectional survey of 407 registered tea smallholders was analysed using covariance-based structural equation modelling. The findings reveal that all four capability dimensions positively and significantly influence operational efficiency, collectively explaining 64% of the variance in performance, while management style does not significantly moderate these relationships, suggesting that internally configured capabilities exert a stronger influence on performance than managerial variation. The study advances Capability Architecture as a distinct explanation of enterprise performance and highlights the importance of integrated capability-building interventions for strengthening enterprise resilience and rural livelihood sustainability.

Keywords: capability architecture; enterprise development; operational efficiency; rural micro-enterprises; tea smallholders.

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Introduction

Existing theoretical perspectives provide valuable insights into the sources of enterprise performance. The Resource-Based View emphasizes the strategic importance of valuable and difficult-to-imitate resources, while Dynamic Capability Theory highlights firms' abilities to renew and reconfigure resources in response to changing environmental conditions (Barney, 1991; Teece, 2023; Zahra et al., 2023). Resource Orchestration Theory further extends these perspectives by emphasizing

managerial processes involved in structuring, bundling, and leveraging organizational resources to create value. Collectively, these perspectives have advanced understanding of how firms acquire, deploy, and adapt resources to achieve competitive outcomes.

However, less attention has been devoted to understanding how multiple capability dimensions become internally coordinated within resource-constrained enterprises (Wilden et al., 2022; Kraus

et al., 2023). While existing theories emphasize resource endowments, capability renewal, and managerial deployment processes, they provide more limited insight into the enduring organizational structures through which labor resources, technical knowledge, training, and organizational routines are aligned, embedded, and coordinated as a mutually reinforcing operational system. This limitation is particularly relevant in rural micro-enterprises, where performance often depends not on the strength of a single capability but on the effective alignment of several interdependent capabilities operating simultaneously under conditions of resource scarcity.

The significance of this gap extends beyond theoretical development and has important implications for enterprise development practice. Although interventions such as technical training, extension services, managerial development programmes, and labour support schemes frequently strengthen individual capability dimensions, evidence regarding their long-term effectiveness remains mixed (Audretsch & Belitski, 2021; Welter & Baker, 2021). Many enterprises continue to experience operational inefficiencies despite receiving targeted support, suggesting that improvements in isolated capabilities do not necessarily translate into sustainable performance gains when complementary capabilities remain weak or poorly coordinated. This challenge is particularly evident among Sri Lankan tea smallholders, who operate under conditions characterized by labour shortages, limited managerial resources, fluctuating access to technical knowledge, and increasing operational pressures. In such environments, the effectiveness of any individual capability often depends on the presence and functioning of other capabilities within the enterprise. Consequently, operational efficiency may depend less on individual capabilities and more on how capabilities are organized and deployed collectively, highlighting the need to understand capability integration as a driver of sustainable enterprise development.

Building on these observations, this study advances the concept of Capability Architecture, which refers to the structural configuration and coordinated deployment of complementary capabilities that collectively shape resource utilization and operational performance. Although related to capability integration, Capability Architecture extends beyond the mere existence of relationships among capabilities by emphasizing the organizational arrangements through which capabilities are aligned, embedded, and reinforced over time. From this perspective, operational efficiency emerges not simply from possessing multiple capabilities but from their systematic

configuration as an interconnected operational system that facilitates effective coordination, resource utilization, and execution. Consequently, Capability Architecture shifts analytical attention from individual capability dimensions to the underlying capability system through which dispersed resources and knowledge are transformed into productive enterprise outcomes.

Capability Architecture provides a framework for understanding why enterprises with similar resources and support interventions experience different performance outcomes by emphasizing the effectiveness of the underlying capability structure rather than individual capabilities. This perspective is particularly relevant for enterprise development research because it provides a potential explanation for why capability-building initiatives frequently produce uneven results across enterprises. Understanding how capabilities are configured and coordinated may therefore offer a more comprehensive basis for designing interventions that strengthen operational efficiency, enterprise sustainability, and rural livelihood resilience within resource-constrained environments.

Literature Review

Operational Efficiency and Enterprise Development in Rural Micro-Enterprises

Operational efficiency has traditionally been viewed as the ability of organizations to maximize outputs while minimizing the resources required to achieve desired outcomes. Within small and micro-enterprises (SMEs), however, operational efficiency extends beyond technical productivity and represents a critical determinant of enterprise sustainability, competitiveness, and long-term survival (Slack & Brandon-Jones, 2023). This is particularly relevant in developing economies where SMEs frequently operate under conditions of resource scarcity, institutional weaknesses, and environmental uncertainty. Under such circumstances, efficient resource utilization becomes essential for maintaining productivity, ensuring business continuity, and responding to operational challenges (Elbanna et al., 2022).

From an enterprise development perspective, operational efficiency extends beyond firm-level performance and contributes to broader development objectives, including productivity enhancement, employment generation, income improvement, poverty reduction, and community resilience (OECD, 2024; Audretsch & Belitski, 2021; Welter & Baker, 2021). Rural micro-enterprises, particularly agricultural smallholders, generate livelihoods and stimulate local economic activity. In Sri Lanka, tea smallholders account for approximately 70–75% of national tea production and support the livelihoods of hundreds of thousands of rural households (Sri Lanka Tea Board, 2024; Tea Research Institute of Sri Lanka, 2024). Despite their

economic significance, the sector faces persistent challenges, including labour shortages, declining productivity, limited access to technical knowledge and extension services, rising input costs, and increasing market uncertainty. These constraints undermine operational efficiency and threaten rural enterprise sustainability.

Government and donor-funded interventions have frequently sought to address these challenges through training programmes, technical support initiatives, and capability-building activities. However, the outcomes of such interventions have often been inconsistent. While some enterprises experience significant productivity improvements, others demonstrate limited or temporary gains despite receiving similar support. These variations suggest that improvements in isolated capability dimensions do not necessarily translate into sustainable performance gains when complementary capabilities remain weak, disconnected, or poorly coordinated. Consequently, understanding the organizational arrangements through which capabilities function collectively has become increasingly important.

Recent enterprise development research increasingly recognizes that sustainable enterprise performance emerges from the interaction of multiple organizational capabilities rather than from isolated interventions alone (Wilden et al., 2022; Zahra et al., 2023). This perspective suggests that capability-building initiatives may generate uneven outcomes because the effectiveness of individual capabilities depends on how they are integrated within broader organizational systems. Consequently, understanding how complementary capabilities are configured and coordinated has become an important concern for both enterprise development research and practice.

Existing research has identified numerous factors that influence operational efficiency, including human capital development, knowledge resources, organizational culture, leadership practices, and labour availability (Kraus et al., 2023; Zahra et al., 2023). While these studies provide important insights into enterprise performance, they predominantly examine individual determinants in isolation. Consequently, limited evidence exists regarding the mechanisms through which dispersed capabilities are integrated and transformed into operational efficiency within resource-constrained rural enterprises.

Improving operational efficiency among tea smallholders therefore represents both a business performance objective and an enterprise development imperative. Understanding how rural micro-enterprises transform dispersed capabilities

into operational efficiency can provide valuable insights for policymakers, extension service providers, and enterprise development agencies seeking to design integrated capability-building interventions that promote sustainable rural development.

Capability Development in Enterprise Development Research

Capability development occupies a central position within enterprise development literature because organizational capabilities influence not only enterprise productivity and competitiveness but also livelihood sustainability, enterprise resilience, and the long-term success of development interventions. Consequently, capability enhancement has become a primary mechanism through which policymakers, development agencies, and support institutions seek to promote sustainable SME development. Enterprise development initiatives frequently seek to strengthen SMEs through interventions such as technical training programmes, extension services, labour support mechanisms, managerial development activities, and knowledge-transfer initiatives (Audretsch & Belitski, 2021; Welter & Baker, 2021; Amoah et al., 2022; Fajarika, 2024). These interventions are founded on the assumption that stronger enterprise capabilities contribute to improved operational outcomes and enhanced competitiveness.

Research consistently demonstrates that capability development supports enterprise performance. Training programmes improve technical competencies and managerial decision-making, labour availability supports operational continuity, organizational culture facilitates collaboration and learning, and technical knowledge enhances resource allocation and problem-solving effectiveness (Kraus et al., 2023; Gonzalez-Varona et al., 2024). Consequently, capability-building initiatives have become a widely adopted strategy for improving SME performance in both developed and developing economies.

However, empirical evidence regarding the effectiveness of capability-building interventions remains mixed. Although many studies report positive effects of capability-building interventions, other studies document limited, temporary, or insignificant performance improvements despite substantial investments in training, technical assistance, and managerial support initiatives (Wilden et al., 2022). Similarly, technical knowledge often fails to produce sustained performance improvements when enterprises lack complementary capabilities necessary for implementation, coordination, and knowledge application. Labour support initiatives have also generated inconsistent outcomes, particularly in

agricultural enterprises where workforce constraints remain severe despite intervention programmes.

These empirical contradictions suggest that the effectiveness of capability-building interventions may depend less on investments in individual capabilities and more on the manner in which capabilities are configured and integrated within enterprise systems. Individual capabilities rarely operate independently; rather, they function as complementary resources whose effectiveness depends on the presence and quality of other capabilities within the enterprise. For example, technical training may improve knowledge acquisition, yet its benefits may be constrained when labour shortages restrict implementation or when organizational routines fail to support knowledge application. Consequently, recent scholarship increasingly recognizes that sustainable enterprise performance emerges from interactions among multiple organizational capabilities rather than from investments in individual capabilities alone (Wilden et al., 2022; Zahra et al., 2023; Fajarika, 2024). This perspective suggests that capability-building interventions should be viewed as components of broader organizational systems that collectively shape enterprise outcomes, particularly in resource-constrained rural micro-enterprises where weaknesses in one capability dimension cannot easily be compensated for by strengths in another.

Consequently, understanding how capabilities are organized, coordinated, and deployed within enterprises represents an important challenge for enterprise development research. Addressing this challenge requires moving beyond isolated capability perspectives toward an integrative framework capable of explaining how complementary capabilities are configured, coordinated, and deployed to generate operational efficiency. Such a framework helps explain why enterprises with similar resources and interventions experience different performance outcomes. Accordingly, an integrative perspective that explains how capabilities are configured and coordinated within enterprises may offer a more comprehensive understanding of operational efficiency in resource-constrained environments.

Theoretical Foundations and Capability Architecture

Resource-Based View

The Resource-Based View (RBV) provides one of the most influential explanations of firm performance and competitive advantage. According to RBV, organizations achieve superior performance through the possession and deployment of valuable, rare, inimitable, and non-substitutable resources (Barney, 1991). Within SMEs, resources such as human capital, technical

expertise, organizational knowledge, and productive labour represent important assets that influence operational outcomes.

RBV therefore provides valuable insights regarding what resources matter for organizational success. However, the theory primarily focuses on resource possession and offers limited explanation regarding how multiple capabilities interact within organizational systems. This limitation becomes particularly significant in resource-constrained enterprises where performance depends not only on resource availability but also on the ability to coordinate and utilize available resources effectively.

Dynamic Capability Theory

Dynamic Capability Theory extends RBV by emphasizing the ability of firms to integrate, build, and reconfigure resources in response to changing environmental conditions (Teece, 2023). The theory suggests that organizational success depends not only on possessing resources but also on the capacity to adapt, learn, and respond to emerging opportunities and challenges.

While Dynamic Capability Theory provides valuable insights into organizational adaptation, its primary focus remains on processes of renewal and reconfiguration. Consequently, the theory offers less guidance regarding how operational capabilities are systematically organized and coordinated within everyday enterprise activities. For resource-constrained SMEs, where efficiency often depends on disciplined resource utilization rather than continuous reconfiguration, this limitation warrants further attention.

Resource Orchestration Theory

Resource Orchestration Theory further advances resource-based perspectives by emphasizing managerial actions associated with structuring, bundling, and leveraging organizational resources to create value. Through effective orchestration, firms are expected to improve resource utilization and enhance performance outcomes.

Although Resource Orchestration Theory explains managerial processes related to resource deployment, it remains primarily concerned with managerial decision-making rather than the enduring organizational structures through which capabilities operate. In highly resource-constrained enterprises, managerial discretion may itself be limited by structural conditions, suggesting the need for a perspective that focuses more explicitly on capability configuration and integration.

Capability Architecture as an Integrative Framework

Building upon these perspectives, the present study advances the concept of Capability Architecture. Capability Architecture refers to the structural configuration, interdependence, and coordinated deployment of complementary capabilities that collectively shape resource utilization and operational performance.

Capability Architecture differs fundamentally from existing resource-based perspectives because it focuses on the organizational arrangements through which capabilities are aligned, integrated, and reinforced over time. Unlike RBV, which focuses on resource possession, Dynamic Capability Theory, which emphasizes adaptation, and Resource Orchestration Theory, which concentrates on managerial actions, Capability Architecture focuses on capability configuration and integration.

This distinction is important because enterprise performance is rarely determined by isolated capabilities operating independently. Rather, performance emerges through interactions among training, labour resources, organizational culture, and technical knowledge. Capability Architecture therefore conceptualizes these capability dimensions as components of an integrated operational system rather than as independent performance drivers. The effectiveness of any individual capability depends not only on its quality but also on how it interacts with complementary capabilities within the enterprise.

From an enterprise development perspective, Capability Architecture provides a useful framework for understanding why capability-building interventions often generate uneven outcomes across enterprises. While support programmes frequently strengthen individual capability dimensions, sustainable performance improvements may depend on how those capabilities are integrated and coordinated within organizational processes. Understanding Capability Architecture therefore offers important insights for both theory and practice by explaining how resource-constrained enterprises transform dispersed capabilities into operational efficiency and sustainable enterprise outcomes.

Capability Architecture Dimensions and Operational Efficiency

Within the present study, Capability Architecture is operationalized through four interrelated capability dimensions: Soil Management Training, Labor Availability, Working Culture, and Technical Knowledge. These dimensions were selected because they represent critical capability domains consistently identified within enterprise development, agricultural extension, and SME

performance literature as influencing productivity and organizational outcomes. Collectively, they reflect the capability structure through which rural micro-enterprises organize, coordinate, and deploy available resources to achieve operational efficiency. While each capability contributes independently to enterprise performance, Capability Architecture suggests that their effectiveness is ultimately determined by how they function as an integrated operational system.

Soil Management Training and Operational Efficiency

Training represents one of the most widely adopted enterprise development interventions aimed at improving SME productivity, sustainability, and competitiveness. Within rural enterprises, training programs facilitate knowledge transfer, strengthen managerial competencies, and enhance the ability of entrepreneurs to implement improved production practices (Audretsch & Belitski, 2021). Agricultural extension services similarly rely on training as a mechanism for improving enterprise performance through the dissemination of technical knowledge and best practices.

From a capability development perspective, training contributes to the accumulation of human capital and enhances the absorptive capacity of enterprises, enabling entrepreneurs to acquire, interpret, and apply new knowledge effectively. Improved training supports more informed decision-making, strengthens operational routines, and facilitates efficient resource utilization (Wilden et al., 2022). Within agricultural enterprises, soil management training is particularly important because it influences decisions relating to input application, cultivation practices, and long-term resource sustainability.

Previous studies have reported positive associations between training and enterprise performance, suggesting that entrepreneurs who receive structured training demonstrate higher levels of productivity and operational effectiveness than those lacking comparable opportunities (Kraus et al., 2023). However, the effectiveness of training depends not only on the acquisition of knowledge but also on the ability of enterprises to integrate and apply that knowledge within operational processes. Consequently, soil management training represents an important capability component through which rural micro-enterprises improve operational efficiency.

H1: Soil management training positively influences operational efficiency.

Labor Availability and Operational Efficiency

Labor availability constitutes a fundamental operational capability within labor-intensive rural enterprises. The ability to access and retain an adequate workforce influences production continuity, task completion, service quality, and overall enterprise performance. In agricultural enterprises, labor shortages can disrupt operational schedules, delay critical activities, and reduce productivity, thereby negatively affecting enterprise efficiency and profitability.

Resource constraint literature highlights labor scarcity as one of the most significant challenges confronting rural SMEs, particularly in developing economies where demographic changes, migration, and competing employment opportunities reduce labor availability (Kraus et al., 2023). Limited labor resources increase coordination costs, place additional pressure on existing workers, and constrain the ability of enterprises to implement efficiency-enhancing practices.

Enterprise development studies similarly emphasize the importance of labor resources in supporting sustainable business growth and operational continuity. Adequate labor availability enables enterprises to maintain workflow consistency, improve task specialization, and strengthen quality control mechanisms. These benefits contribute directly to operational efficiency by reducing delays, minimizing disruptions, and improving resource utilization. Within the Capability Architecture perspective, labor availability represents a critical capability dimension because it influences the extent to which other capabilities can be effectively deployed. Training, technical knowledge, and organizational routines may have limited impact when labor constraints restrict implementation. Accordingly, labor availability is expected to contribute positively to operational efficiency.

H2: Labor availability positively influences operational efficiency.

Working Culture and Operational Efficiency

Working culture represents an important organizational capability that shapes behavior, coordination, learning, and collaboration within enterprises. Organizational culture influences how employees interact, share knowledge, respond to challenges, and implement operational practices. In SMEs, where formal structures are often limited, working culture serves as a critical mechanism for coordinating activities and supporting organizational effectiveness.

Research suggests that supportive and learning-oriented cultures facilitate communication, encourage knowledge sharing, and strengthen

collective commitment to organizational objectives (Kerr & Landry, 2023). Such cultures reduce coordination difficulties, enhance adaptability, and support continuous improvement processes. Conversely, dysfunctional working cultures may create resistance to change, reduce cooperation, and hinder effective resource utilization.

From an enterprise development perspective, working culture contributes to enterprise sustainability by fostering environments that support learning, innovation, and operational discipline. These characteristics are particularly important in resource-constrained enterprises, where the efficient utilization of available resources depends heavily on cooperation and collective action.

Capability Architecture conceptualizes working culture as a coordinating mechanism that enables different capability elements to function cohesively. A supportive working culture facilitates the application of technical knowledge, enhances the effectiveness of training initiatives, and improves labor coordination. Through these mechanisms, working culture contributes to operational efficiency.

H3: Working culture positively influences operational efficiency.

Technical Knowledge and Operational Efficiency

Technical knowledge represents a knowledge-based capability that enables enterprises to make informed decisions, adopt appropriate technologies, and implement effective operational practices. Within rural enterprises, technical knowledge influences production planning, resource allocation, problem-solving, and the adoption of innovation. Consequently, it plays a central role in determining enterprise productivity and operational performance.

Knowledge-based perspectives suggest that organizations possessing superior technical knowledge are better positioned to identify opportunities, solve operational problems, and utilize resources efficiently. In agricultural contexts, technical knowledge contributes to improved cultivation practices, enhanced input management, and more effective decision-making regarding production activities (Teece, 2023).

Enterprise development literature consistently identifies knowledge enhancement as a key pathway through which SMEs improve competitiveness and sustainability. Technical knowledge supports innovation adoption, strengthens strategic decision-making, and improves operational effectiveness. However, knowledge alone does not guarantee

performance improvement. Its value depends on the ability of enterprises to interpret, apply, and integrate knowledge within operational routines.

Within Capability Architecture, technical knowledge represents a foundational capability that informs and supports other capability dimensions. Its effective deployment enhances the quality of operational decisions and strengthens resource utilization processes. Consequently, technical knowledge is expected to contribute positively to operational efficiency.

H4: Technical knowledge positively influences operational efficiency.

Managerial Style as a Boundary Condition *Contingency Theory and Managerial Style*

Contingency Theory proposes that organizational effectiveness depends on the alignment between managerial practices and contextual conditions (Donaldson, 2001). Rather than advocating a universally effective management approach, the theory suggests that different managerial styles may be more or less effective depending on organizational circumstances, environmental conditions, and operational requirements. Within SMEs, managerial style influences how resources are allocated, how employees are coordinated, and how organizational activities are directed toward performance objectives (Elbanna et al., 2022).

Previous research has identified managerial style as an important determinant of organizational outcomes because managerial behavior shapes communication, decision-making, motivation, and coordination processes (Xie et al., 2022). Participative managerial approaches may encourage collaboration and knowledge sharing, while directive approaches may facilitate task control and operational discipline. Consequently, contingency-based perspectives suggest that managerial style can influence the effectiveness with which organizational capabilities are deployed and utilized.

However, the influence of managerial style may be constrained in resource-limited environments. Rural micro-enterprises frequently operate under conditions characterized by labor shortages, limited financial resources, restricted access to expertise, and institutional constraints. Under such circumstances, managerial discretion may be limited by structural conditions that reduce the range of feasible managerial actions. As a result, internally configured capability systems may exert a more direct influence on operational efficiency than variations in managerial behavior alone.

This perspective does not suggest that managerial style is unimportant. Rather, it suggests that managerial style may function as a boundary condition that shapes how specific capability dimensions contribute to enterprise performance. The effectiveness of enterprise capabilities may therefore depend not only on their existence but also on the managerial context within which they are applied.

Management Style, Labor Availability, and Operational Efficiency

Labor availability represents a critical operational capability within rural micro-enterprises. However, the extent to which labor resources contribute to operational efficiency may depend on how effectively those resources are coordinated and utilized. Managerial style influences workforce supervision, task allocation, communication, motivation, and conflict management, all of which affect the productivity of available labor resources (Elbanna et al., 2022).

Participative and supportive managerial approaches may enhance labor utilization by improving communication, strengthening employee commitment, and facilitating coordination among workers. Conversely, ineffective managerial practices may reduce workforce productivity even when adequate labor resources are available. In labor-intensive enterprises such as tea smallholdings, managerial decisions regarding work allocation, scheduling, and supervision can influence the extent to which labor availability is translated into operational efficiency.

At the same time, the influence of managerial style may be constrained by structural labor shortages. When labor resources are severely limited, managerial actions alone may be insufficient to compensate for workforce deficiencies. Nevertheless, managerial style may affect how effectively available labor resources are utilized within operational processes. Accordingly, management style is expected to influence the relationship between labor availability and operational efficiency.

H5: Management style moderates the relationship between labor availability and operational efficiency.

Management Style, Technical Knowledge, and Operational Efficiency

Technical knowledge represents a critical capability that supports decision-making, problem-solving, and resource utilization within rural enterprises. However, the effectiveness of technical knowledge depends not only on its availability but also on its

application within operational activities. Managerial style can influence how knowledge is communicated, interpreted, and utilized within enterprise processes.

Research suggests that participative managerial approaches facilitate knowledge sharing, learning, and collaboration, thereby improving the application of technical expertise within organizational activities (Xie et al., 2022). Managers who encourage communication and learning may create environments in which technical knowledge is more effectively integrated into decision-making and operational practices. Conversely, restrictive managerial approaches may limit opportunities for knowledge exchange and reduce the effectiveness of available expertise. Within resource-constrained micro-enterprises, technical knowledge often serves as an important mechanism through which enterprises improve productivity and efficiency despite limited resources. However, the extent to which technical knowledge contributes to operational efficiency may depend on managerial practices that support its application and dissemination. Consequently, managerial style is expected to influence the relationship between technical knowledge and operational efficiency.

H6: Management style moderates the relationship between technical knowledge and operational efficiency.

Conceptual Framework

Drawing upon enterprise development literature, the Resource-Based View, Dynamic Capability Theory, Resource Orchestration Theory, and Contingency Theory, the present study conceptualizes Capability Architecture as a multidimensional construct comprising Soil Management Training, Labour Availability, Working Culture, and Technical Knowledge. These capability dimensions are proposed to influence Operational Efficiency directly, while Management Style is expected to moderate the relationships between Labour Availability and Operational Efficiency and between Technical Knowledge and Operational Efficiency.

Figure 1 presents the conceptual framework of the study.

Methodology

Research Design

This study adopts a deductive research design within a positivist paradigm to examine the relationship between capability architecture and operational efficiency among tea smallholders operating as micro-enterprises in Sri Lanka. This approach is

particularly appropriate because the study seeks to generate empirical evidence on the capability

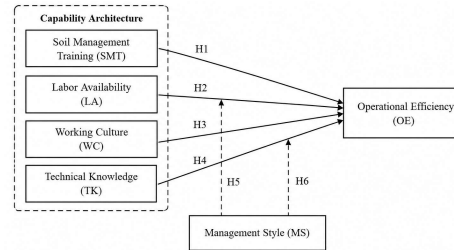


Figure 1. Conceptual Framework of Capability Architecture and Operational Efficiency among Rural Micro-Enterprises

Source: Developed by the authors based on the literature review.

mechanisms that influence operational efficiency among rural micro-enterprises, thereby contributing to enterprise development policy and capability-building interventions in resource-constrained contexts. A quantitative cross-sectional survey design was employed to empirically test the hypothesized relationships derived from the integration of the resource-based view and contingency theory.

The proposed theoretical model was analyzed using covariance-based structural equation modeling (SEM). This technique is well-suited for examining complex relationships among multiple latent constructs simultaneously while accounting for measurement error (Hair et al., 2019; Kline, 2016). It is particularly appropriate in this study as it enables the simultaneous estimation of multiple interrelated relationships among latent constructs, consistent with the study's theory-driven model. Although cross-sectional designs limit causal inference, they are appropriate for examining theoretically grounded relationships among latent constructs in large-scale survey-based research.

Research Context

Sri Lanka's tea smallholder sector constitutes one of the country's most important categories of rural micro-enterprises, contributing substantially to national tea production, employment generation, and rural livelihood sustainability. Tea smallholders account for approximately 70–75% of national tea production and support the livelihoods of hundreds of thousands of rural households (Sri Lanka Tea Board, 2024; Tea Research Institute of Sri Lanka, 2024). Despite their economic importance, tea smallholders continue to operate under conditions characterized by labour shortages, limited access to technical knowledge, and resource constraints. Consequently, the sector provides an appropriate empirical context for examining how internally configured capabilities influence operational efficiency within resource-constrained rural enterprises.

Population and Sampling

The target population comprised registered tea smallholders in Sri Lanka, representing a large segment of micro-enterprises within the country's agrarian economy. Tea smallholders represent an appropriate empirical context because they operate as rural micro-enterprises that contribute significantly to employment generation, livelihood sustainability, and rural economic development while simultaneously facing severe resource constraints that make capability development particularly important. According to the Tea Small Holdings Development Authority (TSHDA), the total number of registered smallholders is approximately 418,531 (TSHDA, 2023). The unit of analysis was the individual tea smallholder entrepreneur.

The sampling frame was derived from the official TSHDA database containing approximately 215,000 registered smallholders nationwide. From this frame, 1,500 respondents were selected using simple random sampling and invited to participate in the study through an online questionnaire.

A total of 407 usable responses were obtained, yielding a 27.1% response rate, which is consistent with established benchmarks for survey research involving geographically dispersed respondents. The achieved sample size exceeds the recommended minimum of 384 observations for large populations (Krejcie and Morgan, 1970; Sekaran and Bougie, 2020) and is adequate for covariance-based SEM analysis (Hair et al., 2019). Although the response rate appears modest, it is comparable to response rates commonly reported in large-scale surveys involving geographically dispersed entrepreneurs and agricultural producers. Furthermore, the achieved sample exceeded the minimum requirements for covariance-based SEM and was considered sufficient for robust statistical analysis.

Potential non-response bias was assessed by comparing early and late respondents following the wave analysis procedure suggested by Armstrong and Overton (1977). No statistically significant differences were observed, suggesting that non-response bias was unlikely to influence the results. The use of a nationally representative sampling frame enhances the generalizability of the findings to the broader population of tea smallholders in Sri Lanka.

Data Collection Procedure

Primary data were collected using a structured questionnaire administered electronically over a six-month period. The online survey approach was selected to facilitate nationwide data collection across geographically dispersed tea-growing regions and to improve access to respondents who would

otherwise be difficult to reach through conventional survey methods. Measurement items were adapted from established and validated scales in prior strategic management and SME research to ensure content validity.

Prior to the main survey, a pilot test with 30 respondents was conducted to assess item clarity and contextual relevance. Minor wording adjustments were made based on pilot feedback.

Participation in the study was voluntary. Respondents were informed about the purpose of the research and provided informed consent prior to completing the questionnaire through the online survey. The study followed institutional research ethics guidelines, and because the research involved anonymous survey responses from adult participants without collecting sensitive personal data, formal ethics committee approval was not required.

Measurement of Variables

All constructs were measured using multi-item reflective scales on a five-point Likert scale (1 = strongly disagree; 5 = strongly agree). Perceived operational efficiency (OE) was specified as the dependent construct. Perceptual measures of operational efficiency were adopted because objective productivity and financial performance indicators are often unavailable or inconsistently maintained among rural micro-enterprises. Previous SME research has demonstrated that perceptual measures provide reliable proxies for enterprise performance when objective data are difficult to obtain. Soil management training (SMT), labor availability (LA), working culture (WC), and technical knowledge (TK) were specified as independent constructs representing dimensions of capability architecture, while management style (MS) was modeled as a moderating construct.

Reliability and validity of the measurement instrument were assessed prior to structural model estimation. Internal consistency reliability was evaluated using Cronbach's alpha and composite reliability (CR), with values exceeding the recommended threshold of 0.70 (Hair et al., 2019; Pallant, 2020). Convergent validity was assessed using average variance extracted (AVE), with values above the recommended 0.50 threshold. Discriminant validity was evaluated by comparing the square root of AVE with inter-construct correlations.

Exploratory factor analysis using principal component analysis with Varimax rotation established strong sampling adequacy ($KMO = 0.967$) and a significant Bartlett's test of sphericity ($\chi^2 = 27,523.944$, $p < .001$), confirming the suitability of the data for factor analysis. Confirmatory factor analysis (CFA) was

subsequently conducted to validate the measurement model

Common Method Bias

Because the study relied on a single survey instrument and self-reported responses, potential common method bias was addressed using both procedural and statistical approaches. Procedurally, respondent anonymity was ensured and questionnaire items were designed to minimize ambiguity and response pattern bias (Podsakoff et al., 2003). Statistically, Harman's single-factor test was conducted to determine whether a single factor accounted for the majority of variance in the data. The results established that no single factor dominated the variance, suggesting that common method bias was unlikely to pose a serious concern. These procedural and statistical remedies collectively reduce the likelihood of common method variance affecting the study results.

In addition to Harman's single-factor test, a common latent factor assessment was performed. The results indicated no substantial differences in standardized loadings, suggesting that common method variance was unlikely to materially affect the findings.

Data Analysis Technique

Data analysis was performed using IBM SPSS and AMOS. Preliminary analysis included descriptive statistics and assessment of normality through skewness and kurtosis statistics, which established no substantial deviations from parametric assumptions (Kline, 2016).

The analysis proceeded in two stages. First, the measurement model was assessed using confirmatory factor analysis to evaluate reliability, convergent validity, and discriminant validity. Second, covariance-based structural equation modeling was employed to test the hypothesized relationships within the proposed framework.

Model fit was evaluated using widely accepted indices, including the chi-square to degrees of freedom ratio (χ^2/df), Comparative Fit Index (CFI), and Root Mean Square Error of Approximation (RMSEA) (Hair et al., 2019; Kline, 2016). Hypotheses were examined using standardized path coefficients and associated significance levels.

Moderation effects were assessed using multi-group structural equation modeling. Respondents were divided into low and high management style groups using a median split procedure. This approach is commonly applied in contingency-based research because it facilitates the examination of structural differences across groups and enables the

comparison of path coefficients under different managerial conditions. Multi-group SEM is particularly useful when the objective is to determine whether contextual factors strengthen or weaken the relationships among latent constructs.

Despite these methodological strengths, the use of self-reported data and cross-sectional design may introduce certain limitations, which are acknowledged in the discussion section. By employing a nationally representative sample of tea smallholders and a theory-driven SEM approach, the study provides empirical evidence on capability development mechanisms within rural micro-enterprises, thereby contributing to the methodological advancement of enterprise development research in emerging economies.

Results

Descriptive Statistics

Descriptive statistics were computed to examine the distributional properties of the study constructs ($N = 407$). Mean values ranged from 3.96 to 4.01, indicating moderately positive perceptions across all variables. Skewness values ranged between -0.04 and 0.06 , while kurtosis values ranged from -1.16 to -0.91 . These values remained within acceptable thresholds and indicated no substantial deviations from normality, thereby supporting the suitability of the data for subsequent multivariate analysis (Kline, 2016).

Exploratory Factor Analysis

Exploratory factor analysis (EFA) was conducted to confirm the dimensional structure of the adapted measurement scales within the context of smallholder micro-enterprises. Principal component extraction with Varimax rotation established strong sampling adequacy ($KMO = 0.967$). Bartlett's test of sphericity was statistically significant ($\chi^2 = 27,523.94$, $p < .001$), confirming that the data were appropriate for factor analysis. The rotated solution revealed a clear and theoretically consistent factor structure, with all retained items loading above 0.60 on their respective constructs, thereby supporting the adequacy of the measurement structure for further analysis. These results support the dimensional validity of the measurement constructs within the study context.

Reliability and Validity Assessment

Internal consistency reliability was evaluated using Cronbach's alpha and composite reliability (CR). As shown in Table 1, all constructs demonstrate very high reliability, with Cronbach's alpha values ranging from 0.965 to 0.976, well above the recommended threshold of 0.70 (Hair et al., 2019;

Pallant, 2020).

Convergent validity was assessed using average variance extracted (AVE), and all constructs exceeded the recommended threshold of 0.50. Composite reliability values also remained above 0.70, confirming strong internal consistency across the measurement scales. Discriminant validity was assessed using the Fornell–Larcker criterion, where the square root of AVE for each construct exceeded the corresponding inter-construct correlations. As presented in Table 2, these values collectively indicate strong construct reliability, convergent validity, and discriminant validity for all measurement constructs.

Assessment of Common Method Bias

Because the data were collected using a single self-administered questionnaire, the potential presence of common method bias (CMB) was assessed using both Harman's single-factor test and a common latent factor approach. In Harman's single-factor test, all measurement items were entered into an unrotated exploratory factor analysis, and the first factor accounted for less than 50% of the total variance, indicating that no single factor dominated the data.

In addition, a common latent factor test was conducted in AMOS to examine whether a single latent construct significantly influenced the measurement items. The results showed that the inclusion of a common latent factor did not substantially alter the factor loadings. These findings suggest that common method bias is unlikely to have a substantial influence on the study results.

Measurement Model Evaluation

Confirmatory factor analysis (CFA) was conducted using AMOS to assess the adequacy of the measurement model. The results indicate excellent model fit, with $\chi^2/df = 1.475$, CFI = 0.977, RMSEA = 0.024, all of which satisfy or exceed commonly recommended thresholds ($\chi^2/df < 3.00$, CFI ≥ 0.95 , RMSEA ≤ 0.08) (Hair et al., 2019; Kline, 2016).

Furthermore, all observed indicators loaded significantly on their respective latent constructs, with standardized factor loadings exceeding 0.70. These results provide strong evidence of convergent validity and confirm the adequacy of the measurement model. Collectively, these results confirm that the measurement model demonstrates satisfactory construct validity and model adequacy.

Structural Model Results

The structural model was estimated to test the hypothesized relationships among the constructs. The model fit indices indicate excellent fit of the structural model, with $\chi^2/df = 1.284$, CFI = 0.986, RMSEA = 0.026. These values confirm that the proposed structural framework adequately represents the observed data.

The model explains a substantial proportion of the variance in operational efficiency ($R^2 = 0.64$), indicating that capability architecture dimensions account for approximately 64% of the variation in efficiency among tea smallholder micro-enterprises. This level of explanatory power highlights the importance of capability-based interventions for enterprise development.

Moderation Analysis

The moderating role of management style was examined using multi-group structural equation modeling. Respondents were divided into low and high management style groups using a median split procedure, and the structural path coefficients were compared across the two groups.

The estimated relationships between the capability architecture dimensions and operational efficiency were statistically equivalent across both groups. This indicates that management style does not significantly alter the strength or direction of these structural relationships. Accordingly, the proposed moderating effects in H5 and H6 were not supported by the multi-group analysis. The absence of significant moderating effects suggests that the contribution of capability architecture dimensions to operational efficiency remains relatively stable across different managerial conditions. This finding provides preliminary evidence that internally configured capabilities may exert a stronger influence on operational efficiency than variations in managerial style within highly resource-constrained rural enterprises.

Hypothesis Testing

The hypothesized relationships were assessed using standardized path coefficients (β) and corresponding significance levels. The detailed results of hypothesis testing are presented in Table 3. As shown in Table 3, soil management training ($\beta = 0.32$, $p < .001$), labor availability ($\beta = 0.29$, $p < .001$), working culture ($\beta = 0.27$, $p < .001$), and technical knowledge ($\beta = 0.24$, $p < .01$) each exert significant positive effects on operational efficiency.

These results provide empirical support for H1, H2, H3, and H4. In contrast, the interaction effects associated with management style were not statistically significant ($\beta = 0.05$, $p > .05$; $\beta = 0.03$, $p > .05$), indicating that the moderating hypotheses

(H5 and H6) are not supported. Overall, the findings demonstrate that capability architecture dimensions directly influence operational efficiency, whereas management style does not significantly moderate these relationships.

Overall, the findings demonstrate that the dimensions of capability architecture exert significant positive effects on operational efficiency among rural micro-enterprises. The results further indicate that management style does not significantly alter these relationships. Collectively, the findings suggest that operational efficiency among tea smallholders is driven primarily by the configuration and deployment of complementary capabilities rather than by variations in managerial style.

Discussion

The findings of this study demonstrate that operational efficiency among tea smallholder micro-enterprises is primarily shaped by internally configured capabilities rather than by isolated resources or managerial attributes. The significant positive effects of soil management training, labour availability, working culture, and technical knowledge suggest that efficiency within resource-constrained enterprises emerges through the coordinated deployment of human, organizational, and knowledge-based capabilities. These findings reinforce the argument that enterprise performance in constrained environments depends upon the effective organization and integration of complementary capabilities. Collectively, the results provide empirical support for the concept of Capability Architecture by demonstrating that operational efficiency is generated through the structured integration of complementary capabilities rather than through isolated capability dimensions.

The findings also offer a boundary condition to contingency-based explanations of SME performance. Although Contingency Theory emphasizes the role of managerial behaviour in shaping organizational outcomes, the absence of significant moderating effects suggests that managerial discretion exerts limited influence in highly constrained environments. Instead, operational efficiency appears to depend primarily on internally configured capability systems. This finding shifts the analytical emphasis from leadership-centric explanations toward the internal organization of capabilities and positions Capability Architecture as a dominant explanatory mechanism of performance in resource-constrained micro-enterprises.

From an enterprise development perspective, the findings offer important practical implications.

Development programmes frequently focus on isolated interventions such as technical training or managerial development activities. However, the results suggest that interventions targeting individual capability dimensions may generate limited and uneven outcomes if complementary capabilities remain weak or poorly coordinated. Sustainable improvements in enterprise performance are therefore more likely to emerge through integrated capability-building strategies that simultaneously strengthen training systems, labour coordination, knowledge-sharing mechanisms, and organizational routines.

The findings also have important implications for rural development policy. Strengthening agricultural extension services, improving access to technical advisory support, facilitating labour coordination mechanisms, and promoting collaborative learning platforms may enhance the capability architecture of rural enterprises and improve operational efficiency. Such interventions have the potential to contribute not only to enterprise productivity but also to livelihood sustainability, rural resilience, and inclusive economic development.

Conclusion

This study examined the influence of Capability Architecture on operational efficiency among tea smallholders operating as rural micro-enterprises in Sri Lanka. The findings demonstrate that soil management training, labour availability, working culture, and technical knowledge exert significant positive effects on operational efficiency, while management style does not significantly moderate these relationships. The results therefore suggest that operational efficiency in resource-constrained enterprises is primarily determined by the configuration and coordination of complementary capabilities rather than by variations in managerial style.

The study contributes to the enterprise development literature by advancing the concept of Capability Architecture as a distinct explanation of enterprise performance in resource-constrained environments, emphasizing that sustainable enterprise outcomes emerge through the configuration and integration of complementary capabilities rather than through isolated capability dimensions. By demonstrating how internally coordinated capabilities contribute to operational efficiency, enterprise resilience, and livelihood sustainability among rural micro-enterprises, the study extends understanding of capability-driven enterprise development in emerging economies. The findings further suggest that policymakers, extension service providers, and development agencies should move beyond

fragmented capability-building initiatives and adopt integrated interventions that simultaneously strengthen training systems, knowledge application, labour coordination, and organizational learning processes to improve enterprise performance and rural development outcomes.

Several limitations should be acknowledged. The cross-sectional design limits causal inference, and the use of perceptual measures may introduce response bias. Furthermore, the study focuses exclusively on tea smallholders in Sri Lanka, which may limit the generalizability of the findings to other contexts. Future research could employ longitudinal designs, incorporate objective performance measures, and examine the applicability of Capability Architecture across different types of SMEs and developing-country settings.

Overall, the study demonstrates that operational efficiency among rural micro-enterprises is fundamentally shaped by the configuration of interdependent capabilities. The findings provide a capability-based explanation of enterprise performance in resource-constrained environments and offer insights for enterprise and rural development policy.

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Appendices

Table 1. Reliability Statistics of Study Constructs

Construct	Number of Items	Cronbach's Alpha
OE	11	0.976
SMT	9	0.976
LA	11	0.965
WC	9	0.970

TK	8	0.968
MS	10	0.967
Overall Scale	-	0.975

Table 2. Construct Reliability and Validity

Construct	CR	AVE	√AVE
OE	0.97	0.69	0.83
SMT	0.96	0.66	0.81
LA	0.95	0.64	0.80
WC	0.96	0.67	0.82
TK	0.95	0.63	0.79
MS	0.96	0.65	0.81

Note: CR = Composite Reliability; AVE = Average Variance Extracted.