

# Beyond Tools: The BPM Cultural Bridge to Lean Six Sigma Success in Services

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## Abstract

This conceptual paper develops an integrative framework that positions Business Process Management (BPM) culture as the critical mediating mechanism linking Lean Six Sigma (LSS) initiatives to sustained process performance in the service industry. Grounded in a synthesis of Lean Theory and Organizational Culture Theory, it challenges the prevailing tool-centric approach by underscoring that technical excellence in LSS requires strong cultural alignment for lasting success. The study argues that a mature BPM culture—characterized by customer orientation, excellence, responsibility, and teamwork—is essential for embedding LSS principles and ensuring that process improvements endure beyond project implementation.

**Purpose:** This paper aims to conceptualize how BPM culture mediates the relationship between LSS initiatives and process performance in services. It addresses the persistent gap in the literature that focuses narrowly on direct tool–performance relationships by emphasizing the socio-technical nature of sustainable improvement.

**Design/methodology/approach:** The study adopts a conceptual, theory-building approach. Drawing on a systematic synthesis of Lean and Organizational Culture theories, it conceptualizes BPM culture as a higher-order, multidimensional construct and proposes a framework delineating its mediating role between three core LSS practices—Muda elimination, Continuous Improvement, and Six Sigma—and the dual dimensions of process performance: process efficiency and process effectiveness.

**Research limitations/implications:** As a conceptual study, the framework requires empirical validation. Future research should test the proposed relationships using quantitative methods such as structural equation modelling, particularly Partial Least Squares (PLS-SEM), across diverse service sectors. Longitudinal studies would be valuable to examine the evolution of these relationships over time. **Practical implications:** The framework provides service managers with a structured rationale to transition from purely technical deployments of LSS to a socio-technical implementation strategy. It offers actionable guidance for assessing cultural readiness, fostering leadership commitment, aligning incentives, and embedding process-oriented values that maximize the long-term return on LSS investments. **Originality/value:**

This study makes a novel theoretical contribution by integrating Lean Theory and Organizational Culture Theory through the mediating construct of BPM culture. It reframes LSS success in services as a socio-technical achievement—dependent not only on rigorous methodologies but also on the cultural context that sustains them—thereby addressing a significant gap in prior literature and providing a foundation for future empirical research.

**Keywords:** Lean Six Sigma, BPM Culture, Service Industry, Process Performance, Organizational Culture

### **Introduction**

In the contemporary global economy, the service sector has emerged as a central driver of growth, innovation, and employment, shaping the competitiveness of both developed and emerging economies (World Bank, 2022). The increasing dominance of services across industries such as healthcare, finance, education, and telecommunications has transformed customer expectations, placing greater pressure on organizations to deliver high-quality, cost-effective, and customer-centric solutions. This evolution, however, also exposes service organizations to intense challenges: heightened competition, rising operational costs, and the demand for faster, more customized responses to customer needs (Antony et al., 2024; Alkaf et al., 2021).

To address these challenges, Lean Six Sigma (LSS) has been widely adopted as an improvement methodology. LSS synergistically combines three interrelated practices: Lean's emphasis on eliminating waste (Muda) (Ohno, 1988; Womack & Jones, 1990), Continuous Improvement (CI) and Kaizen's philosophy of incremental change (Imai, 1986), and Six Sigma's structured, data-driven approach to reducing variation and defects (Pyzdek, 2011; Harry & Schroeder, 2000). Together, these practices provide a comprehensive toolkit for improving efficiency and effectiveness in processes (George, 2011; Ptacek et al., 2013). Yet, despite its proven successes in manufacturing, the translation of LSS into service settings has proven inconsistent and fraught with limitations (Antony et al., 2019; Klein et al., 2022).

The distinctive characteristics of services—intangibility, customer co-production, and heavy reliance on employee discretion—introduce complexities absent in manufacturing environments (Pakdil & Leonard, 2015). As a result, LSS tools that are effective in optimizing technical workflows often fall short when transplanted directly into service contexts. Improvements are typically realized during active projects but are rarely sustained once formal oversight ends, leading to regression and organizational frustration (Schmiedel et al., 2020; Antony et al., 2024).

One critical factor influencing these uneven outcomes is organizational culture. Business Process Management (BPM) culture, defined as the shared values, beliefs, and behaviours that promote process-oriented thinking, accountability, and cross-functional collaboration, plays a pivotal role in determining whether LSS practices are embedded and sustained (Schmiedel et al., 2014; Brocke & Rosemann, 2015). BPM culture enables organizations to move beyond tool-centric adoption by cultivating the cultural soil necessary for technical methods to thrive.

This paper therefore proposes a conceptual framework that integrates Lean Theory and Organizational Culture Theory, positioning BPM culture as the mediating mechanism that

translates LSS practices into improved service process performance (process efficiency and process effectiveness). By reframing success as dependent not only on tools but also on cultural alignment, the framework addresses the persistent gap between short-term gains and sustainable improvements in the service industry.

### Literature Review

This section provides a comprehensive review of the literature, synthesizing key concepts to establish the theoretical foundation for this study. It examines the application of LSS in the service sector, delves into the principles of Muda, CI and Six Sigma methodologies, and explores the relevant tenets of Organizational Culture Theory and BPM culture. A consistent theme emerging from the literature is the limitation of a purely tool-centric approach to LSS and underscores the critical necessity of integrating cultural enablers to achieve and, crucially, sustain meaningful process performance improvements.

#### *Lean Six Sigma Initiatives in Services (Independent Variables)*

The translation of LSS from its manufacturing origins into the service industry has been both conceptually ambitious and empirically challenging. While LSS remains widely recognized as a powerful integrative methodology for achieving operational excellence—merging Lean’s focus on waste elimination (Muda) with Six Sigma’s emphasis on reducing process variation and defects (George, 2011; Pepper & Spedding, 2010)—its transferability beyond standardized, tangible, and repetitive manufacturing environments (Ohno, 1988; Womack & Jones, 1990) is far from straightforward. In manufacturing, the conditions of control, measurement, and predictability create fertile ground for LSS implementation. In contrast, service processes are typically characterized by intangibility, heterogeneity, and human interdependence, which complicate the direct application of mechanistic improvement tools (Antony et al., 2017; Klein et al., 2022).

Empirical studies across diverse service sectors—including healthcare (Antony et al., 2019; Improta et al., 2019; Ferreira et al., 2018), finance (Heckl et al., 2010; Rucker, 2000), telecommunications (Antony, 2006), and education—demonstrate that while LSS can yield measurable performance gains, such improvements are often inconsistent or unsustainable. This inconsistency highlights a persistent gap between LSS’s technical promise and its organizational realization. As the service sector continues to dominate global GDP and competitive dynamics (World Bank, 2022), the capacity of LSS to deliver lasting impact increasingly depends on how well it is adapted to human-centric, knowledge-intensive environments rather than on its technical sophistication alone.

Theoretically, the literature suggests that LSS’s fundamental principles—Muda elimination, CI, and Six Sigma’s DMAIC methodology—retain their relevance in services but require cultural and behavioural recontextualization to succeed. Muda identification can streamline workflows and reduce hidden costs (Pepper & Spedding, 2010; Antony et al., 2017), CI fosters engagement and adaptability through incremental learning (Imai, 1986; Jain, 2023), and Six Sigma introduces data-driven rigor to inherently variable service processes (Pyzdek, 2011; Antony et al., 2019). However, while these tools are technically robust, their long-term effectiveness in services is contingent upon the presence of a supportive cultural infrastructure that reinforces process ownership, cross-functional collaboration, and learning orientation (Pakdil & Leonard, 2015; Schmiedel et al., 2020).

Recent scholarship argues that the integration of Lean and Six Sigma, though conceptually synergistic, is insufficient on its own to address the social complexities of service systems. The combined framework may promote process standardization, error minimization, and enhanced responsiveness (Snee & Hoerl, 2003; Patel & Patel, 2021), yet its sustainability depends less on methodological precision and more on cultural alignment and behavioural engagement. Consequently, this synthesis underscores a critical shift in perspective: LSS success in services is not merely a function of tool mastery but of embedding those tools within a culture that supports continuous learning, accountability, and process-based thinking.

### *Muda*

The elimination of Muda—a Japanese term for “waste”—has long been recognized as a foundational principle of Lean thinking and, by extension, LSS. Originally conceptualized by Ohno (1988) within the Toyota Production System (TPS), the philosophy identifies seven classical types of waste: (1) transportation, (2) inventory, (3) motion, (4) waiting, (5) over-processing, (6) overproduction, and (7) defects. The overarching goal is to maximize value by minimizing non-value-adding activities, thereby achieving smoother workflows, lower costs, and higher quality (Schonberger, 2010). TPS operationalizes this philosophy through its two interdependent pillars—Just-in-Time (JIT) production and Jidoka (Soare, 2012)—which together ensure both process flow and built-in quality. While JIT minimizes resource idleness by synchronizing supply with demand, Jidoka empowers workers to detect and address quality issues at the source, embodying Lean’s human-centric approach to continuous attentiveness and problem-solving. These principles laid the conceptual foundation for Lean Manufacturing (Calçado et al., 2024), which subsequently evolved into the broader LSS methodology integrating statistical rigor from Six Sigma.

However, the direct transfer of these manufacturing-born principles into service environments has proven problematic and conceptually incomplete. In manufacturing, waste is tangible—visible in materials, motion, or defective products. In contrast, in services, Muda manifests in intangible forms such as delays in decision-making, redundant information flows, and inconsistencies in customer interaction (Antony et al., 2017). Service processes are inherently co-produced with customers, rely on human discretion and knowledge, and often lack standardized workflows (Kwak & Anbari, 2006). Consequently, waste in services cannot always be objectively measured or eliminated using traditional tools. For instance, what appears to be “waiting” in a hospital might, from the patient’s perspective, be a necessary buffer for safety or empathy. This suggests that the perception of waste in services is socio-technical, shaped not only by process design but also by behavioural and cultural factors.

Empirical research supports the potential—but also the limitations—of Muda elimination in services. Ferreira et al. (2018) demonstrated that Lean projects in healthcare significantly reduced patient throughput times and improved quality indicators, while Heckl et al. (2010) showed how process simplification in banking accelerated transaction completion and improved customer satisfaction. These successes confirm the transferability of Lean tools but also highlight their contingent effectiveness, which depends heavily on contextual adaptation. Pepper and Spedding (2010) argue that without a holistic systems perspective, waste elimination initiatives risk becoming “local optimizations” that improve isolated steps but create new inefficiencies elsewhere in the process chain. Similarly, Antony et al. (2017) caution that Lean practices often fail to sustain long-term gains in services when cultural

enablers—such as leadership engagement, teamwork, and employee empowerment—are absent.

To visualize and eliminate Muda effectively, tools such as Value Stream Mapping (VSM) have been widely advocated (Pepper & Spedding, 2010). VSM allows organizations to capture the flow of information and activities from the customer’s perspective, exposing bottlenecks, redundancies, and non-value-adding steps. Yet, several studies (e.g., Klein et al., 2022; Pakdil & Leonard, 2015) observe that technical mapping alone rarely delivers sustainable transformation. Service organizations frequently succeed in optimizing flowcharts and KPIs but fail to change daily behaviours and decision logics. This disconnect arises because technical interventions focus on “what” to improve, whereas cultural alignment determines “how” and “why” improvements are pursued and maintained.

Thus, while Muda elimination represents the technical mechanism of Lean improvement, it does not inherently create the social conditions required for sustained performance. Without an enabling cultural context—specifically, one grounded in BPM culture values such as responsibility and teamwork—waste elimination efforts tend to remain superficial, short-lived, and prone to regression. Klein et al. (2022) describe this as a situation where visual process redesigns fail to penetrate the behavioural routines of employees. This underscores the central argument of the present study: that Muda elimination, while indispensable for achieving operational efficiency, can only yield durable results when embedded within a strong BPM culture that reinforces accountability, collaboration, and process ownership across organizational boundaries.

### **Continuous Improvement**

CI constitutes a fundamental pillar of LSS, representing the philosophy of sustained, incremental advancement rather than episodic, large-scale reform. Rooted in the Kaizen tradition and operationalized through the Plan–Do–Check–Act (PDCA) cycle, CI embodies a disciplined yet participative approach to problem-solving and process enhancement (Imai, 1986; Bessant & Caffyn, 1997). Beyond its procedural tools, CI reflects a distinct cultural philosophy that emphasizes employee involvement, shared accountability, and learning through experimentation—principles that have proven especially vital in the dynamic and customer-centric nature of service environments (Suárez-Barraza et al., 2023; Yokozawa et al., 2021).

Expanding beyond Kaizen’s original focus on shop-floor improvements, the broader CI philosophy integrates three interdependent dimensions: continuity, incrementalism, and participation (Singh & Singh, 2015). This triad positions CI not merely as a problem-solving technique but as an organizational mindset that fosters adaptability and resilience. In service organizations—where processes are often intangible, knowledge-intensive, and heavily dependent on frontline discretion—CI provides a systematic mechanism for ongoing refinement. It enables firms to respond effectively to evolving customer needs, regulatory pressures, and competitive demands (Antony, 2014; Ptacek et al., 2013).

Empirical research substantiates CI’s tangible benefits across service sectors. In healthcare, Thomerson (2001) reported how CI-based initiatives reduced bottlenecks in patient discharge, significantly improving throughput and satisfaction. In the financial services sector,

Rucker (2000) demonstrated that PDCA-driven interventions reduced transaction errors and improved service accuracy. Similarly, Suárez-Barraza et al. (2023) and Jain (2023) found that CI promotes organizational agility by embedding problem-solving capabilities into daily routines. More recently, Monteiro et al. (2024) showed that CI initiatives in the food service industry delivered measurable gains in both operational performance and customer satisfaction, with over 80% of outcomes linked directly to efficiency and quality improvements. Collectively, these findings reinforce CI's dual contribution: enhancing internal performance and enriching external customer experiences.

However, despite its conceptual appeal and empirical validation, the practical effectiveness of CI in services remains uneven. Scholars increasingly emphasize that the success of CI initiatives depends less on technical methods and more on the underlying cultural infrastructure that sustains them (Antony, 2014; Pakdil & Leonard, 2015). In service contexts, where employees exercise autonomy and influence customer outcomes directly, their engagement and psychological ownership are decisive factors. Without cultural reinforcement—manifested through empowerment, recognition, and a shared sense of responsibility—CI risks devolving into isolated projects or symbolic compliance exercises, quickly fading once managerial oversight diminishes.

Klein et al. (2022) caution that such initiatives often deliver superficial improvements when detached from an enabling culture that embeds process thinking into daily behaviour. This critical observation underscores the central argument of the present study: CI provides the mechanisms for iterative improvement, but BPM culture provides the institutional and behavioural soil in which those mechanisms can take root and flourish sustainably. A robust BPM culture—anchored in teamwork, responsibility, and excellence—transforms CI from a set of techniques into a deeply ingrained organizational habit that continuously renews service performance over time.

### *Six Sigma*

Six Sigma represents the analytical cornerstone of the LSS framework, offering a disciplined, data-driven methodology for achieving process consistency, minimizing variation, and eliminating defects. Developed at Motorola in the 1980s and popularized by General Electric in the 1990s, Six Sigma's structured DMAIC framework—Define, Measure, Analyze, Improve, and Control—provides a systematic roadmap for diagnosing inefficiencies and implementing statistically validated solutions (Pande et al., 2000; 2014). Its methodological rigor contrasts and complements Lean's focus on flow and waste elimination, together forming an integrated socio-technical system for operational excellence (George, 2011; Womack & Jones, 1990).

The empirical record attests to Six Sigma's versatility across industries. In healthcare, its application has led to measurable reductions in medical errors, improved patient safety, and optimized clinical workflows (Antony et al., 2019; Improta et al., 2019). In banking, Six Sigma projects have enhanced compliance accuracy, reduced transaction errors, and streamlined back-office operations (Heckl et al., 2010; Rucker, 2000). Similarly, in telecommunications, the methodology has improved call centre responsiveness and reduced complaint rates (Suárez-Barraza et al., 2023). Beyond the private sector, Li et al. (2019) demonstrated its adaptability in higher education, where DMAIC-driven interventions improved administrative service efficiency despite the complex human dynamics inherent in service delivery.

Collectively, these findings highlight Six Sigma's potential to generate measurable, replicable improvements in process quality and customer satisfaction across diverse service contexts.

However, critical analysis reveals that while Six Sigma's statistical discipline offers undeniable strengths, its translation into the service sector is neither seamless nor guaranteed. Unlike manufacturing, service processes are characterized by intangible outputs, variable human inputs, and limited standardization, making the identification and control of variation substantially more complex (Kwak & Anbari, 2006). Kääriä and Ahm Shamsuzzoha (2023) found, for example, that inefficiencies in pricing and invoicing processes often stemmed not from data system limitations, but from human discretion and inconsistent work practices—factors less amenable to statistical control. This underscores a key paradox: Six Sigma's analytical precision can diagnose variation, but it cannot, on its own, address the behavioural or cultural roots that generate inconsistency in service environments.

The limitations of purely technical Six Sigma applications are well-documented. Projects often demonstrate early success during the active improvement phase but struggle to maintain results once oversight and resources diminish. Antony et al. (2024) attribute this recurring decline to a lack of internalization of Six Sigma's underlying values of process discipline, accountability, and continuous learning. Similarly, Klein et al. (2022) argue that without an embedded cultural infrastructure to reinforce desired behaviours, Six Sigma risks becoming a short-lived initiative—effective at detecting defects but ineffective at sustaining improvement.

These insights point to an essential conceptual shift. Six Sigma's power lies not solely in its tools, but in its capacity to shape organizational mindsets when embedded within a supportive cultural framework. BPM culture provides this necessary foundation by institutionalizing values of responsibility, teamwork, and data-driven decision-making. Within such a culture, employees are not merely implementers of statistical tools but active participants in problem-solving and accountability processes. The BPM values of Customer Orientation and Excellence reinforce Six Sigma's customer-focused and quality-driven orientation, while Teamwork and Responsibility ensure that improvements are sustained through shared ownership and collaboration.

Thus, while Six Sigma offers the methodological precision for identifying and correcting variation, BPM culture ensures that these improvements are internalized, replicated, and maintained over time. In this sense, Six Sigma provides the technical mechanisms, but BPM culture supplies the behavioural infrastructure necessary for long-term operational excellence. The synergy between the two transforms Six Sigma from a statistical exercise into a sustainable, organization-wide capability that drives enduring efficiency and effectiveness in service delivery.

#### *Process Performance in Services (Dependent Variables)*

Process performance is a cornerstone of organizational success in the service sector, reflecting the degree to which internal operations deliver value efficiently and effectively. Unlike manufacturing, where outputs are tangible and performance metrics are standardized, service performance is inherently multifaceted—dependent on human interactions, knowledge flows, and real-time adaptability. Scholars broadly agree that process

performance in services is best conceptualized through two interdependent dimensions—efficiency and effectiveness—which together determine how well organizations balance operational productivity with customer value creation (Schmiedel et al., 2020; Milanie et al., 2020).

Process efficiency captures the extent to which resources are utilized optimally to minimize waste and maximize throughput. It represents the principle of “doing things right,” focusing on the economization of time, cost, and labour without compromising quality (Milanie et al., 2020). In service environments, efficiency gains are manifested through faster response times, smoother process flow, and reduced transaction costs—factors that directly affect service reliability and customer satisfaction (Melián & Martín, 2019). For instance, in customer support or financial operations, effective workflow design and resource allocation have been shown to improve not only internal productivity but also perceived service responsiveness (Chang et al., 2017). However, a critical evaluation of the literature reveals that efficiency-focused improvements often risk prioritizing speed and cost reduction at the expense of flexibility and personalization—key attributes of service quality (Antony et al., 2017). Thus, excessive standardization, while enhancing efficiency, can paradoxically erode the experiential aspects of service delivery that drive long-term customer loyalty.

Process effectiveness, in contrast, focuses on “doing the right things”—the degree to which organizational processes achieve desired outcomes such as high-quality service delivery, customer satisfaction, and strategic goal attainment (Alkaf et al., 2021). Effectiveness embodies the organization’s ability to align its processes with broader business objectives and stakeholder expectations. Empirical studies consistently show that effective processes enhance customer perceptions of value, which in turn strengthens competitive advantage and organizational reputation (Hafizh & Aswar, 2020; Dreyfus, 2020). Yet, while most service organizations measure effectiveness in terms of outcomes (e.g., satisfaction scores or retention rates), fewer studies investigate how process design, employee behaviour, and culture interact to sustain these outcomes over time. This gap underscores the need for a more integrated perspective that links process execution to the behavioural and cultural enablers within the organization.

Recent research reinforces that sustainable operational excellence depends on simultaneous improvements in both efficiency and effectiveness rather than isolated gains in one dimension (Chang et al., 2017; Schmiedel et al., 2020). Efficiency without effectiveness risks cost minimization without customer value, while effectiveness without efficiency leads to unsustainable cost structures and resource strain. The interplay between these dimensions becomes particularly salient in service settings, where outcomes rely on human discretion and customer co-production. Consequently, achieving high process performance is not simply a technical task but a behavioural and organizational challenge that requires shared values, cross-functional collaboration, and continuous learning.

Critically, this synthesis points to a growing recognition in the literature that technical process optimization alone cannot sustain high performance. Numerous service organizations that adopted Lean Six Sigma reported initial gains in throughput and accuracy, only to experience performance regression when projects concluded (Klein et al., 2022; Antony et al., 2024). The common factor across these studies is the absence of a strong cultural infrastructure to

anchor new routines and behaviours. This reinforces the theoretical premise of the present study: that BPM culture functions as the mediating mechanism that converts LSS-driven technical improvements into lasting performance outcomes. A BPM-oriented culture fosters process ownership, accountability, and teamwork—social elements that enable efficiency improvements to endure and effectiveness outcomes to compound over time (Brocke & Rosemann, 2015; Schmiedel et al., 2020).

In conclusion, the literature establishes that process performance in services is a multidimensional construct encompassing efficiency and effectiveness, both of which are essential yet insufficient when pursued in isolation. While LSS provides the methodological tools for diagnosing and improving process inefficiencies, BPM culture provides the behavioural context that embeds these improvements into organizational routines. This integration—technical and cultural—forms the foundation of sustainable process excellence and represents the conceptual bridge that this study seeks to articulate and empirically validate.

#### *Business Process Management (BPM) Culture (Mediating Variables)*

Organizational culture has long been recognized as a fundamental determinant of organizational success or failure. Defined by Schein (2010) as a dynamic pattern of shared assumptions, values, and norms that guide behaviour within a group, culture shapes how individuals perceive, interpret, and enact organizational priorities. Within the context of LSS implementation, culture is not merely a backdrop but a decisive factor influencing how employees engage with improvement initiatives. Empirical evidence demonstrates that while LSS provides the technical mechanisms for change, culture determines whether these mechanisms are understood, embraced, and sustained (Pakdil & Leonard, 2015; Brocke & Rosemann, 2015). For instance, hierarchical and control-oriented cultures often inhibit employee empowerment and open problem-solving—both essential to Lean’s philosophy—whereas collaborative and process-oriented cultures encourage collective accountability and cross-functional learning (Schmiedel et al., 2020).

While various models—such as Hofstede’s cultural dimensions and Denison’s Organizational Culture Model (Hofstede et al., 2010; Denison et al., 2014)—have contributed to understanding culture’s influence on organizational outcomes, many studies continue to treat culture as a static moderator or environmental context rather than an active, mediating mechanism. This theoretical limitation has constrained our understanding of how culture shapes the success of process improvement initiatives. Addressing this gap, BPM culture emerges as a more specific, operationalizable construct that encapsulates the process-oriented values and behaviours required to embed LSS principles at all organizational levels (Schmiedel et al., 2014).

Unlike broader organizational culture frameworks, BPM culture explicitly aligns cultural values with the principles of process orientation, end-to-end visibility, and performance ownership. It represents a targeted cultural configuration that enables organizations to sustain process excellence by embedding improvement practices into their daily routines. Malinova and Mendling (2018) argue that BPM success depends not only on technical implementation but also on the “soft infrastructure” of shared beliefs, leadership behaviours, and employee engagement—underscoring that cultural alignment is as vital as process

design. Similarly, Brocke and Rosemann (2015) demonstrate that process initiatives fail to achieve sustained benefits when divorced from organizational values, leading to temporary compliance rather than meaningful transformation.

The CERT framework proposed by Schmiedel et al. (2014)—comprising Customer Orientation, Excellence, Responsibility, and Teamwork—offers a structured lens through which BPM culture can be operationalized.

- **Customer Orientation:** This dimension reflects a shared, organization-wide focus on deeply understanding and proactively meeting the needs of both external and internal customers. It ensures that processes are designed, executed, and improved with the primary goal of delivering genuine, measurable value from the customer's perspective.
- **Excellence:** This signifies a collective and ingrained commitment to continuous improvement, innovation, and the relentless pursuit of high standards in all process activities. It embodies a refusal to accept the status quo and a drive for perpetual betterment.
- **Responsibility:** This entails establishing clear process ownership and fostering a deep sense of accountability for process outcomes among all employees. It empowers individuals and teams to take initiative, solve problems within their domain, and feel personally invested in the success of the end-to-end process.
- **Teamwork:** This dimension emphasizes the critical importance of cross-functional collaboration, open knowledge sharing, and the breaking down of traditional departmental silos. It is essential for effectively managing and optimizing processes that span multiple organizational units.

Together, these dimensions form the cultural foundation for process-driven organizations. Empirical studies affirm that strong BPM cultures enhance cross-functional collaboration, data-driven decision-making, and sustained process improvements—key determinants of long-term LSS success (Brocke & Schmiedel, 2011; Schmiedel et al., 2020). In service industries, where processes are often intangible, people-dependent, and co-created with customers, these cultural values are even more critical for translating process methodologies into meaningful outcomes (Antony et al., 2024).

Recent scholarship has extended BPM culture's relevance into the era of digital transformation. Benraad et al. (2022) note that as organizations increasingly automate and digitize processes, BPM culture acts as a vital bridge between technological systems and human behaviours. This integration ensures that process excellence remains people-centred, preventing digital initiatives from becoming purely technical exercises detached from strategic and cultural alignment. Thus, BPM culture evolves from a management philosophy into an organizational capability—a cultural infrastructure that sustains agility, learning, and continuous adaptation.

Critically, the mediating role of BPM culture becomes most evident when examining why LSS initiatives often fail to sustain results despite initial success. Studies show that waste reduction projects collapse without accountability, CI initiatives remain fragmented without teamwork, and Six Sigma projects lose traction without a shared commitment to excellence (Klein et al., 2022). These patterns illustrate that the technical rigor of LSS alone cannot

guarantee sustainability; rather, BPM culture provides the behavioural scaffolding that embeds these practices into daily organizational life. By positioning BPM culture as an active mediator—rather than a peripheral moderator—this study advances a more nuanced understanding of how organizational values and behaviours translate technical improvement efforts into durable process performance outcomes (vom Brocke & Schmiedel, 2011).

In essence, BPM culture functions as the organizational soil into which LSS tools must be planted. Without this cultural grounding, improvement efforts risk remaining superficial and transient; with it, organizations cultivate the behavioural and structural stability required for enduring excellence. This mediating mechanism is therefore not only central to LSS success but also fundamental to achieving sustainable process performance in service environments where human engagement, collaboration, and learning drive competitive advantage.

**Summary of Literature Gaps**

Despite the extensive body of research on Lean and Six Sigma, several critical gaps remain, as illustrated in Table 1 (in the original text). First, the majority of studies focus on manufacturing contexts or examine only the direct effects of LSS tools on performance, largely neglecting the essential mediating role of organizational culture, specifically within the unique service context. Second, existing research on culture and process improvement often treats culture as a broad contextual moderator or a static backdrop, rather than investigating it as an active, central mechanism that translates intention into action. Third, while the concept of BPM culture is well-theorized, it has rarely been explicitly and systematically integrated into empirical LSS research models. Finally, the complex interplay between LSS practices, BPM culture, and service performance in the modern economy—remains acutely underexplored, leaving a significant void in both academic understanding and managerial guidance. This study aims to address these gaps by proposing and detailing a conceptual model that places BPM culture at the heart of achieving sustainable LSS success in services.

Table 1  
*Summary of Research Gap*

Stream of Research	What is Known	Limitations / Gaps	How This Paper Addresses Them
<b>Lean Six Sigma in Services</b>	LSS tools demonstrably improve operational efficiency and quality in sectors like healthcare, finance, and telecom (Antony et al., 2019; Antony et al., 2017; Antony, 2006).	Results are often short-lived with high initiative failure rates; implementations frequently lack cultural integration, treating LSS as a set of external tools rather than an embedded philosophy.	Positions BPM culture not as a peripheral factor, but as the central mediating variable that ensures the sustainability of LSS-driven improvements.
<b>Continuous Improvement</b>	CI methodologies foster valuable incremental change and rely on frontline employee	CI efforts are often episodic (e.g., isolated events or projects) and fail to become permanent	Explicitly links the practice of CI to the reinforcement of core BPM cultural values (e.g., Excellence, Teamwork), ensuring it

	engagement for success (Imai, 1986; Suárez-Barraza et al., 2023).	without a cultural foundation that reinforces and rewards ongoing improvement.	becomes a lasting organizational routine.
<b>Six Sigma in Services</b>	The DMAIC framework effectively improves process accuracy and reduces variation in service settings (Antony, 2004; Heckl et al., 2010; Antony et al., 2016).	The human-centred, variable nature of service delivery often undermines the long-term maintenance of statistical gains after project closure.	Positions BPM culture as the essential social mechanism that embeds data-driven thinking and statistical rigor into daily behaviours, ensuring lasting control.
<b>Organizational Culture &amp; LSS</b>	An organization's overarching culture significantly influences the adoption and success of LSS initiatives (Pakdil & Leonard, 2015).	Culture is typically treated as a broad background moderator or static context, not as an active, measurable mechanism that transmits the effect of tools to outcomes.	Reframes culture from a general context to a specific, measurable mediating construct (BPM culture) that actively explains <i>how</i> LSS influences performance.
<b>BPM Culture</b>	The CERT values (Customer Orientation, Excellence, Responsibility, Teamwork) enable a sustainable process-oriented mindset (Benraad et al., 2022; Schmiedel et al., 2020; vom Brocke & Sinnl, 2011)	The concept of BPM culture has seen limited integration with the extensive LSS literature; the two streams of research have largely progressed in parallel.	Integrates the BPM culture construct directly into the LSS model, proposing it as the missing link that connects LSS initiatives to performance outcomes.

In response, this study develops a conceptual model that explicitly positions BPM culture as the mediating mechanism between LSS initiatives and service process performance. By addressing these gaps, it contributes to both theoretical advancement and practical guidance in service organizations.

### Conceptual Framework and Propositions

#### *Integrating Theories: A Socio-Technical Model of LSS, BPM Culture, and Process Performance*

To address the limitations of a purely tool-centric perspective, this study integrates Lean Theory and Organizational Culture Theory to propose a socio-technical framework that explains how LSS initiatives translate into sustained process performance within service organizations. While Lean Theory provides the technical logic—the systematic pursuit of waste elimination, process flow, and variation control—Organizational Culture Theory contributes the social logic by explaining how collective values, norms, and behaviours determine whether these technical principles are effectively enacted and sustained (Schein, 2010; Brocke & Rosemann, 2015).

This integration responds to a critical gap in the literature: while numerous studies confirm that LSS improves operational outcomes, their explanatory focus remains predominantly on tools, methods, and project structures, overlooking the cultural mechanisms that enable long-term institutionalization (Antony et al., 2019; Klein et al., 2022). By synthesizing these theories, the present model proposes that technical improvement efforts (Muda elimination, CI, and Six Sigma) foster the development of a BPM culture, which in turn drives sustainable improvements in process performance.

Specifically, the model (Figure 1) positions the three core LSS initiatives as independent variables that influence the mediating variable—BPM culture. Rather than being isolated interventions, these initiatives represent complementary pathways for cultivating shared process-oriented values and behaviours. For example, Muda elimination nurtures responsibility through process ownership and accountability; CI reinforces teamwork and participative learning; and Six Sigma instils excellence through data-driven discipline and continuous refinement. Collectively, these initiatives create the behavioural infrastructure necessary for a BPM culture characterized by the four CERT dimensions—Customer Orientation, Excellence, Responsibility, and Teamwork (Schmiedel et al., 2014).

BPM culture, in turn, serves as the causal bridge that connects technical practice with organizational performance. It transforms LSS from a project-based improvement method into a sustainable, organization-wide capability. This cultural mediation is particularly critical in service environments, where processes are knowledge-intensive, customer-facing, and dependent on employee discretion and collaboration. A strong BPM culture aligns individual and collective behaviours with process goals, ensuring that efficiency (“doing things right”) and effectiveness (“doing the right things”) are simultaneously achieved (Schmiedel et al., 2020; Alkaf et al., 2021).

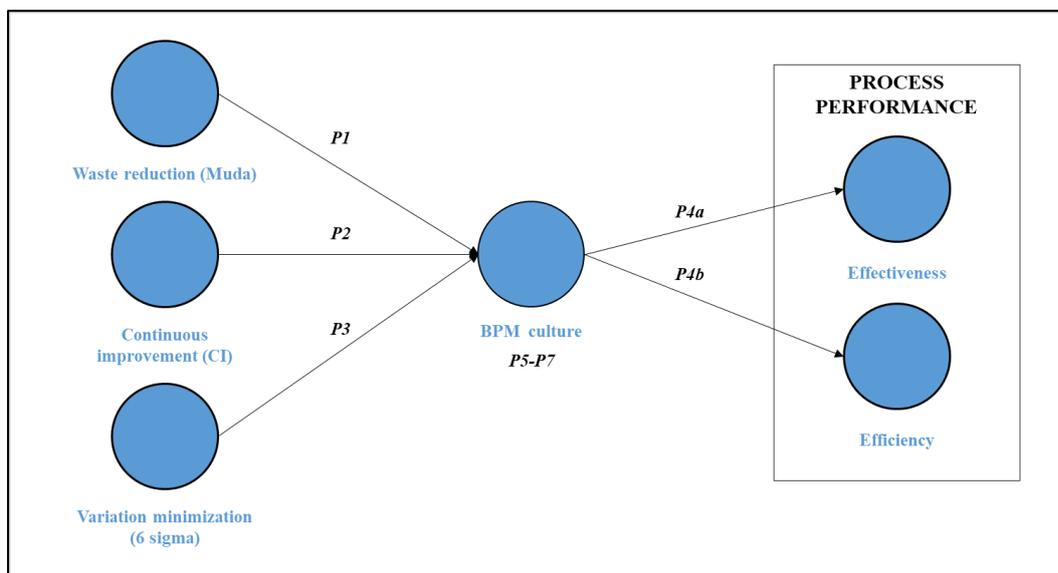


Figure 1: Conceptual Framework

### *Propositions Development*

Drawing on the preceding review, we propose a conceptual model (Figure 1) in which BPM culture mediates the relationship between LSS initiatives and service process performance.

LSS initiatives are represented by three core practices: Muda elimination, CI, and Six Sigma. Process performance is conceptualized across two key dimensions: efficiency, which encompasses optimal resource utilization, cost, and time; and effectiveness, which includes quality, customer satisfaction, and the achievement of desired outcomes.

*Propositions on LSS Initiatives and BPM Culture (P1-P3)*

Research suggests that LSS initiatives do not merely operate on processes in a vacuum but actively influence organizational culture when properly embedded and sustained. Each core practice cultivates specific cultural values that are fundamental to a BPM-oriented mindset. Proposition 1 (P1) posits that Muda elimination has a positive effect on BPM culture on BPM culture. This is because the relentless pursuit of Muda necessitates process transparency and exposes interdependencies, thereby fostering cross-functional accountability and collaboration. This practice inherently aligns with and strengthens the BPM cultural values of responsibility and teamwork, as eliminating waste is a collective effort that requires a shared commitment to process efficiency (Ohno, 1988; Klein et al., 2022).

Proposition 2 (P2) states that CI is has a positive effect on BPM culture. CI methodologies, such as Kaizen and the PDCA cycle, institutionalize a mindset of ongoing, incremental enhancement and shared learning. By empowering employees at all levels to identify and solve problems, CI directly reinforces a cultural commitment to the pursuit of excellence and creates an environment where innovation and systematic problem-solving become ingrained organizational habits. This embeds the core BPM value of continuous learning into the fabric of the organization (Imai, 1986; Suárez-Barraza et al., 2023).

Proposition 3 (P3) proposes that Six Sigma has a positive effect on BPM culture. The Six Sigma methodology, with its rigorous DMAIC framework, mandates a disciplined, data-driven approach to problem-solving. This reduces reliance on intuition and anecdote, instead promoting decisions based on empirical evidence and statistical analysis. This practice cultivates cultural values of responsibility (through precise measurement of outcomes) and customer orientation (by using data to pinpoint and address root causes of customer dissatisfaction), thereby strengthening the data-centric foundation of a mature BPM culture (Pyzdek, 2011; Antony et al., 2017).

*Proposition on BPM Culture and Process Performance (P4)*

The model further proposes a direct relationship between a strong BPM culture and superior process performance. Proposition 4 (P4) argues that BPM culture drives both process efficiency and process effectiveness by embedding process-oriented values into daily operations and decision-making (Schmiedel et al., 2020; Benraad et al., 2022). Specifically, P4a posits that BPM culture has a positive effect on process efficiency. A culture that values waste reduction, accountability, and data-driven analysis naturally optimise resource utilization, reduces costs, and shortens cycle times. P4b posits that BPM culture has a positive effect on process effectiveness. The embedded values of customer orientation, teamwork, and pursuit of excellence directly enhance service quality, increase customer satisfaction, and ensure that process outcomes consistently meet strategic goals. Empirical evidence from sectors like healthcare and finance confirms that such cultural alignment is critical for sustaining performance gains long after initial improvement projects are completed (Antony et al., 2019).

*Propositions on BPM Culture as a Mediator (P5-P7)*

The core contribution of this framework is positioning BPM culture not just as an outcome or an antecedent, but as the vital mediating mechanism that explains how LSS initiatives achieve sustainable performance. Without this cultural support, LSS projects may deliver temporary improvements but often fail to endure, as they are not internalized into the organization's values and behaviours (Antony et al., 2024).

Therefore, we propose that the positive effect of each LSS practice on performance is transmitted through and enhanced by the presence of a strong BPM culture. Proposition 5 (P5) states that BPM culture mediates the relationship between Muda elimination and (a) process efficiency and (b) process effectiveness. The practice of waste reduction only leads to lasting gains if it is supported by a culture that values and maintains lean processes. Proposition 6 (P6) states that BPM culture mediates the relationship between CI and (a) process efficiency and (b) process effectiveness. The tools of continuous improvement yield sustainable results only when housed within a culture that genuinely encourages learning, experimentation, and employee engagement. Finally, Proposition 7 (P7) states that BPM culture mediates the relationship between Six Sigma and (a) process efficiency and (b) process effectiveness. The data-driven rigor of Six Sigma is fully realized only in a culture that inherently believes in measurement, accountability, and fact-based decision-making. In sum, BPM culture acts as the essential bridge that ensures LSS initiatives are not just implemented but are fully embedded, self-sustaining, and capable of delivering long-term performance excellence.

**Discussion and Conclusion**

This paper contends that for LSS to fulfil its promise of delivering sustainable performance improvement in the service industry, organizations must consciously and deliberately build a cultural bridge. LSS provides the powerful technical vehicles for change—the methodologies, tools, and data-driven approaches—but BPM culture provides the essential road and foundational infrastructure upon which these vehicles travel. Without this critical cultural alignment, tool-centric initiatives risk yielding only short-lived gains, a pattern consistently observed in prior studies of service settings where human factors and variability dominate (Klein et al., 2022; Schmiedel et al., 2020). Our integrated framework directly addresses this recurring failure by positioning BPM culture as the vital mediating mechanism that actively translates discrete technical LSS interventions into tangible, embedded, and enduring gains in both operational efficiency and service effectiveness. As a conceptual study, this paper's primary contribution lies in theory building and synthesis; its corresponding limitation is the subsequent lack of empirical validation, which opens a clear pathway for future research.

By advancing a socio-technical perspective, this study fundamentally reframes the prerequisites for LSS success in services. It argues that sustainable excellence is dependent not only on the rigorous application of technical methodologies but also, and equally, on the cultural context in which they are implemented and lived out daily. For scholars, this work integrates Lean Theory and Organizational Culture Theory into a unified conceptual framework, explicitly highlighting BPM culture as a multidimensional, higher-order mediator. For practitioners, it provides a powerful and pragmatic metaphor: while LSS provides the vehicles (tools) for process change, it is a strong, supportive culture that provides the well-

paved road toward sustainable service excellence. Future research is strongly encouraged to empirically test this proposed framework across diverse service sectors and national contexts, utilizing mixed-methods approaches to fully capture the rich, dynamic interplay between tools, culture, and long-term performance.

### **Theoretical Implications**

This study makes several key contributions to theory. First, it contributes to Lean Theory by robustly extending its application and relevance from its origins in standardized manufacturing environments to the far more complex, variable, and human-dependent service context. Prior research has definitively shown that Lean and Six Sigma principles are highly effective in predictable, tangible production settings (Womack & Jones, 1990; Pepper & Spedding, 2010), but their translation to services has been fraught with challenges due to inherent process variability, customer co-creation, and intellectual intensity (Antony et al., 2017; Pakdil & Leonard, 2015). By conceptualizing BPM culture not as a peripheral factor but as the central mediating mechanism, this paper directly responds to repeated scholarly calls for more sophisticated frameworks that move beyond simplistic, tool-centric perspectives to explain success and failure in service environments (Schmiedel et al., 2020; Klein et al., 2022). Second, the deliberate integration of Organizational Culture Theory significantly advances theoretical understanding. While Schein (2010) and others long emphasized that culture fundamentally shapes organizational behaviour, few studies have systematically examined *how* specific cultural elements interact with and enable the effectiveness of formal process improvement methodologies in services. By operationalizing BPM culture through the validated, multi-dimensional CERT framework established by Schmiedel et al. (2014), this study highlights a precise, process-specific cultural configuration that actively conditions and enhances the impact of LSS initiatives. This moves the theoretical conversation forward by positioning culture not as a vague background or moderating variable, but as an active mediating construct, thereby extending and refining prior work on the cultural enablers of performance (Brocke & Schmiedel, 2011; Brocke & Rosemann, 2015).

Overall, this research makes a key integrative theoretical contribution by bridging two prominent yet often isolated academic domains. It successfully extends Lean Theory beyond its mechanical and manufacturing origins by contextualizing it within the human-driven, interactive reality of services and explicitly linking its technical principles to the behavioural and social dynamics best explained by Organizational Culture Theory (Schein, 2010). By theorizing BPM culture as a multidimensional, higher-order mediator (Brocke & Schmiedel, 2011; Schmiedel et al., 2014), we provide a more nuanced, holistic, and powerful explanation for the drivers of sustainable process performance, directly addressing a significant gap in the literature which has predominantly focused on examining direct effects or treated culture as a secondary moderating variable rather than the central mediating mechanism.

### **Practical and Social Implications**

For practitioners and managers, the proposed framework provides a clear, compelling explanation for the familiar scenario where LSS initiatives in services spark initial improvements but then fail to sustain outcomes. Empirical studies have consistently shown that organizations lacking strong cultural support experience employee resistance, fragmented adoption, and an eventual decline in improvement efforts once project teams disband (Antony et al., 2024; Alkaf et al., 2021). This model demonstrates that by proactively

embedding the values of customer orientation, pursuit of excellence, personal responsibility, and cross-functional teamwork into daily operations, leaders can create the fertile ground for LSS tools to take root, thrive, and deliver lasting value.

This paper also advocates for a crucial paradigm shift in managerial thinking. It argues that investing in cultural development is not a secondary "soft" activity following technical "hard" training, but is in fact a necessary *prerequisite* for achieving a return on substantial LSS investments. To operationalize this, service managers should prioritize the following actions:

1. **Assess Cultural Readiness:** Before committing to large-scale LSS deployment, evaluate the existing organizational culture using validated diagnostics aligned with the CERT dimensions to honestly identify cultural strengths and critical gaps (Schmiedel et al., 2020).
2. **Lead by Example:** Senior leadership must go beyond verbal support; they must visibly, consistently, and authentically champion process ownership, collaborative problem-solving, and data-driven decision-making in their own actions to model the desired behaviours for the entire organization (Antony et al., 2024).
3. **Align Systems and Incentives:** Structure training programs, performance metrics, and reward and recognition systems to deliberately reinforce process-oriented values and collective teamwork, moving beyond rewards that are solely based on individual or narrow functional goals (Pakdil & Leonard, 2015).
4. **Communicate the 'Why':** Beyond teaching the 'how-to' of LSS tools, leadership must continuously communicate *why* these practices matter, clearly linking them to the organization's core purpose, values, and strategic goals to foster intrinsic motivation and genuine buy-in at all levels (Pakdil & Leonard, 2015).

By strategically aligning culture with methodology, organizations can significantly enhance adoption rates, reduce change resistance, and most importantly, lock in performance improvements for the long term.

The implications extend beyond organizational boundaries to broader societal well-being. Service industries are deeply intertwined with societal functioning in critical domains such as healthcare, finance, education, and public services. Robust research highlights how effective process improvement can directly reduce patient waiting times and medical errors (Antony et al., 2019; Rucker 2000), enhance the accessibility and fairness of financial services (Antony et al., 2017), and improve the efficiency and reliability of telecommunications and public utilities (Suárez-Barraza et al., 2023, Antony, 2006). Embedding a strong BPM culture in these contexts enables organizations to achieve internal operational efficiency while also contributing to broader societal goals of equity, accessibility, and enhanced quality of life. Therefore, building this cultural bridge to LSS success is both a strategic organizational imperative and a profound social responsibility.

### Limitations and Suggestions for Future Research

As a conceptual study, the primary limitation lies in the absence of empirical validation. The seven propositions (P1-P7) developed in this paper are logically derived but untested, providing a clear and structured agenda for future research. To address this, quantitative studies should be conducted to test the proposed framework across multiple service sectors—including healthcare, finance, education, logistics, business services, and public

services. The use of advanced statistical methods such as PLS-SEM is highly recommended, as this technique is particularly well-suited for testing complex models with mediating variables and for theory development (Hair et al., 2022). Furthermore, longitudinal research designs would be especially valuable in capturing the causal and evolutionary dynamics between LSS implementation, the development of BPM culture, and sustained performance outcomes over time, moving beyond static snapshots.

In addition to quantitative methods, qualitative approaches such as in-depth case studies, semi-structured interviews, or ethnographic methods could provide richer, deeper insights into the nuanced mechanisms and lived experiences through which specific cultural values shape the adoption, adaptation, and ultimate effectiveness of LSS tools in practice. Mixed-method studies would offer the most comprehensive understanding by combining the generalizability and rigor of statistical testing with the contextual depth and interpretive power of qualitative inquiry.

Cross-cultural comparative studies also represent a highly promising avenue for future research. Given that organizational and national culture vary significantly across geographic regions and industries, testing this framework in both developed and emerging economies could reveal important contextual contingencies and help refine the integration of Lean Theory and Organizational Culture Theory for different settings.

Finally, future work could explore sector-specific adaptations of the framework. For instance, in healthcare, BPM culture may place a heightened emphasis on patient-centred care and clinical safety (Antony et al., 2019); in financial services (Thomerson, 2001; Rucker, 2000), on risk management and regulatory compliance; and in education, on stakeholder engagement and learning outcome accountability. Exploring these contextual nuances would greatly enrich theoretical development while simultaneously providing more precise, actionable, and practical guidance for managers operating in specific sectors.

By moving beyond a narrow, tool-centric view and embracing the critical cultural dimension, service organizations can finally unlock the full, sustainable potential of LSS. This transforms LSS from a series of isolated, temporary projects into a deep core cultural capability that drives long-term excellence, resilience, and enduring competitive advantage.

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