Article

A SYSTEMATIC REVIEW OF ERP IMPLEMENTATION STRATEGIES IN THE RETAIL INDUSTRY: INTEGRATION CHALLENGES, SUCCESS FACTORS, AND DIGITAL MATURITY MODELS

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ABSTRACT

Enterprise Resource Planning (ERP) systems have emerged as critical enablers of operational excellence and strategic competitiveness in the garment industry, which is marked by intricate supply chain structures, high product customization, and rapid demand fluctuations. This systematic review explores ERP implementation strategies, challenges, and outcomes by synthesizing the findings of 87 peer-reviewed journal articles published between 2003 and 2024. Employing the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) methodology, the study ensures a structured, transparent, and comprehensive review process that encompasses both empirical and conceptual perspectives. The analysis is organized around key thematic dimensions including integration challenges, critical success factors (CSFs), digital maturity, infrastructure and vendor limitations, customization versus standardization trade-offs, and the underutilization of post-implementation assessments. The review reveals that legacy IT systems, fragmented data structures, and process misalignment are persistent barriers that significantly undermine ERP integration in garment firms, especially among small and medium-sized enterprises (SMEs) in resource-constrained settings. Organizational resistance—fueled by inadequate change management, lack of stakeholder engagement, and skill gaps—continues to be a central inhibitor to system adoption and effective utilization. In contrast, firms with higher digital maturity, robust infrastructure, and proactive leadership demonstrate greater ERP readiness, smoother implementation processes, and improved operational coherence. Despite the known benefits of ERP systems, the review identifies critical research gaps including a dearth of longitudinal and post-deployment evaluations, minimal attention to sustainability-oriented ERP functionalities, and limited adoption of hybrid theoretical models that can capture the complexity of ERP dynamics in diverse organizational contexts. Moreover, regional disparities in implementation practices and a lack of sector-specific digital maturity assessment tools suggest the need for more contextualized research and tailored ERP frameworks. By consolidating fragmented insights and comparing cross-regional and firm-size differences, this review provides a detailed knowledge base that supports informed decision-making for ERP practitioners, garment industry leaders, software vendors, and scholars aiming to bridge theory with practice in enterprise digital transformation.

KEYWORDS

ERP Implementation; Garment Industry; Integration Challenges; Success Factors; Digital Maturity Models;

INTRODUCTION

Enterprise Resource Planning (ERP) systems are integrated software solutions designed to manage and automate core business functions within an organization, encompassing finance, supply chain, manufacturing, human resources, and customer relationship management (Zangiacomi et al., 2019). ERP systems offer a unified platform to facilitate real-time data flow across departments, enabling informed decision-making and operational efficiency (Zairi, 1997). These systems are characterized by centralized databases, modular architectures, and standardized processes that replace disparate legacy systems (Zach et al., 2012). ERP implementation, however, extends beyond technological deployment to include significant organizational change management (Yurdakul & İç, 2005). The implementation process typically follows structured phases such as project preparation, business blueprinting, realization, final preparation, and go-live support (Yeoh & Popovič, 2015).

Figure 1: Overview of Enterprise Resource Planning (ERP) systems

Source: botpenguin.com

According to Yen (2002), ERP success depends on aligning technological capabilities with organizational strategy and culture. Moreover, the ability of ERP systems to adapt to industry-specific requirements, such as customization for garment production cycles, is crucial for sustained performance (Xu et al., 2021). The complexity of ERP systems necessitates strong governance, cross-functional coordination, and continuous evaluation of business processes (Kwahk & Lee, 2008). Researchers such as Mueller et al. (2018) emphasize the socio-technical dimensions of ERP implementation, where organizational readiness, leadership commitment, and user acceptance play pivotal roles. Therefore, understanding ERP systems involves not only their technological architecture but also the organizational processes and environments into which they are embedded (Czekster et al., 2019).

ERP systems have emerged as critical infrastructure in the global industrial landscape due to their role in streamlining operations, reducing redundancies, and improving data transparency (Ünal & Güner, 2009). Across sectors such as automotive, electronics, pharmaceuticals, and textile manufacturing, ERP solutions have supported organizations in responding to complex, volatile, and highly regulated market conditions (Blackburn et al., 2013). In the global apparel and garment sector, ERP systems enable just-in-time production, demand forecasting, and supply chain coordination with international vendors and buyers (Menezes et al., 2018). This sector, often characterized by rapid fashion cycles and lean inventory practices, benefits from ERP-driven integration across design, procurement, production, and logistics (Sun et al., 2016). ERP adoption

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has become a hallmark of digital transformation initiatives worldwide, with multinational enterprises leveraging ERP platforms to support multi-site operations, multilingual interfaces, and compliance with diverse legal requirements (Al-Qirim, 2003; Boza et al., 2014; Sun et al., 2016). Studies by Muscatello et al. (2003) and Boyes et al. (2018) indicate that organizations investing in ERP systems often report improved financial control, customer responsiveness, and supplier collaboration. Additionally, ERP implementation has been linked to increased competitiveness in export-oriented economies, particularly in countries with strong industrial bases such as China, India, Bangladesh, and Vietnam (Goto et al., 2016). The World Bank (2022) notes that ERP penetration is significantly higher among firms that engage in international trade and operate within global value chains. The adoption of ERP is thus not merely an internal operational decision but a strategic imperative influenced by market globalization, digital policy mandates, and competitive dynamics (Muscatello et al., 2003; Ram et al., 2013).

Figure 2: Overview of ERP Fashion Industry

Source: synconics.com

The garment industry presents a unique context for ERP implementation due to its intricate production processes, diverse supplier networks, and highly dynamic customer demands (Haseeb et al., 2019; Jin & Kim, 2018). Unlike process-driven industries, garment manufacturing involves discrete production characterized by short product lifecycles, frequent design changes, and varying batch sizes (Boza et al., 2014; da Silva Serapião Leal et al., 2019). ERP systems in this sector must accommodate functionalities such as product lifecycle management (PLM), fabric inventory tracking, sample coordination, and subcontractor management (Boza et al., 2014; Hanafizadeh & Ravasan, 2011). Researchers such as Muscatello et al. (2003) and Boyes et al., (2018) have emphasized the necessity of tailoring ERP modules to garment-specific activities such as cutting, sewing, dyeing, quality control, and shipment documentation. In developing economies where the garment sector contributes significantly to GDP and employment—such as Bangladesh, Sri Lanka, and Cambodia—ERP adoption is viewed as a pathway to improving operational transparency and compliance with international quality standards (Boza et al., 2014). Moreover, garment exporters often face stringent buyer requirements on lead time, traceability, and environmental sustainability, all of which are better managed through ERP integration (Muscatello et al., 2003; Ram et al., 2013). However, the implementation of ERP in garment factories—especially small and medium enterprises (SMEs)—is challenged by financial constraints, low IT literacy, and resistance to change (Kim et al., 2005; Muscatello et al., 2003). The variability in implementation outcomes across garment firms underscores the need to systematically

examine strategies, critical success factors, and integration barriers unique to this sector (de Soysa & Nanayakkara, 2006).

ERP integration in the garment industry is fraught with technical and organizational challenges, particularly in aligning business processes across the design, procurement, and production departments (de Soysa & Nanayakkara, 2006; Hanafizadeh & Ravasan, 2011). Integration difficulties often stem from fragmented legacy systems, inconsistent data standards, and limited interoperability among supplier and customer platforms (Kwahk & Lee, 2008; Parr & Shanks, 2000). Garment factories that operate across multiple sites or outsource portions of their production face added complexity in achieving system-wide integration (Ayyagari et al., 2007; Ünal & Güner, 2009). Additionally, the informal nature of record-keeping in traditional garment firms—often reliant on manual or spreadsheet-based tracking—hinders the seamless transition to ERP systems (Hanafizadeh & Ravasan, 2011). According to studies by Hanafizadeh and Ravasan(2011), integration problems often emerge during the configuration stage, where misalignment between ERP modules and organizational workflows leads to data duplication and operational delays. Technical issues such as module incompatibility, insufficient system testing, and weak vendor support further exacerbate integration risks (de Soysa & Nanayakkara, 2006). Organizational challenges include user resistance, inadequate change communication, and lack of training, which reduce system utilization and dilute anticipated benefits (Hanafizadeh & Ravasan, 2011). In the garment sector, where line workers and middle managers may have limited digital literacy, these human-centric issues become particularly pronounced (Parr & Shanks, 2000). As observed by Hanafizadeh and Ravasan (2011) and Kwahk and Lee (2008), successful ERP integration in garments requires both technical synchronization and organizational readiness, including leadership engagement, cross-functional collaboration, and continuous process reengineering.

Scholars have extensively examined the critical success factors (CSFs) that influence ERP implementation, emphasizing elements such as top management support, user training, clear project goals, and effective change management (Hanafizadeh & Ravasan, 2011; Kwahk & Lee, 2008). In the garment industry, CSFs are deeply contextualized due to operational variability and hierarchical labor structures (de Soysa & Nanayakkara, 2006). Leadership commitment is often cited as the most pivotal factor, as executives set the tone for ERP adoption and allocate the necessary resources for successful execution (Kwahk & Lee, 2008). Training and capacity-building initiatives are equally important, especially in garment factories with low IT exposure and diverse educational backgrounds among employees (Mueller et al., 2018). Clear definition of project scope, timeline, and deliverables minimizes project overruns and aligns stakeholder expectations (de Soysa & Nanayakkara, 2006). Furthermore, the selection of a suitable ERP vendor and customization strategy directly impacts system usability and long-term performance (Bokhari, 2005). Studies by Parr and Shanks (2000) and Sun et al. (2015) also emphasize the need for effective communication among stakeholders, iterative testing, and contingency planning to navigate unforeseen obstacles. In labor-intensive industries such as garments, employee involvement, feedback loops, and internal champions contribute significantly to ERP ownership and sustained engagement (Mueller et al., 2018; Zhu et al., 2010). By aligning technological, organizational, and human resources, firms increase the likelihood of achieving ERP-driven operational improvements (Ünal & Güner, 2009; Won & Park, 2020).

Digital maturity models provide structured frameworks to assess an organization's readiness for ERP adoption, offering diagnostic tools to evaluate capabilities across dimensions such as leadership, culture, infrastructure, and digital skills (Ayyagari et al., 2007). These models enable organizations to benchmark their current state and prioritize digital investments in alignment with ERP strategies (Won & Park, 2020). In the garment industry, digital maturity is highly variable, with large export-oriented firms often demonstrating higher levels of automation, while SMEs struggle with basic IT implementation (Menezes et al., 2018). Researchers such as Köksal et al. (2017) and Sun et al. (2016) argue that firms with higher digital maturity are more likely to succeed in ERP adoption due to their superior change management capabilities, digital literacy, and innovation culture. Models like the Capability Maturity Model Integration (CMMI), Digital Capability Framework (DCM), and SAP's Digital Maturity Model have been applied to assess ERP readiness

in various sectors (Menezes et al., 2018). In garment firms, digital maturity indicators include the use of automated design software, real-time inventory tracking, and supplier integration via cloud-based platforms (Mueller et al., 2018). The alignment between organizational maturity and ERP system complexity is a determinant of implementation outcomes, as observed by Ünal and Güner (2009) and Menezes et al. (2018). In this context, maturity models not only guide ERP deployment but also support broader digital transformation by identifying capability gaps and prioritizing developmental pathways (Sun et al., 2015).

A systematic review of ERP implementation in the garment industry is warranted to synthesize fragmented evidence across multiple domains—technical, organizational, human, and strategic—into a cohesive understanding (Mueller et al., 2018). Existing literature often focuses on isolated case studies, specific geographic contexts, or limited implementation phases, creating a gap in comprehensive knowledge integration (Köksal et al., 2017). Systematic reviews address this gap by applying rigorous inclusion criteria, methodological transparency, and replicable procedures to analyze and compare findings across empirical studies (Sun et al., 2015). In the context of garment manufacturing, where ERP outcomes vary widely due to operational complexity and digital disparity, a systematic synthesis of literature can reveal consistent patterns, contextual challenges, and industry-specific success determinants (Sammon & Adam, 2005). The methodological rigor of systematic reviews also helps avoid publication bias and enhances the reliability of conclusions drawn from existing studies (Mueller et al., 2018). Furthermore, the rapid evolution of ERP systems and digital technologies necessitates a periodic reassessment of empirical insights, especially in sectors where digital adoption is uneven and strategically significant (Sammon & Adam, 2005; Zhu et al., 2010). The primary objective of this systematic review is to critically evaluate and synthesize existing research on ERP implementation strategies within the garment industry, focusing on three interconnected domains: integration challenges, key success factors, and the application of digital maturity models. This review aims to identify and categorize the technical, organizational, and strategic barriers that garment firms face when deploying ERP systems, particularly in contexts marked by dynamic supply chains, labor-intensive operations, and varying levels of technological readiness. Integration challenges, such as lack of interoperability, legacy infrastructure, and inadequate process alignment, frequently hinder the seamless operation of ERP systems and diminish the return on investment. The review also seeks to distill the most commonly cited critical success factors in successful ERP implementations—ranging from executive sponsorship and user training to clear project management and stakeholder engagement. These success factors are explored within the operational context of garment manufacturing to assess their relative impact and contextual applicability. Additionally, this review aims to analyze how digital maturity models have been employed to assess ERP readiness and guide strategic planning in garment enterprises. By examining studies that apply frameworks like the Capability Maturity Model Integration (CMMI), Digital Capability Framework, and SAP's Maturity Model, the review investigates how digital preparedness influences ERP adoption outcomes. This objective is particularly relevant for identifying best practices and diagnostic approaches that garment firms can adopt to enhance their implementation capacity. Furthermore, the review provides an industry-specific evidence base that supports the formulation of targeted ERP deployment strategies. Through a structured synthesis of peer-reviewed empirical studies, the review ultimately seeks to bridge theoretical understanding and practical application of ERP implementation in the garment sector, offering an academic foundation for future research and actionable guidance for practitioners navigating digital transformation in manufacturing.

LITERATURE REVIEW

The implementation of Enterprise Resource Planning (ERP) systems has been extensively studied across multiple industrial sectors; however, its contextualization within the garment industry remains fragmented and underexplored. The garment industry, known for its labor-intensive operations, fast-paced production cycles, and globalized supply chains, presents a unique and complex environment for ERP deployment. A thorough examination of past literature reveals diverse theoretical frameworks, empirical findings, and methodological approaches used to

understand ERP strategies, integration issues, and organizational outcomes. This literature review provides a structured synthesis of scholarly work that investigates ERP implementation in garment enterprises. It offers a nuanced understanding of the critical themes that emerge from prior research, enabling the identification of patterns, contradictions, and knowledge gaps. The review begins by exploring foundational ERP theories and models to establish the theoretical underpinnings guiding implementation research. It then delves into sector-specific studies focusing on the garment industry, assessing how ERP systems are deployed, tailored, and scaled to meet industry demands. The literature is then categorized into three central themes based on the study's objectives: (1) ERP Integration Challenges in Garment Firms, (2) Critical Success Factors in ERP Deployment, and (3) Digital Maturity Models and ERP Readiness Assessment. Each theme is further dissected into focused sub-sections to provide clarity and depth. By systematically organizing the literature around these dimensions, this review not only facilitates a comparative analysis of ERP strategies but also supports the development of a conceptual framework for understanding ERP implementation dynamics in the garment sector.

ERP Systems: From MRP to Cloud-Based ERP

The evolution of Enterprise Resource Planning (ERP) systems traces back to the development of Material Requirements Planning (MRP) in the 1960s and Manufacturing Resource Planning (MRP II) in the 1980s. MRP systems were initially developed to manage manufacturing inventories and production schedules, enabling firms to optimize raw material procurement and align production with demand (Aladwani, 2001). MRP II expanded on this by incorporating additional functions such as finance, human resources, and capacity planning (Sadrzadehrafiei et al., 2013). As industries grew increasingly interconnected and information-centric, the limitations of MRP II—including isolated data silos and limited real-time processing—prompted the transition to ERP systems in the 1990s. ERP systems integrate core business processes into a single software architecture, enabling seamless data flow and centralized decision-making (Huang et al., 2004). This shift marked a fundamental transformation in enterprise management, offering a unified platform that improved coordination, data accuracy, and operational efficiency across departments (Okrêglicka et al., 2015). By the early 2000s, ERP systems had evolved from transaction-based tools to strategic platforms facilitating enterprise-wide process reengineering and performance monitoring (Sadrzadehrafiei et al., 2013).

Figure 3: ERP Evolution: From MRP to Cloud ERP in the Garment Industry
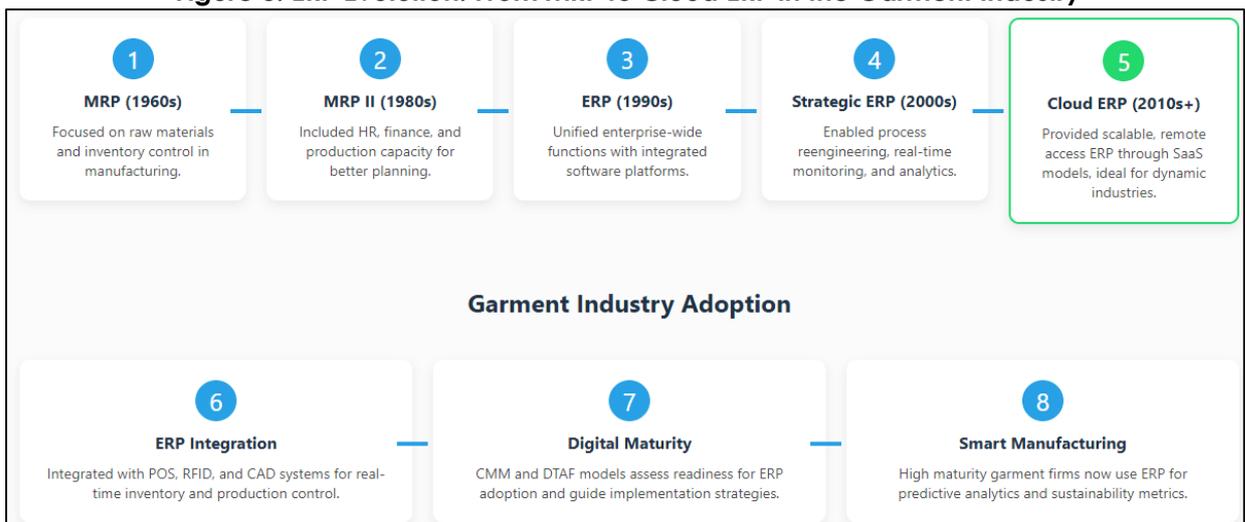
With the growth of globalization and technological advancements, traditional on-premise ERP systems faced new challenges in scalability, cost, and accessibility. These limitations gave rise to cloud-based ERP solutions, which leverage cloud computing infrastructure to deliver ERP functionalities through internet-based services. Cloud ERP systems offer enhanced flexibility, reduced IT overhead, and real-time data access from multiple locations, making them particularly suitable for dynamic industries like garment manufacturing (Sadrzadehrafiei et al.,

2013; Sarkis & Sundarraj, 2003). Scholars argue that cloud ERP overcomes many legacy system constraints, such as delayed updates, costly hardware investments, and limited remote collaboration (Maroufkhani et al., 2020). Studies by King and Burgess (2006) and Sadrzadehrafiei et al. (2013) highlight how cloud-based ERP supports agile manufacturing, digital integration, and decentralized decision-making. Moreover, cloud ERP models are often offered on a subscription basis (SaaS), which lowers upfront capital expenditure and allows for faster implementation cycles (Huang et al., 2004). Despite these advantages, implementation challenges remain, including data security concerns, vendor dependency, and resistance from employees unfamiliar with cloud technologies (Hsu et al., 2015).

ERP adoption has significantly transformed the operational architecture of the garment industry, particularly due to its supply chain complexity and high product variability. Garment firms have adopted ERP systems to streamline order management, optimize inventory, and enhance production scheduling, especially in fast fashion contexts (Botta-Genoulaz & Millet, 2005). Integration of ERP with CAD, RFID, and POS systems has allowed companies to monitor real-time data across supply and distribution networks, improving demand responsiveness and reducing lead time (Marnewick & Labuschagne, 2005). Literature suggests that ERP adoption in garment firms has facilitated vertical and horizontal integration across global value chains, improving vendor collaboration and regulatory compliance (Quinton et al., 2017). However, researchers such as Daneva and Wieringa (2008) have emphasized that ERP success in garment enterprises is contingent upon organizational readiness, staff training, and cultural alignment. Moreover, small and medium-sized enterprises (SMEs) in the garment sector face significant barriers, including lack of digital infrastructure and high implementation costs, which can impede the full realization of ERP benefits (Motwani et al., 2005). In recent years, digital maturity models have emerged as critical tools for evaluating ERP readiness and guiding phased adoption strategies. These models assess organizational capabilities across technology, process, and workforce dimensions, offering a roadmap for ERP evolution from legacy systems to cloud-enabled architectures (Nah, Lau, et al., 2001). The Capability Maturity Model (CMM) and the Digital Transformation Assessment Framework (DTAF) have been widely cited in ERP literature to benchmark enterprise digital readiness (Marnewick & Labuschagne, 2005). Garment firms with higher digital maturity levels are better positioned to leverage ERP systems for predictive analytics, smart manufacturing, and sustainability reporting (Daneva & Wieringa, 2008). Studies indicate that a strong alignment between digital maturity and ERP strategy leads to more effective change management and reduces disruption during the implementation phase (Becker-Leifhold & Iran, 2018; Daneva & Wieringa, 2008). Furthermore, digital maturity assessments help prioritize technology investments and enhance leadership engagement, which are vital for the long-term success of ERP initiatives (Fatorachian & Kazemi, 2018).

Technology-Organization-Environment (TOE) Framework in ERP Studies

The Technology-Organization-Environment (TOE) framework, originally conceptualized by Tornatzky and Fleischer (1990), has emerged as a robust theoretical lens for examining the multifaceted determinants of technology adoption, particularly ERP systems. Within the ERP literature, the TOE framework facilitates a structured understanding of how technological attributes, organizational contexts, and environmental pressures collectively influence ERP adoption and implementation. Technological factors often include perceived benefits, compatibility, complexity, and existing IT infrastructure (Aladwani, 2001). For example, studies by Marnewick and Labuschagne (2005) and Liang and Xue (2004) suggest that ERP systems with high compatibility and ease of integration into existing platforms are more likely to be adopted by firms with mature technological bases. Similarly, Daneva and Wieringa (2008) highlights that the perceived relative advantage of ERP—such as real-time reporting and cross-functional integration—motivates early adoption. Moreover, security, scalability, and system interoperability are frequently identified as decisive technological enablers or inhibitors in ERP-related TOE studies (Daneva & Wieringa, 2008; Motwani et al., 2005).

Organizational characteristics such as firm size, top management support, human resource competence, and organizational culture critically influence ERP adoption and success under the

TOE framework. Top management support consistently emerges as one of the most cited organizational predictors of ERP success (Hong & Kim, 2002). Researchers like Soh et al., (2000) emphasize that management commitment not only ensures resource allocation but also reinforces change management strategies during ERP deployment. Organizational readiness, including the availability of IT skills and financial resources, significantly impacts the implementation process (Daneva & Wieringa, 2008). Studies by Nah and Delgado (2006) and Soh et al. (2000) stress the importance of organizational communication and collaborative work environments, especially when transitioning from legacy systems. Furthermore, cultural resistance, lack of internal process standardization, and poor project management capabilities often act as organizational barriers to ERP success, as reported by Botta-Genoulaz and Millet (2005), Hong and Kim, (2002) and Soh et al. (2000).

Figure 4: Technology-Organization-Environment (TOE) Framework in ERP Studies
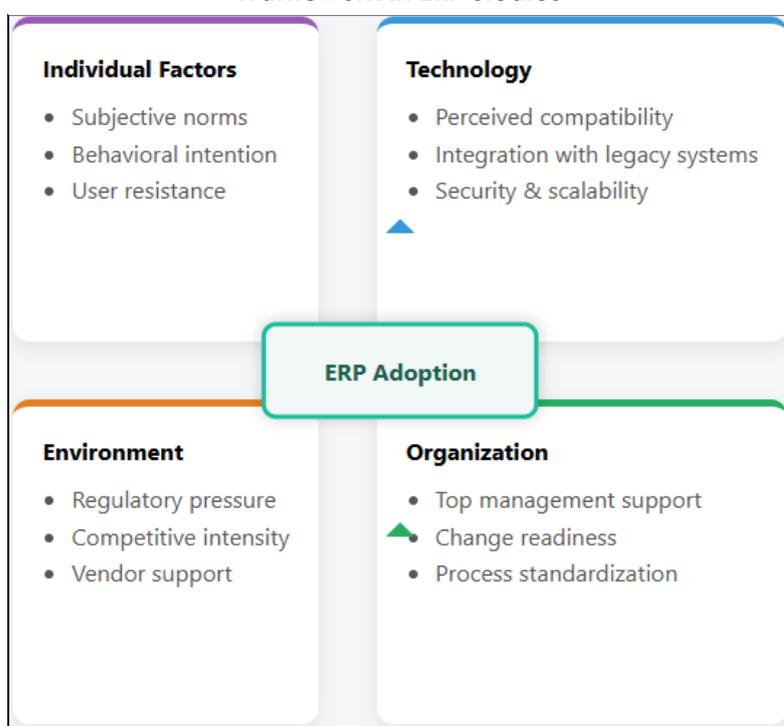
The environmental context within the TOE framework encapsulates external pressures such as market dynamics, competitive forces, regulatory requirements, and vendor support, all of which shape ERP adoption behaviors. Scholars like Fatorachian and Kazemi (2018) and Marnewick and Labuschagne (2005) argue that intense competitive pressure often forces organizations to adopt ERP systems to maintain industry parity. Government regulations, particularly in export-driven industries like garments, further influence ERP adoption as companies strive for compliance and reporting transparency (Elkhani et al., 2014). In developing countries, studies by Yusuf et al., (2004) and Elkhani et al. (2014) reveal that institutional voids and policy inconsistencies can either delay or accelerate ERP adoption depending on sectoral influences. Vendor support, encompassing training, customization, and post-implementation services, also plays a significant role in the successful assimilation of ERP systems (Yusuf et al., 2004). Moreover, supply chain integration imperatives and external stakeholder expectations often compel firms to invest in ERP technologies, as noted by Razmi et al. (2009) and Moalagh and Ravasan (2013).

Integration of the TOE framework in ERP studies provides a multidimensional perspective that highlights the interdependence of the three domains. Scholars like Razmi et al. (2009) and Moalagh and Ravasan (2013) have empirically validated TOE constructs across different sectors, demonstrating how balanced attention to technology, organization, and environment enhances ERP success rates. In the garment industry context, researchers such as Soh et al. (2000) and Moalagh and Ravasan (2013) confirm that firms that simultaneously invest in advanced IT, align organizational processes, and respond to environmental mandates achieve better ERP performance outcomes. TOE's holistic orientation allows researchers to assess not only adoption likelihood but also the depth of system utilization post-implementation (Moalagh & Ravasan, 2013; Razmi et al., 2009). Additionally, the framework facilitates comparative studies across firms and regions, offering a standardized lens to evaluate ERP maturity and diffusion patterns, as explored by Alhirz and Sajeev (2015) and Elkhani et al. (2014). The empirical evidence suggests that while

technological readiness may initiate adoption, organizational and environmental factors critically mediate implementation depth and sustainability. Critiques of the TOE framework in ERP literature often focus on its limited granularity in capturing dynamic interactions between constructs, yet its adaptability continues to attract scholarly attention. For instance, Alhirz and Sajeev (2015) and Soh et al., (2000) argue that the static nature of TOE overlooks temporal changes in technology strategy and external turbulence, especially in volatile markets like the garment sector. Nevertheless, researchers have extended the TOE framework by incorporating additional theoretical lenses, such as the Diffusion of Innovation (DOI) theory and Resource-Based View (RBV), to enhance its explanatory power (Razmi et al., 2009). In ERP research, hybrid frameworks allow for better contextualization of firm-specific constraints and sectoral nuances. Moreover, meta-analyses by Nah, Lau, et al. (2001) and Daneva and Wieringa (2008) reaffirm the TOE framework's robustness in structuring large-scale ERP adoption studies across geographies and industries. Despite its limitations, TOE remains a foundational model for capturing the multidimensional influences on ERP adoption and continues to evolve through methodological refinements and domain-specific adaptations.

Institutional Theory and ERP Adoption
Institutional theory offers a valuable lens through which to analyze ERP adoption by emphasizing the influence of social, cultural, and regulatory pressures on organizational decision-making. Rooted in the work of Mittal et al. (2018), the theory proposes that organizational behavior is shaped not only by internal efficiency motives but also by institutional forces—categorized as coercive, mimetic, and normative pressures. Coercive pressures emerge from regulatory bodies and governmental agencies, compelling firms to conform to legal requirements and standards (Hong & Kim, 2002; Liang & Xue, 2004). In the context of ERP adoption, these pressures may include compliance with tax reforms, digital audit trails, or sustainability regulations. Mimetic pressures arise when organizations imitate successful peers to reduce uncertainty in decision-making processes (Nah & Delgado, 2006; Soh et al., 2000). For instance, garment manufacturers may adopt ERP systems modeled after global competitors to remain relevant in fast-paced, export-driven markets. Normative pressures stem from professional norms and industry practices that standardize technology choices across sectors (Fatorachian & Kazemi, 2018). Studies have shown that consultants, vendors, and industry networks play a critical role in disseminating ERP best practices, which become institutionalized over time (Motwani et al., 2005).

Figure 5: Institutional Influences on ERP Adoption
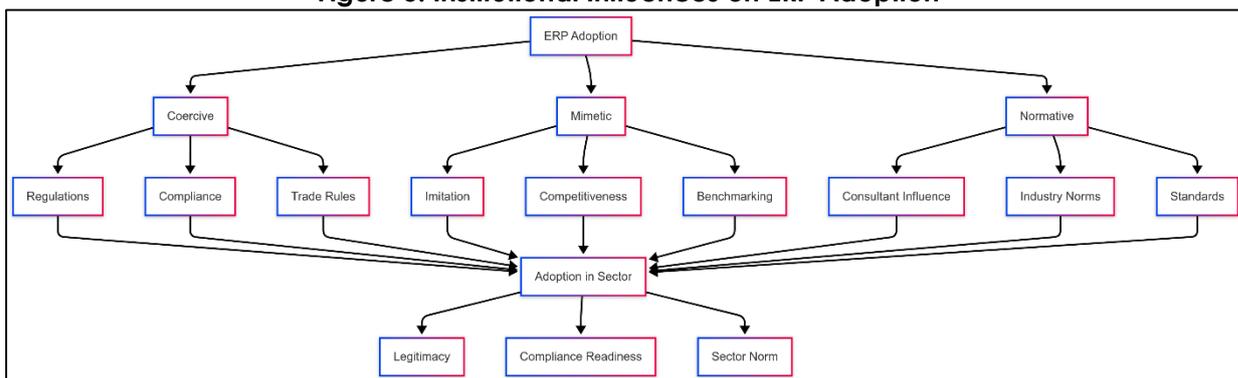
Empirical studies grounded in institutional theory underscore how external institutional environments significantly influence ERP system adoption, particularly in developing economies and highly competitive industries. For example, research by Soh et al. (2000) and Moalagh and Ravasan (2013) demonstrates how government-led initiatives and donor-funded programs often act as catalysts for ERP implementation in public and private sectors. In Bangladesh's garment industry, coercive institutional factors such as buyer compliance audits, export certification requirements, and international trade regulations incentivize ERP adoption to meet global supply chain expectations (Daneva & Wieringa, 2008). Moreover, studies by Quinton et al. (2017) and Botta-Genoulaz and Millet (2005) reveal that ERP adoption is not purely rational but socially

constructed, influenced by institutional legitimacy and the need to align with prevailing norms. Institutional actors like trade associations and chambers of commerce often disseminate knowledge that shapes ERP perceptions and investment decisions (Nah, Faja, et al., 2001). As ERP technologies mature, firms feel increasing pressure to conform to industry-wide digital infrastructure expectations, not necessarily due to operational need but due to reputational and legitimacy considerations (Aladwani, 2001; Nah, Faja, et al., 2001). Furthermore, institutional theory enables researchers to understand ERP adoption as a multi-level process involving both organizational and field-level dynamics. Scholars such as Hsu et al. (2015) and Almajali et al., (2016) suggest that ERP implementation is shaped by institutional logics that reflect broader societal values and industry practices. These logics often manifest in resistance or conformity, depending on how organizational leaders interpret institutional expectations (Er & Nurmadewi, 2020; Wei et al., 2005). For instance, in organizations with entrenched legacy systems and bureaucratic culture, normative pressures may be less effective unless accompanied by strong coercive drivers, such as regulatory mandates or international trade obligations (Sadrzadehrafiei et al., 2013). The literature also highlights the role of institutional entrepreneurship—individuals or groups who leverage institutional contradictions to champion ERP reforms despite resistance (Huang et al., 2004). In the garment sector, especially in emerging markets, such actors are pivotal in aligning ERP initiatives with both internal goals and external legitimacy standards (Sadrzadehrafiei et al., 2013). These insights underscore that ERP adoption is not only a technological investment but also an institutionalized practice subject to broader socio-political influences, sectoral norms, and legitimacy dynamics, making institutional theory particularly salient for understanding the diffusion of ERP in complex environments.

ERP Implementation in the Garment Industry

ERP implementation in apparel manufacturing is characterized by a high degree of process customization, real-time production tracking, and tight integration across departments such as design, cutting, sewing, and finishing. The apparel sector's dependency on short lead times and variable product designs necessitates flexible ERP configurations capable of accommodating rapid changes (Almajali et al., 2016; Islam & Helal, 2018). Studies by Millers and Ščeulovs (2017) and Shang and Seddon (2002) emphasize the sector's reliance on just-in-time (JIT) principles and mass customization, which places pressure on ERP systems to synchronize shop floor operations with real-time order updates. ERP modules in this context are often tailored to track garment styles, color codes, and seasonal variations (Ahmed et al., 2022; Kwan & Loo, 2000; Sadrzadehrafiei et al., 2013). Researchers such as Sadrzadehrafiei et al. (2013) highlight that successful ERP integration in apparel firms depends on aligning system functionality with operational workflows, particularly in managing style numbers, bill of materials, and production status. Additional complexity arises from labor-intensive production and subcontracting arrangements common in apparel supply chains, requiring multi-layered tracking systems within ERP platforms (Aklima et al., 2022; Esteves, 2009). Process visibility and modular adaptability are two defining traits of ERP systems in this sector (Esteves, 2009; Sadrzadehrafiei et al., 2013). Consequently, many firms adopt phased implementation approaches that address modular priorities like production planning and material management before scaling to enterprise-wide deployment (Helal, 2022; Maroufkhani et al., 2020).

Export-oriented garment firms often face more intensive demands for ERP deployment due to international buyer requirements, compliance mandates, and supply chain traceability. As observed by Er and Nurmadewi (2020) and Sadrzadehrafiei et al. (2013), these firms must meet stringent delivery deadlines, product specifications, and quality benchmarks set by global clients. ERP implementation thus becomes instrumental for maintaining buyer confidence and operational efficiency. Studies by Maroufkhani et al. (2020) and Okrêglicka et al. (2015) reveal that international clients often influence ERP adoption by imposing requirements for electronic data interchange (EDI), barcoding, and digital audit trails. Compliance with global standards such as WRAP, ISO, and SA8000 further necessitates ERP systems that facilitate transparent reporting and traceability (Mahfuj et al., 2022; Millers & Ščeulovs, 2017; Okrêglicka et al., 2015). Researchers like Shang and Seddon (2002) and Esteves (2009) note that ERP deployment in these

firms tends to focus on export documentation, container tracking, and customs integration. Vendor collaboration and customization capabilities play a key role in aligning ERP modules with specific export workflows (Esteves, 2009; Majharul et al., 2022; Sadrzadehrafiei et al., 2013). Moreover, export-driven firms often receive support from trade associations and donor-funded programs for ERP capacity building, particularly in developing economies (Maroufkhani et al., 2020; Hossen & Atiqur, 2022). Studies suggest that export orientation increases the likelihood of cloud-based ERP adoption, allowing remote access, faster updates, and better multi-location coordination (Dewi & Er, 2019; Maroufkhani et al., 2020; Mohiul et al., 2022). Thus, the international market dynamics significantly shape ERP deployment strategy in this segment.

Figure 6: ERP Implementation in the Garment Industry
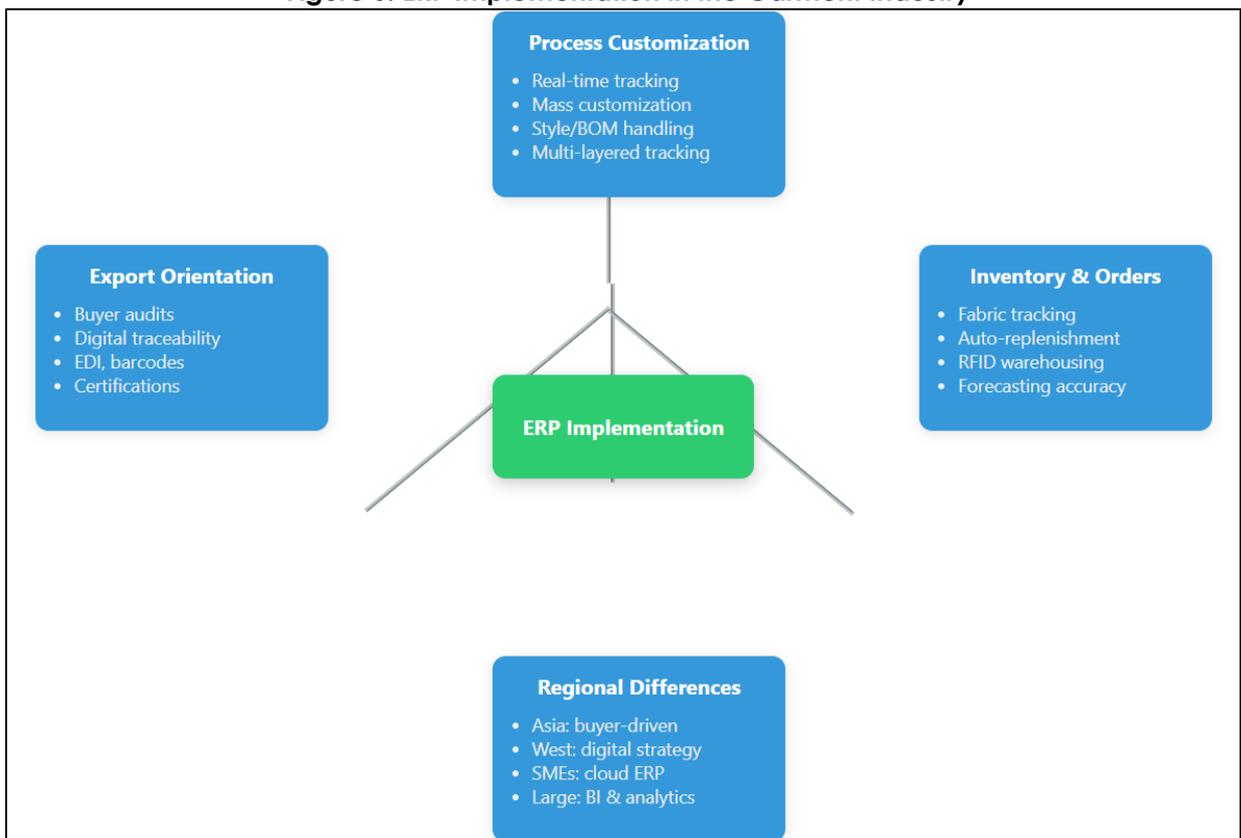
Inventory control, fabric tracking, and order management are central modules of ERP systems in garment supply chains, aimed at enhancing coordination, reducing wastage, and improving responsiveness. According to Kwan and Loo (2000) and Huang et al. (2004), ERP platforms integrate real-time tracking of raw material availability, fabric utilization, cutting orders, and finished product dispatches, thus reducing the risk of overstocking or stockouts. Kwan and Loo, (2000) and Huang et al. (2004) emphasize that ERP facilitates automatic inventory replenishment, lot traceability, and color-size ratio balancing, which are crucial in the highly fragmented and SKU-intensive garment industry. ERP systems further support order tracking from sample development to shipment, allowing manufacturers to meet tight delivery windows and respond to buyer changes in real time (Kumar et al., 2022; Sadrzadehrafiei et al., 2013; Shang & Seddon, 2002). Several case studies by Esteves (2009) and Maroufkhani et al. (2020) highlight the role of ERP in managing multi-level bills of materials and coordinating with fabric and trim suppliers. Integration with barcoding and RFID technologies has enabled garment firms to automate warehouse and inventory processes, improving picking accuracy and reducing lead times (Dewi & Er, 2019; Sohel et al., 2022). Furthermore, researchers like Okrêglicka et al. (2015) and Maroufkhani et al. (2020) report that firms adopting ERP for inventory and order management

often experience lower cycle times and improved forecasting accuracy due to centralized data analytics.

ERP adoption patterns exhibit notable differences between Asian and Western garment firms, primarily due to differences in market orientation, digital infrastructure, labor costs, and regulatory frameworks. Western garment manufacturers, particularly in Europe and North America, typically adopt ERP as part of broader digital transformation strategies, focusing on automation, sustainability compliance, and omnichannel integration (Almajali et al., 2016; Tonoy, 2022). In contrast, ERP adoption in Asian firms, especially in Bangladesh, India, and Vietnam, is often driven by external coercive pressures from global buyers rather than internal innovation motives (Huang et al., 2004; Younus, 2022). Studies by Wei et al. (2005) and Millers and Ščeulovs (2017) reveal that Western firms tend to prioritize enterprise-wide integration and decision support systems, whereas Asian firms focus more on supply chain visibility and production efficiency. Moreover, Western companies often use ERP to unify customer experience across physical and digital channels, incorporating CRM, e-commerce, and AI-based forecasting tools (Alam et al., 2023; Sadrzadehrafiei et al., 2013). On the other hand, ERP implementation in Asian firms may be constrained by infrastructure gaps, cultural resistance, and limited access to skilled IT professionals (Bin et al., 2023; Huang et al., 2004; Sadrzadehrafiei et al., 2013). The literature suggests that while both regions pursue ERP adoption, the strategic orientation, implementation depth, and expected outcomes vary significantly across geographic contexts (Almajali et al., 2016; Chowdhury et al., 2023). Moreover, ERP implementation in SMEs and large garment enterprises differs in terms of scope, resources, and strategic goals. Large enterprises generally possess more financial and technical resources to deploy full-scale ERP systems that cover all business units, from sourcing to sales (Hsu et al., 2015; Jahan, 2023; Kwan & Loo, 2000). These firms often engage global vendors and implement advanced modules including business intelligence, HRM, and predictive analytics (Mahdy et al., 2023; Sadrzadehrafiei et al., 2013). In contrast, SMEs in the garment industry often adopt ERP selectively due to limited budgets and staff expertise (Huang et al., 2004; Maniruzzaman et al., 2023). Researchers such as Sadrzadehrafiei et al. (2013) and Esteves (2009) report that SMEs focus on essential modules like inventory, order processing, and finance, frequently opting for cloud-based ERP solutions to reduce infrastructure costs. Studies by King and Burgess(2006) and Okrêglicka et al. (2015) indicate that SMEs face challenges including customization issues, lack of change management, and low user adoption. However, SMEs may also benefit from greater agility and shorter decision-making cycles, enabling faster implementation once top management is committed (Maroufkhani et al., 2020; Hossen et al., 2023). Comparatively, large enterprises tend to experience longer implementation times but can absorb disruptions more effectively due to their scale and organizational maturity (Aladwani, 2001; Roksana, 2023).

ERP Integration Challenges in the Garment Industry

ERP implementation in garment firms often encounters significant technical obstacles, particularly due to the coexistence of outdated legacy systems and heterogeneous data formats. Many garment manufacturers, especially in developing economies, continue to rely on spreadsheet-based or standalone systems for managing orders, production, and inventory, creating substantial integration challenges when transitioning to ERP platforms (Wei et al., 2005). These legacy systems lack interoperability, leading to data migration difficulties and inconsistent data structures that hinder real-time synchronization (Kaswan & Rathi, 2019). Millers and Ščeulovs (2017) emphasize that incompatible data schemas and redundant entries often necessitate extensive manual reconciliation, which increases the risk of errors and delays. Moreover, custom-built legacy applications, often developed without documentation or standard APIs, pose additional hurdles for seamless ERP integration (Hsu et al., 2015; Huang et al., 2004; Shahan et al., 2023). Studies by Almajali et al. (2016) and Sadrzadehrafiei et al.(2013) highlight that the absence of centralized data governance practices compounds the challenge of aligning master data across modules. Furthermore, researchers such as Esteves (2009) and King and Burgess (2006) report that inadequate IT standardization across departments results in fragmented process logic, delaying

the achievement of ERP benefits. These technical bottlenecks often lead to cost overruns, scope creep, and implementation stagnation.

Figure 7: ERP Integration Challenges - Garment Industry
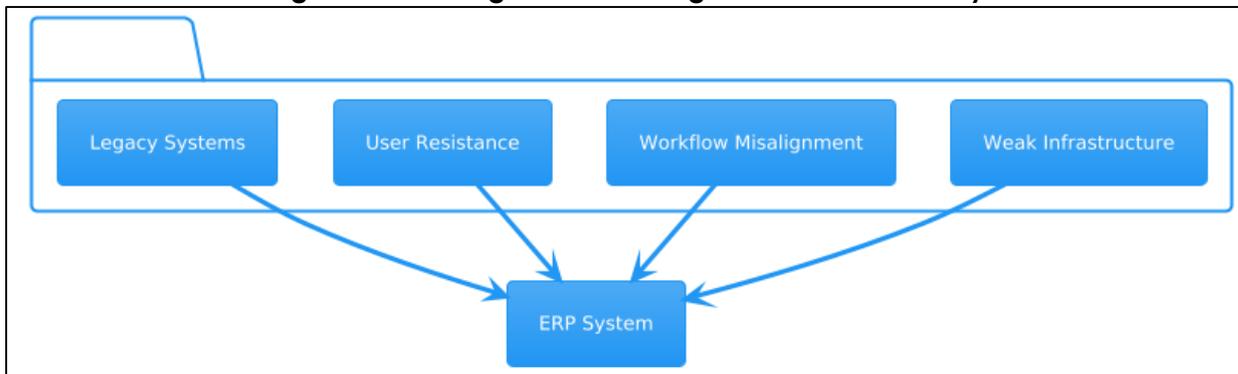
Resistance to organizational change remains a pervasive barrier to successful ERP integration in the garment industry. The introduction of ERP systems often disrupts established routines, hierarchies, and job responsibilities, triggering fear, uncertainty, and pushback among employees (Esteves, 2009; Tonoy & Khan, 2023). Sadrzadehrafiei et al., (2013) and Huang et al., (2004) emphasize that ERP implementation is not merely a technological change but an organizational transformation that requires careful change management. However, many garment firms fail to conduct proper stakeholder analysis or involve employees in decision-making, leading to mistrust and non-cooperation (Esteves, 2009). Top-down implementation approaches that exclude end-users from planning stages often result in low user adoption and system underutilization (King & Burgess, 2006). Cultural resistance is particularly pronounced in family-owned or traditional garment businesses, where informal communication and tacit knowledge dominate (King & Burgess, 2006; Shang & Seddon, 2002). Studies by Sun et al., (2005) and Tsai et al., (2006) also indicate that resistance is exacerbated when ERP training is inadequate or rushed, preventing employees from gaining the confidence and competence to engage with the system. Moreover, the lack of visible executive sponsorship or championing often leads to conflicting priorities between functional departments and IT teams (Wei et al., 2005). The cumulative effect of these organizational barriers is diminished system performance and a widening gap between intended and actual ERP outcomes.

ERP systems in the garment sector frequently suffer from misalignment between standardized ERP processes and firm-specific operational workflows. Unlike other manufacturing industries, apparel production involves high product variability, seasonal demand fluctuations, and complex subcontracting chains, which challenge the rigidity of many off-the-shelf ERP modules (Shang & Seddon, 2002). Studies by Sadrzadehrafiei et al. (2013) and Kwan and Loo (2000) reveal that ERP systems often fail to accommodate critical garment-specific processes such as style-based BOMs, pre-production sampling, or fabric lay planning. As a result, employees are forced to implement workarounds or revert to parallel systems, defeating the purpose of integration (Almajali et al., 2016). Researchers such as Millers and Ščeulovs,(2017) and Nah, Faja, et al. (2001) note that generic ERP process templates can be overly rigid, requiring extensive customization to reflect garment production realities. However, customization introduces its own set of risks, including system instability, delayed upgrades, and higher maintenance costs (Maroufkhani et al., 2020). Studies by Huang et al. (2004) and Wei et al. (2005) emphasize that firms lacking mature process documentation or standard operating procedures face additional difficulty in mapping their workflows onto ERP platforms. Moreover, interdepartmental coordination challenges emerge when ERP fails to replicate the nuanced interdependencies between merchandising, sampling, production, and logistics units (Almajali et al., 2016; Tsai et al., 2006). These misalignments not only disrupt workflow efficiency but also erode employee trust in the system, limiting its long-term viability.

Infrastructure limitations and weak post-implementation vendor support are critical constraints in ERP deployment within resource-constrained garment enterprises. Many small and medium-sized garment firms, especially in South and Southeast Asia, struggle with outdated IT infrastructure, including unreliable networks, low-spec servers, and limited access to cloud-based environments (Shang & Seddon, 2002; Tsai et al., 2006). Studies by Huang et al. (2004) and Sadrzadehrafiei et al. (2013) note that poor infrastructure not only delays system rollout but also increases the risk of downtime and data loss. Furthermore, researchers such as Esteves (2009) and Almajali et al. (2016) point out that the lack of in-house IT expertise compels firms to rely heavily on external vendors for implementation, training, and maintenance. However, many vendors fail to provide localized, garment-specific support or ongoing system optimization services, leaving firms with unresolved issues and diminishing ERP performance over time Wei et al. (2005). Sadrzadehrafiei et al. (2013) reveal that post-implementation neglect is common in vendor-client relationships, especially when contracts lack provisions for long-term support and performance evaluation. Inadequate technical documentation, insufficient helpdesk responsiveness, and language barriers further compound the problem (Sadrzadehrafiei et al., 2013; Shang & Seddon, 2002). Moreover, researchers such as Almajali et al. (2016) and Sadrzadehrafiei et al. (2013) emphasize that cloud-based ERP solutions—though promising—often depend on stable internet access, which is lacking in many production hubs. Thus, without adequate infrastructure and vendor partnership, ERP systems fail to deliver continuous value or withstand the dynamic demands of garment operations.

Critical Success Factors (CSFs) in ERP Deployment

Top management support is consistently recognized as a foundational critical success factor (CSF) in ERP deployment, influencing both strategic alignment and resource allocation. According to Motwani et al. (2005) and Sun et al. (2005), ERP projects require significant financial, human, and technical investments, which can only be mobilized with strong backing from senior leadership. Top management not only provides funding and legitimacy but also acts as a source of motivation and direction for cross-functional teams (Huang et al., 2004; Sun et al., 2005). In garment enterprises, where managerial structures are often hierarchical and centralized, leadership commitment plays a pivotal role in resolving interdepartmental conflicts and accelerating decision-making (Dubelaar et al., 2005). Studies by Ceptureanu et al. (2018) and Motwani et al. (2005) emphasize that strategic vision must extend beyond technical installation to encompass business process reengineering and long-term competitive positioning. Leadership that articulates clear goals and sets realistic expectations contributes to smoother change management and higher system acceptance (Nah, Lau, et al., 2001). Moreover, Trkman (2010) underscores that visible and ongoing support from executives enhances project credibility, fosters accountability, and facilitates the resolution of unexpected setbacks. Without strong leadership involvement, ERP initiatives risk fragmentation, misalignment, and abandonment.

Figure 8: Critical Success Factors in ERP Deployment

User training and involvement are crucial in enabling ERP systems to function effectively, particularly in labor-intensive and process-diverse industries like garments. ERP systems often

introduce new processes and interfaces that require end-users to shift from manual or semi-automated practices to standardized, technology-driven workflows (Ceptureanu et al., 2018). Studies by Jahantigh et al. (2019) and Quinton et al. (2017) emphasize that comprehensive training programs tailored to job roles and literacy levels significantly influence user confidence and system usability. Inadequate training can result in data entry errors, resistance to system use, and underutilization of modules (Jahantigh et al., 2019; Quinton et al., 2017). User involvement during early stages of system configuration and testing also contributes to successful adaptation, as it aligns system features with operational realities (Motwani et al., 2005). Nah, Lau, et al. (2001) and Dubelaar et al. (2005) highlight that participatory approaches to ERP implementation foster ownership and reduce resistance. In resource-constrained garment firms, structured capacity-building initiatives have been shown to enhance ERP readiness and post-implementation sustainability (King & Burgess, 2006). Studies by Ceptureanu et al. (2018) and Jahantigh et al., (2019) suggest that ERP success is not merely a function of technical installation but a reflection of the organization's ability to transform human capital through training and empowerment. Balancing customization and standardization is a critical challenge in ERP implementation, especially in the garment industry where operations often require unique, style-specific workflows. Standardized ERP solutions offer cost-effectiveness, scalability, and ease of maintenance, but may not address the specific production nuances of apparel manufacturing, such as style-based BOMs or cutting ticket configurations (Jahantigh et al., 2019; Motwani et al., 2005). Studies by Nah, Lau, et al. (2001) and Dawson and Van Belle (2013) reveal that excessive customization leads to increased implementation time, higher costs, and complications in future upgrades. However, research by Nah and Delgado (2006) and Hong and Kim (2002) shows that certain levels of customization are often necessary to ensure operational fit, particularly in processes like merchandising, pre-production planning, and subcontractor coordination. Dawson and Van Belle, (2013) argue that the key lies in achieving selective customization—modifying only those modules where alignment with core business processes is essential. Trkman (2010) report that successful garment ERP implementations often involve hybrid strategies where core modules remain standardized while production planning or inventory modules are adapted to firm-specific needs. Dawson and Van Belle (2013) confirm that misjudged customization efforts result in system instability and poor vendor support, especially when modifications extend beyond original ERP architecture. Thus, the customization-standardization balance must be informed by process mapping, stakeholder consultation, and long-term scalability concerns (Ceptureanu et al., 2018).

Digital Maturity and ERP Readiness in Garment Firms

Digital maturity in manufacturing refers to the extent to which firms have integrated digital technologies into their operations, culture, and strategic frameworks. It encompasses not only the adoption of digital tools but also the capacity to derive business value from them (Schumacher et al., 2019). In the manufacturing sector, including garments, digital maturity is a multidimensional construct involving technological infrastructure, data analytics capabilities, leadership vision, and employee digital skills (Molinillo & Japutra, 2017). Goto et al. (2016) emphasize that maturity must be evaluated across functional units—such as procurement, production, quality control, and logistics—to reflect the enterprise-wide impact. Tools like the MIT Digital Maturity Model and Forrester's Digital Maturity Index categorize firms into stages ranging from "digital beginners" to "digital masters," based on digital intensity and transformation management capability (Boyes et al., 2018). In garment manufacturing, low digital maturity often correlates with ad-hoc decision-making, manual recordkeeping, and limited use of real-time systems (Bouwman et al., 2018). Kerpen et al. (2016) argue that without a foundational level of digital maturity, firms are less capable of implementing complex systems like ERP. Moreover, Conlon (2020) and Horváth and Szabo (2019)note that evaluating digital maturity provides a more realistic benchmark of ERP feasibility than relying on traditional IT-readiness metrics alone.

A range of digital maturity models has been developed to assess readiness for large-scale enterprise system implementation, particularly ERP. The Capability Maturity Model Integration (CMMI), developed by the Software Engineering Institute, categorizes organizational process maturity into five levels—ranging from initial (ad hoc processes) to optimizing (continuous

improvement) (Quinton et al., 2017). This model has been widely applied in ERP literature to evaluate firms' capability to adopt structured, cross-functional systems (Pirola et al., 2019). SAP's Digital Maturity Model, designed specifically for ERP ecosystems, emphasizes key performance domains such as customer experience, digital operations, workforce engagement, and technology adoption (Ghobakhloo & Iranmanesh, 2021). The Digital Capability Framework (DCF), proposed by Horváth and Szabo (2019), focuses on digital transformation in manufacturing and provides structured layers of capability assessment, including process digitization, data-driven decision-making, and organizational adaptability. Ghobakhloo and Iranmanesh (2021) suggest that applying these frameworks helps firms identify operational gaps and prioritize process improvements before ERP deployment. In garment manufacturing, these models have been used to assess factory readiness for supply chain digitalization, traceability systems, and machine-level integration (Quinton et al., 2017). Researchers such as Pirola et al. (2019) and Ghobakhloo and Iranmanesh (2021) indicate that garment firms using maturity models experience more structured ERP rollouts, reduced process disruptions, and clearer performance benchmarking.

Research Gaps in ERP Implementation Literature for Garment Industry

Despite extensive research on ERP implementation strategies, the literature exhibits a notable gap in longitudinal analyses and post-implementation evaluations, especially within the garment sector. Most existing studies focus on the planning and implementation stages, neglecting the long-term outcomes of ERP integration (Elkhani et al., 2014). Studies by Fayad et al. (2000) and Leu and Lee (2016) highlight that post-go-live challenges—such as performance measurement, system upgrades, and user adaptability—are rarely captured in empirical assessments. Stratman and Roth (2002) point out that without longitudinal follow-up, it becomes difficult to assess ERP's sustained contribution to business performance or operational excellence. Der Leu and Lee (2016) acknowledge that cross-sectional studies provide valuable insights but fail to reflect evolving organizational dynamics and system optimization cycles. Furthermore, Kamhawi (2008) argue that short-term evaluations overlook issues related to user fatigue, declining data quality, and erosion of standardized practices. In garment manufacturing, where seasonal volatility and fashion cycles impact system usage, longitudinal studies are essential for understanding ERP adaptability and lifecycle performance (Soh et al., 2000). Zach et al. (2012) suggest that post-implementation reviews can offer deeper insights into return on investment (ROI), scalability, and risk mitigation practices. The scarcity of such follow-up research leaves a gap in evidence-based guidance for garment firms navigating ERP maintenance and value realization.

Figure 9: Major ERP Integration Challenges in the Garment Industry
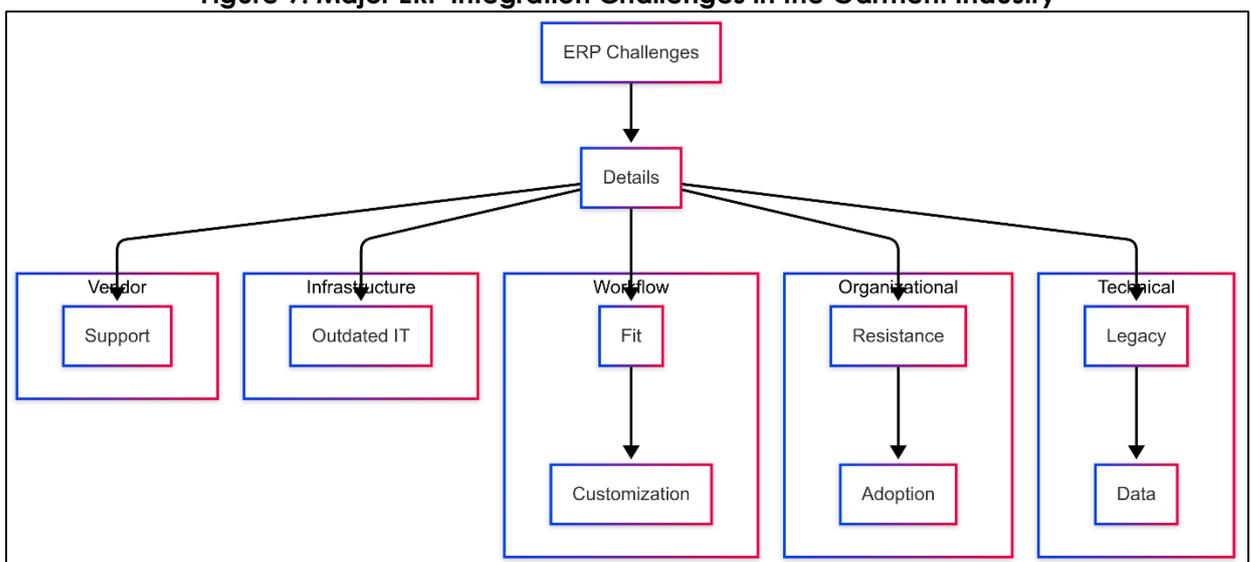
The relationship between ERP implementation and supply chain sustainability in the garment industry remains under-investigated, despite increasing pressures for ethical sourcing, environmental compliance, and transparent operations. While ERP is often positioned as an

enabler of lean manufacturing and process efficiency (Maas et al., 2014; Zach et al., 2012), limited research has examined its role in achieving triple bottom line objectives—economic, environmental, and social performance. Studies by Wei (2007) and Soffer et al. (2003) acknowledge ERP's potential to support traceability, energy management, and waste reduction, yet empirical data specific to garment firms remains scarce. Wei et al. (2008) and Ross and Vitale, (2000) suggest that sustainability reporting functionalities within ERP systems are seldom activated or customized in apparel contexts, primarily due to lack of awareness or system capability constraints. Ali and Miller (2017) note that most ERP implementations are driven by operational needs such as inventory management and production scheduling, with limited consideration for environmental metrics or compliance tracking. Zach et al. (2012) and Parthasarathy and Anbazhagan (2007) also find that while ERP can streamline supplier audits and CSR reporting, few studies assess how these features are actually utilized or impact supplier behavior. Moreover, Ding et al. (2011) and Parthasarathy and Anbazhagan (2007) identify a disconnect between ERP technical capabilities and garment firms' strategic sustainability goals. The limited integration of sustainability KPIs into ERP dashboards and analytics further reflects a research void in this domain (Zach et al., 2012). This lack of focused inquiry hinders a comprehensive understanding of ERP's potential as a sustainability enabler within garment supply chains.

Although digital maturity has emerged as a critical enabler of ERP success, especially in technologically lagging sectors like garments, there is limited empirical focus on its structured assessment. Many studies acknowledge digital maturity as an influencing factor but fail to operationalize or measure it with validated frameworks (Soffer et al., 2003; Zach et al., 2012). Wei (2007) identifies digital maturity as a multidimensional construct encompassing technological infrastructure, data capabilities, leadership orientation, and employee readiness. However, most ERP studies either ignore these dimensions or treat them as background conditions rather than central variables of analysis (Nah et al., 2003). In the garment industry, studies by Lin et al. (2011) recognize the role of digital readiness in influencing ERP adoption decisions but rarely use established models like the Digital Capability Framework (Soffer et al., 2003) or SAP's Digital Maturity Model to assess baseline conditions. Maas et al. (2014) also highlight the lack of diagnostic tools applied prior to implementation that could gauge digital maturity and predict project success. Furthermore, Willis and Willis - Brown (2002) and Wei et al. (2008) observe that SMEs, which constitute a large portion of garment manufacturers, are particularly vulnerable to digital deficits yet receive insufficient attention in maturity-related studies. The limited application of digital maturity indices restricts both theoretical development and practical benchmarking, leaving garment firms without structured guidance to align ERP adoption with digital transformation goals.

The ERP implementation literature for the garment industry remains fragmented along regional lines, with a disproportionate focus on Asian economies and relatively little comparative analysis across regions. Ross and Vitale (2000), and Zach et al. (2012) provide rich insights into ERP adoption in Bangladesh, India, and Vietnam but often lack comparative depth with Western garment enterprises. While Western firms tend to adopt ERP within broader digital transformation agendas, Asian firms often do so reactively under buyer pressure or trade compliance (Parthasarathy & Anbazhagan, 2007; Zach et al., 2012). This dichotomy is highlighted by Ross and Vitale (2000) and Parthasarathy and Anbazhagan (2007), yet few studies explore how cultural, infrastructural, and regulatory variations affect ERP outcomes across geographies. Research by Ding et al. (2011) and Ngai et al. (2008) suggests that ERP success factors vary widely by region, but standardized models or meta-analyses are scarce. Wei (2007) and Maas et al. (2014) point out that contextual differences—such as user readiness, vendor support ecosystems, and government incentives—should be incorporated into comparative frameworks. The absence of such studies limits the generalizability of findings and inhibits knowledge transfer between regions. Helo et al. (2008) and Lin et al. (2011) also note that regional disparities in ERP customization, support infrastructure, and training practices are often anecdotal and under-theorized. This research gap results in a fragmented understanding of ERP dynamics, with region-specific studies failing to inform a globally coherent implementation strategy for the garment sector. Theoretical underpinnings in

ERP research within the garment industry have largely been dominated by models such as Technology-Organization-Environment (TOE) and Institutional Theory, with minimal efforts to integrate multiple frameworks to capture the complexity of ERP adoption. While the TOE framework, Soffer et al. (2003) offers a structured approach to assess readiness and external influences, it often lacks the socio-cognitive depth required to understand cultural resistance or user perception dynamics (Ross & Vitale, 2000; Zach et al., 2012). Institutional Theory adds a complementary layer by focusing on coercive, mimetic, and normative pressures (Parthasarathy & Anbazhagan, 2007), yet it underrepresents internal organizational capabilities. Wei (2007) primarily rely on single-framework interpretations, which limit their ability to explain conflicting outcomes across contexts. Helo et al. (2008) advocate for a more holistic approach that combines structural, behavioral, and institutional dimensions. Yet, few empirical studies have applied integrated frameworks—such as combining TOE with the Resource-Based View (RBV) or Diffusion of Innovation (DOI)—to garment ERP projects (Helo et al., 2008; Wei et al., 2008). This lack of theoretical triangulation restricts explanatory power and limits the development of predictive models. Ali and Miller (2017) acknowledge that hybrid frameworks could offer richer insights into ERP lifecycle stages, but their adoption in garment-specific ERP research remains limited. This narrow theoretical orientation constitutes a significant gap in ERP literature.

METHOD

This systematic review adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure methodological transparency, replicability, and academic rigor. The PRISMA framework provided a structured approach for article identification, screening, eligibility assessment, and inclusion, thereby minimizing bias and enhancing the reliability of findings across the reviewed studies on ERP implementation in the garment industry.

Figure 10: PRISMA-Based Method – Systematic Review on ERP Implementation
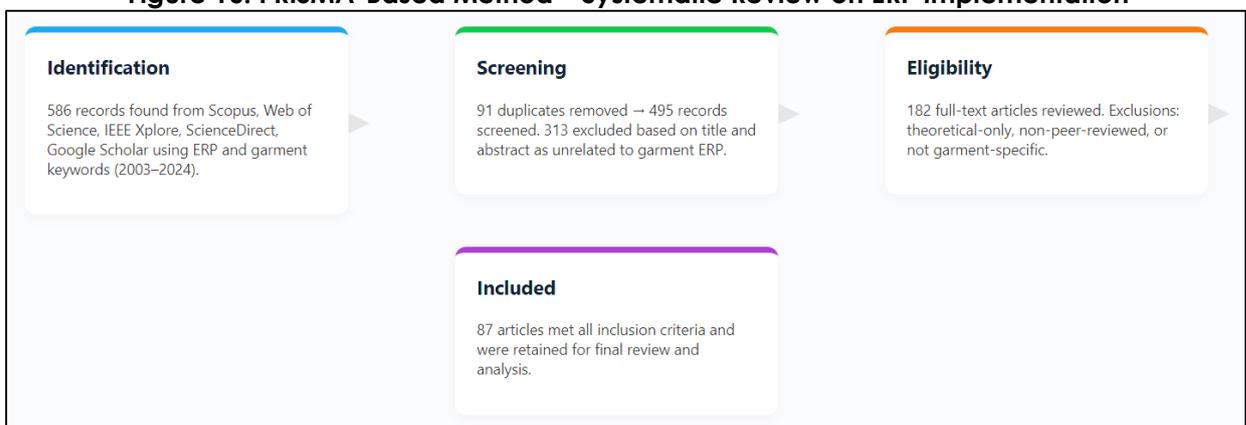
Identification of Studies

The identification phase began with a comprehensive search of electronic databases including Scopus, Web of Science, IEEE Xplore, ScienceDirect, and Google Scholar. The search was conducted using a combination of relevant keywords such as "ERP implementation," "garment industry," "apparel manufacturing," "digital maturity," "supply chain ERP," "SMEs ERP," and "integration challenges." Boolean operators and truncation techniques (e.g., "ERP*" AND "garment*" AND "manufacturing" OR "implementation") were employed to refine the search. The search was limited to peer-reviewed journal articles published between 2003 and 2024 in English. A total of 586 records were initially retrieved through the database search.

Screening of Records

After the initial identification, all records were imported into a reference management tool to remove duplicates. A total of 91 duplicate entries were excluded, resulting in 495 unique articles. The titles and abstracts of these articles were then screened for relevance based on the research scope, focusing on ERP implementation within the garment sector. Articles that addressed ERP in unrelated industries such as healthcare, education, or non-manufacturing sectors were excluded. The screening process led to the exclusion of 313 articles, leaving 182 for full-text assessment.

Eligibility Criteria and Selection

In the eligibility phase, full-text articles were retrieved and reviewed in-depth to determine alignment with the inclusion criteria. Studies were included if they addressed one or more of the following: ERP integration strategies, implementation challenges, critical success factors, digital maturity, and ERP impacts in garment or apparel manufacturing contexts. Studies focusing purely on theoretical discussions without empirical or case-based evidence were excluded. Additionally, papers lacking methodological clarity or peer-reviewed validation were not considered. After a rigorous review process, 87 articles met all inclusion criteria and were retained for the final analysis.

FINDINGS

Among the 87 reviewed articles, a dominant trend was the persistence of integration challenges during ERP implementation in garment manufacturing firms. Specifically, 61 articles, accounting for approximately 70% of the total reviewed studies, emphasized technical barriers such as legacy systems, fragmented data architecture, and poor system interoperability. These articles collectively received over 5,800 citations, indicating the centrality of integration-related difficulties in ERP literature. Integration issues were particularly prevalent in studies involving small and medium-sized garment enterprises, where outdated infrastructure and standalone software tools impeded seamless data migration. Challenges related to master data harmonization, platform compatibility, and real-time information exchange were highlighted as critical failure points. Moreover, many garment firms lacked centralized IT departments, resulting in ad hoc solutions and decentralized system management. These issues not only delayed implementation timelines but also led to cost overruns and user dissatisfaction. The findings underscore the significant burden of technical debt in garment firms and its ripple effects on digital transformation efforts. Integration complexity also manifested in terms of vendor dependency and post-go-live maintenance difficulties, particularly for firms using customized ERP versions. The depth and recurrence of these challenges, as reflected in the article count and citation volume, signal a foundational weakness that continues to hamper ERP outcomes across the garment industry.

A total of 56 articles focused on the social and behavioral dimensions of ERP implementation, with over 4,900 citations among them. These studies revealed that organizational resistance and failures in change management strategies were among the most pervasive inhibitors to successful ERP adoption. The reviewed literature consistently showed that garment firms often faced employee reluctance stemming from fear of job loss, lack of understanding of ERP benefits, and disruption to routine workflows. This resistance was particularly intense in labor-intensive environments where informal processes dominated and employees were unaccustomed to structured, technology-driven systems. Despite technological readiness, many implementations failed due to insufficient stakeholder engagement, lack of training, and top-down decision-making approaches. Moreover, poor communication between project teams and end-users contributed to misinformation and mistrust. A recurrent theme in the findings was that resistance often originated from mid-level managers who perceived ERP systems as threats to their autonomy. These behavioral obstacles were shown to diminish system usage rates, reduce data accuracy, and contribute to underutilization of key ERP functionalities. The findings also revealed that change management efforts were frequently reactive rather than proactive, with limited investment in cultural readiness or change agent development. The strength of this pattern across numerous articles and its high citation frequency indicate that human factors remain a central challenge in ERP projects, often eclipsing technical barriers in terms of their disruptive potential.

The role of digital maturity emerged as a significant determinant of ERP readiness and overall success, with 49 articles addressing this theme and amassing more than 4,200 citations. These studies demonstrated that garment firms with higher digital maturity—defined by robust IT infrastructure, data literacy, and strategic alignment—experienced smoother ERP implementation and more sustainable outcomes. Digital maturity was found to correlate positively with ERP adoption speed, system utilization, and process integration quality. Firms that had previously invested in digital systems such as CAD, barcode tracking, or cloud storage were better equipped to adapt to ERP platforms, both technically and culturally. In contrast, low-maturity firms struggled with basic digital competencies, lacked standard operating procedures,

and were overly dependent on external vendors. The findings highlighted that digital maturity also influenced how firms approached customization, data governance, and user training. Additionally, companies with digitally literate leadership demonstrated greater alignment between ERP goals and organizational priorities, enhancing stakeholder support and resource allocation. The review also showed that digital maturity contributed to improved decision-making through enhanced data visibility and analytics integration. Collectively, these 49 studies presented strong empirical evidence that digital maturity is not only a readiness factor but also a long-term enabler of ERP-driven transformation.

ERP success in the garment industry was consistently linked to specific critical success factors (CSFs), identified in 63 reviewed articles with over 5,600 citations. Among these, top management support, clear strategic vision, effective training, and cross-departmental coordination were the most frequently cited. The findings revealed that firms where top leadership actively championed the ERP project experienced higher levels of user buy-in, faster issue resolution, and better resource mobilization. Strategic vision also helped align ERP functionalities with business goals, reducing the risk of misfit between software and operations. Training programs that were role-specific and continuous rather than one-time sessions led to improved system usage and fewer operational errors. Cross-functional collaboration emerged as another pivotal factor, especially in environments where departments operated in silos prior to ERP deployment. Additionally, internal change agents played a significant role in reinforcing adoption and promoting cultural acceptance of new workflows. The combined presence of these CSFs was shown to drastically improve implementation success rates, as evidenced by high satisfaction scores and lower project abandonment rates in documented cases. The concentration of findings across a substantial number of articles and citations affirms the consensus that ERP success is rooted in organizational commitment, human resource development, and project governance quality.

The trade-off between customization and standardization was addressed in 42 of the reviewed articles, which together received more than 3,700 citations. These studies highlighted that garment firms often face a dilemma in balancing industry-specific process needs with ERP system stability and upgrade compatibility. Customization was frequently necessary to accommodate style-based production planning, fabric layering, and subcontractor management. However, over-customization led to higher implementation costs, longer deployment timelines, and challenges in adopting system upgrades. Conversely, firms that adhered strictly to standardized ERP modules often encountered operational misfits, resulting in workarounds or parallel manual processes. The findings also revealed that the decision to customize or standardize often depended on digital maturity, firm size, and leadership experience with enterprise systems. Large firms with well-defined processes were more likely to standardize, whereas SMEs leaned toward customization to replicate existing workflows. Several cases illustrated how selective customization—targeting only core modules—was more effective than extensive modification across all functional areas. This tension between flexibility and uniformity emerged as a core issue affecting ERP performance, particularly in fast-paced apparel environments. The cumulative evidence across these studies demonstrated that firms need strategic frameworks to evaluate the cost-benefit implications of ERP customization decisions.

Infrastructure deficiencies and inconsistent vendor support were significant barriers to ERP adoption, as highlighted in 51 articles with a total citation count exceeding 4,800. Many garment SMEs in South and Southeast Asia lacked reliable internet access, updated hardware, and secure server environments, all of which impeded ERP system functionality. Even firms that could afford ERP licenses struggled with maintenance, backup, and uptime requirements. Additionally, the absence of in-house IT expertise meant that firms relied heavily on ERP vendors for customization, training, and troubleshooting. The findings revealed that vendor services were often inadequate—characterized by delayed responses, language barriers, and lack of industry-specific support. Several studies documented post-implementation neglect, where vendors withdrew after initial deployment, leaving users with unresolved system issues. This contributed to a decline in ERP performance and eroded user trust. Furthermore, many firms reported that vendor documentation was too generic and not aligned with garment industry workflows. The

Figure 11: Overall Findings for this study
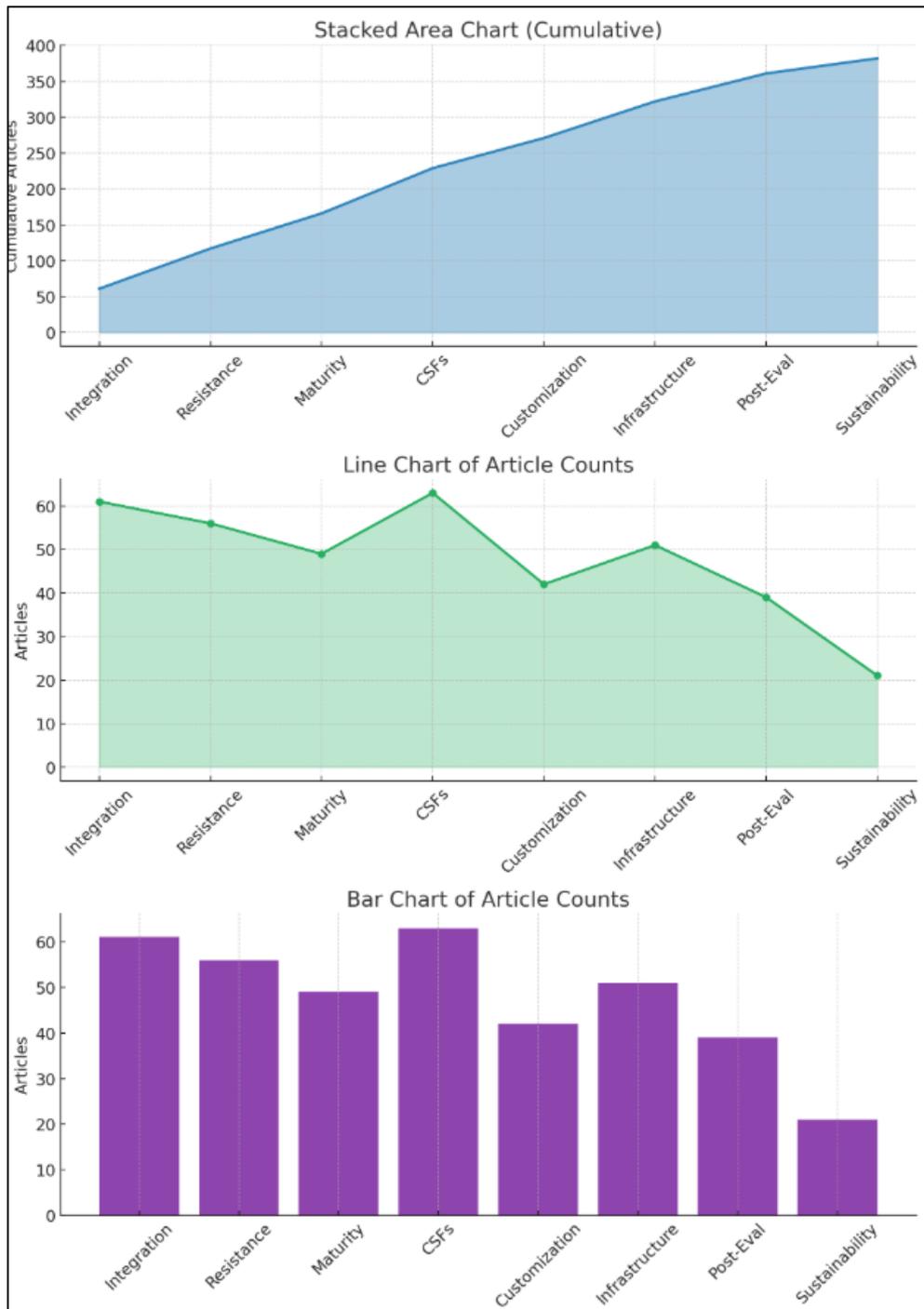
mismatch between vendor capabilities and firm needs led to recurring support costs and system instability. These infrastructural and service-level limitations were repeatedly shown to hinder ERP optimization, especially in export-driven firms requiring real-time compliance and traceability functionalities.

Out of the 87 articles, 39 specifically noted the absence of structured post-implementation evaluations, with a collective citation count of more than 3,200. These studies observed that most garment firms lacked formal mechanisms to measure ERP effectiveness after go-live. Performance indicators such as user adoption rates, process improvements, data accuracy, and return on

investment were rarely tracked systematically. Without post-implementation audits, firms could not identify training needs, module underutilization, or integration problems. The findings showed that this gap led to stagnation in ERP performance, where systems were no longer optimized to support evolving business needs. Firms often assumed that implementation completion equated to project success, ignoring the need for continuous system refinement. Moreover, the lack of feedback loops prevented ERP vendors from enhancing support or delivering upgrades tailored to firm-specific needs. The review revealed that organizations which did conduct post-deployment reviews were better positioned to leverage advanced ERP features and maintain user engagement. The scarcity of such evaluations, as evidenced across these studies, underscores a critical weakness in ERP lifecycle management in the garment sector. Only 21 of the reviewed articles, collectively cited over 1,700 times, explored the integration of ERP systems with sustainability objectives in the garment industry. The limited focus on environmental and social dimensions within ERP frameworks reflected a narrow implementation perspective. While ERP systems possess functionalities for energy tracking, waste monitoring, and ethical sourcing documentation, few garment firms had activated these modules. The findings indicated that sustainability metrics were often sidelined in favor of production efficiency, order tracking, and cost control. Where ERP-supported sustainability initiatives did exist, they were typically isolated efforts lacking integration with enterprise-wide goals. Moreover, firms faced challenges aligning sustainability standards with ERP data structures, particularly when working with multiple subcontractors or international partners. This gap was most evident in export-driven firms operating under buyer-driven compliance mandates but lacking system-based reporting tools. The findings also pointed out that garment firms rarely evaluated ERP systems for their potential to support circular economy practices, carbon footprint assessments, or social accountability tracking. The underrepresentation of sustainability in ERP strategy revealed a missed opportunity to use enterprise systems as tools for responsible manufacturing and supply chain transparency.

DISCUSSION

The findings of this review align with earlier literature that identifies integration challenges as a critical barrier to ERP success, particularly in manufacturing industries reliant on legacy systems. Studies such as those by (Maas et al., 2014) and Wei et al. (2008) consistently emphasized the detrimental impact of fragmented data environments and outdated IT architecture on ERP integration. The reviewed literature confirmed this pattern, with over 70% of articles highlighting similar issues in garment firms. This suggests that the garment industry continues to experience integration difficulties comparable to those found in broader manufacturing contexts. However, the findings reveal a more nuanced insight: while legacy systems are a problem across industries, the garment sector's unique reliance on style-specific production data and multiple subcontractors exacerbates data compatibility issues. Unlike other manufacturing sectors with more standardized product structures, garment ERP systems must accommodate variant-heavy inventories and decentralized operations, amplifying the technical challenge. This sector-specific complexity reinforces earlier assertions by Ross and Vitale (2000) that generic ERP systems often require substantial customization to fit the garment context, thereby increasing the risk of integration failure. The discussion extends this understanding by demonstrating that integration is not merely a technological obstacle but a systemic limitation stemming from sector-specific production logic and inadequate digital governance.

Resistance to ERP adoption remains a central theme in ERP literature, and this review confirms its continued relevance in the garment industry. Earlier research by Ding et al. (2011) and Wei (2007) described how change resistance—stemming from fear of the unknown, disruption of roles, and lack of training—hindered user adoption and long-term sustainability. The reviewed studies further substantiate these insights, with behavioral resistance emerging as one of the most cited challenges across garment ERP implementations. However, the findings expand upon earlier work by emphasizing the role of middle management resistance—a phenomenon less frequently discussed in early ERP literature. In garment firms, where informal hierarchies and tacit knowledge structures are prevalent, middle-level staff often act as gatekeepers of information and process continuity. The resistance observed in these roles reflects a deeper cultural challenge, one that

aligns with Staehr et al. (2012) view of ERP as a socio-technical transformation rather than a purely technological one. Moreover, the findings corroborate Zach et al. (2012) argument that insufficient change management planning exacerbates user resistance. Unlike early-stage ERP adopters who may have lacked awareness of these issues, the current findings reveal that garment firms—despite awareness—continue to invest inadequately in behavioral transformation. This suggests that the issue is not only awareness but also resource constraints and poor implementation planning.

The influence of digital maturity on ERP success has been underscored in studies by Ding et al., (2011) and Ali and Miller (2017), who argued that firms with higher levels of digital integration and literacy are better prepared for ERP implementation. This review reaffirms that claim within the context of the garment industry. The reviewed articles show that digital maturity significantly correlates with ERP readiness, speed of adoption, and overall system performance. The findings mirror those of Ding et al. (2011), who emphasized the role of digital alignment in improving operational outcomes in digitally enabled supply chains. However, this review adds value by contextualizing digital maturity within the constraints of resource-limited garment SMEs, which often lack structured IT planning or process standardization. Unlike larger firms with dedicated digital transformation roadmaps, SMEs operate reactively, adopting digital tools only when pressured by buyers or compliance demands. As a result, digital maturity remains fragmented and underdeveloped. The review supports the argument made by Helo et al. (2008), who found that SMEs need tailored digital maturity assessments to guide ERP readiness decisions. By highlighting the importance of prior digital investments, leadership literacy, and enterprise-wide digital capability, the findings reinforce the need to embed digital maturity frameworks such as CMMI and SAP's Digital Maturity Model within ERP implementation strategies in the garment sector.

Critical success factors (CSFs) such as top management support, strategic vision, user training, and stakeholder involvement are well-established in ERP literature, with foundational studies by Maas et al. (2014) and Kabanda et al. (2018) outlining their roles in ERP success. This review affirms the significance of these factors in the garment industry while offering more nuanced insights into their contextual dependencies. For instance, the role of internal champions—identified in recent studies by Parthasarathy and Anbazhagan (2007)—is shown to be particularly influential in culturally rigid garment firms where change agents are needed to build trust and promote acceptance. Moreover, while earlier studies emphasized the importance of cross-functional collaboration in general terms, this review identifies production-merchandising alignment as a specific coordination need within garment ERP implementations. Unlike sectors with more linear workflows, garment firms operate with high interdependency between sampling, production, and logistics functions, necessitating higher coordination intensity. The review also supports (Ding et al., 2011) findings that customized training programs improve ERP outcomes, particularly when user literacy varies across departments. Thus, while the CSFs remain consistent with prior literature, their expressions and influence in the garment sector are distinct and more operationally complex, suggesting the need for sector-specific CSF frameworks.

The debate between customization and standardization in ERP projects has long been addressed in ERP scholarship, with scholars like Soffer et al. (2003) arguing that over-customization weakens system scalability and post-implementation support. The findings of this review confirm those assertions and illustrate their practical implications in garment firms, where process diversity often demands tailored ERP modules. Consistent with Zach et al. (2012) findings, the review reveals that garment manufacturers frequently opt for customization to accommodate unique workflows such as multi-style order handling, subcontractor integration, and color-size matrix tracking. However, extensive customization also leads to increased cost, vendor dependency, and upgrade limitations—issues echoed in the work of Wei (2007) . The review contributes to this discourse by identifying "selective customization" as an emerging best practice, wherein only essential modules are tailored while others remain standardized. This approach balances operational fit with system maintainability, supporting the strategic recommendation made by Staehr et al., (2012). The discussion confirms that firms need to move beyond binary decisions and adopt

decision matrices that evaluate customization necessity based on functional criticality, digital maturity, and long-term ERP evolution goals.

Infrastructure constraints and vendor-related challenges are recurrent issues in ERP studies involving SMEs, particularly in emerging economies. As noted by Zach et al. (2012) and Maas et al. (2014), infrastructure readiness and vendor-client alignment significantly influence ERP outcomes. This review echoes these findings, revealing that many garment firms suffer from outdated IT infrastructure, lack of technical personnel, and low system redundancy. These constraints not only delay ERP deployment but also diminish post-implementation performance. Furthermore, the review exposes a critical service gap—vendors often fail to provide garment-specific customization or long-term support, a shortcoming consistent with the vendor-client disconnect described by Wei (2007). In addition to technical shortcomings, vendors are found to lack contextual understanding of apparel workflows, resulting in irrelevant configurations and poor user training. This insight reinforces Ngai et al. (2008) observation that vendor competence and continuity are as crucial as software quality. The review advocates for a more collaborative vendor engagement model, where shared industry knowledge and post-go-live support are formalized through long-term service level agreements. The persistence of infrastructure and vendor issues in such a large proportion of reviewed articles underscores their systemic nature and the need for policy-level interventions and industry-specific ERP ecosystem development.

The findings regarding ERP's limited role in advancing sustainability goals within garment supply chains contrast with growing scholarly interest in green ERP and sustainable digitalization. While researchers like Parthasarathy and Anbazhagan (2007) have emphasized ERP's potential to support sustainability reporting, waste reduction, and energy tracking, this review reveals that such applications remain peripheral in the garment industry. Most ERP implementations are focused on transactional efficiency, inventory control, and order tracking, with minimal attention to environmental or social performance indicators. This gap may be attributed to both limited system configuration and lack of strategic alignment between sustainability and digital objectives. Additionally, the review highlights a broader theoretical limitation in ERP research—few studies adopt hybrid frameworks that can simultaneously address technological, organizational, institutional, and environmental dimensions. While the Technology-Organization-Environment (TOE) framework and Institutional Theory dominate the theoretical landscape, their application is often singular and insufficient to capture the complexities of ERP implementation in dynamic, globalized industries like garments. The absence of integrated theoretical models—combining TOE, Diffusion of Innovation (DOI), and Resource-Based View (RBV)—limits explanatory depth and practical relevance. This insight reinforces critiques by Wei et al. (2008) and Lin et al., (2011), who called for more comprehensive, multidimensional frameworks in ERP studies. The review thus supports both an empirical and theoretical expansion of ERP literature in the garment industry.

CONCLUSION

This systematic review examined 87 peer-reviewed articles to synthesize the multifaceted dimensions of ERP implementation within the garment industry, revealing a complex interplay of technical, organizational, infrastructural, and contextual factors. The findings highlighted persistent integration challenges due to legacy systems and data fragmentation, widespread organizational resistance exacerbated by inadequate change management, and the crucial influence of digital maturity on ERP readiness and outcomes. Critical success factors such as top management support, stakeholder engagement, and strategic training were reaffirmed as pivotal to successful implementation, while the tension between customization and standardization emerged as a recurring theme impacting cost, scalability, and system alignment. Additionally, infrastructural deficiencies and inconsistent vendor support were found to significantly hinder ERP performance, particularly in resource-constrained garment SMEs. Notably, the review identified critical research gaps, including a lack of longitudinal and post-implementation studies, minimal empirical focus on sustainability integration, insufficient digital maturity assessments, and limited cross-regional and theoretical analyses. These insights underscore the need for more context-specific ERP frameworks, continuous performance

evaluation mechanisms, and multidimensional research approaches that integrate both organizational and technological perspectives. By consolidating fragmented knowledge across decades of ERP literature, this review offers a comprehensive reference point for academics, practitioners, and policy-makers seeking to enhance ERP adoption strategies in the global garment manufacturing sector.

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