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Review Article

Advancing Digital Transformation through Business Process Orientation Maturity Models: A Systematic Literature Review

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Abstract

The growing pace of digital transformation has positioned Business Process Orientation Maturity Models (BPOMMs) as critical tools for managing organizational change. This systematic literature review (SLR) synthesizes findings from 40 peer-reviewed journal articles to examine how BPOMMs have evolved to support strategic transformation. The study aims to identify major themes, assess methodologies, and evaluate the incorporation of technology, sustainability, and ethics in maturity models. Using the PRISMA guidelines, a structured four-phase process was applied: identification, screening, eligibility assessment, and inclusion. Searches were conducted in major databases using targeted Boolean strings, followed by thematic synthesis and data tabulation. The review identifies six dominant themes: BPOMMs as enablers of digital transformation; the development of multidimensional, context-specific frameworks; the role of technologies such as AI and IoT; the integration of knowledge management and learning; the embedding of ESG practices; and the theoretical-methodological evolution. The study highlights a growing shift toward adaptive, user-centric, and ethically grounded models. This research contributes to academic and practical understanding by clarifying the strategic relevance of BPOMMs in modern digital ecosystems and proposing directions for more agile, sustainable frameworks.

Keywords: *Business Process Orientation, Maturity Models, Digital Transformation, Knowledge Management, Sustainability, Organizational Learning, Process Governance.*

INTRODUCTION

Digital transformation (DT) has emerged as a pivotal force reshaping the strategic direction of modern organizations through the integration of advanced digital technologies across business operations. Far beyond a mere technological shift, DT encapsulates fundamental changes in organizational structure, leadership, and strategic intent. As organizations seek to enhance agility, efficiency, and competitiveness in volatile environments, digital maturity (DM) becomes a crucial transformation metric for assessing readiness and capability in embracing (Jordan & Zabukovšek, 2023; Mursyada, 2024; Touijer & Elabjani, 2025). Recent studies confirm a strong correlation between digital maturity and organizational performance. Zabukovšek et al. (2023) note that tools like Document Management Systems (DMS) contribute to operational efficiency and environmental sustainability, while Touijer and Elabjani (2025) emphasize innovation and responsiveness as outcomes of mature digital strategies, especially for SMEs. Digital maturity, therefore, serves not only as a gauge of technological adoption but as an indicator of integrated, strategic transformation.

In response to the complexity of DT, maturity models offer structured frameworks to evaluate organizational capabilities, facilitate benchmarking, and guide improvement strategies. Borovkov et al. (2021) report persistent readiness gaps in advanced industries, underlining the relevance of maturity models in navigating digital transitions. Šimić et al. (2019) further assert that e-business adoption improves competitiveness, implying that maturity frameworks must incorporate both technical and organizational dimensions, including human capital and strategic alignment. One prominent model in this domain is the Business Process Orientation Maturity Model (BPOMM), designed to assess the maturity of an organization's process orientation.

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BPOMMs integrate organizational processes with strategic and digital transformation initiatives. Van Looy et al. (2022) and ER et al. (2023) explain that BPOMMs provide diagnostic insights that help organizations align internal capabilities with external technological opportunities. Utami et al. (2020) showcase its relevance in SMEs, where process maturity directly influences the capacity to integrate information systems.

BPOMMs are particularly significant in operations and supply chain contexts. As value chains digitize, structured process orientation enhances integration, transparency, and responsiveness. Glavan (2020) demonstrates that process maturity improves lean operations and coordination, while Viegas and Costa (2023) warn against overly rigid models that fail to adapt to sectoral variations. These models must remain flexible to reflect emerging business environments and industry-specific challenges. While the review includes literature from various sectors such as SMEs, manufacturing, healthcare, and supply chain operations, it does not aim to conduct a sector-by-sector comparison. Instead, it synthesizes findings across contexts to identify generalizable patterns and sectoral adaptations, particularly emphasizing applications in emerging economies and resource-constrained settings.

Despite these advantages, literature exploring the intersection of BPOMMs and digital transformation remains fragmented. Many models imply linear maturity progressions, which conflict with the often iterative, non-sequential nature of digital implementation. Scholars such as Looy (2020) and Viegas and Costa (2023) advocate for non-linear, adaptable frameworks that reflect contextual dynamics and organizational learning processes. Meanwhile, critiques by Dobrosavljević et al. (2020) and Özkan et al. (2024) note the neglect of key variables such as leadership behavior, cultural readiness, and infrastructural constraints in existing maturity models. This study addresses these limitations through a systematic literature review (SLR) of peer-reviewed studies published between 2010 and 2025, indexed in Scopus. The review aims to: (1) analyze how BPOMMs contribute to digital transformation outcomes across industries; (2) explore the key enablers and barriers in maturity model implementation; and (3) propose recommendations for theoretical advancement and practical application of BPOMMs in digitally evolving environments. The study contributes by advancing maturity model theory with adaptive, context-sensitive frameworks and offering practical guidance for managing digital transformation through flexible, structured assessment tools.

LITERATURE REVIEW

Historical and Conceptual Foundations of BPO and Maturity Models

The conceptual development of Business Process Orientation (BPO) and Business Process Management (BPM) has evolved as a response to the growing need for organizations to enhance internal efficiencies and external competitiveness. BPO emphasizes aligning organizational processes with strategic objectives, aiming to streamline operations and improve performance outcomes (Van Looy et al., 2022). As these process-centric approaches gained traction, they necessitated frameworks to assess maturity levels, thus giving rise to various maturity models. The Capability Maturity Model Integration (CMMI), developed by the Software Engineering Institute in the 1990s, is among the earliest structured models that chart organizational progression from ad hoc to optimized processes (Van Looy, 2020). Its focus on software and systems engineering laid the foundation for more generalized models, such as the Business Process Maturity Model (BPMM), which accommodates broader organizational capabilities beyond software.

The BPOMM provides a more recent and refined approach tailored for SMEs. It introduces nine key assessment areas that enable organizations to evaluate their process orientation maturity comprehensively (Utami et al., 2020). BPOMM's design makes it especially suitable for SMEs with resource limitations, offering practical pathways for process improvement. Scholars have

emphasized the importance of these models in benchmarking and driving continuous improvement. ER et al. (2023) stress that maturity models offer diagnostic clarity, allowing firms to strategically align capabilities with operational objectives. Viegas and Costa (2023) further highlight how maturity assessments can integrate multi-criteria decision-making (MCDM) to accommodate organizational complexity. Dobrosavljević et al. (2020) argue that such structured models facilitate dynamic responses to evolving market demands, particularly in sectors with rapid innovation cycles.

Looy (2020) and Koldewey et al. (2022) suggest that the effectiveness of maturity models lies in their ability to incorporate feedback loops and support adaptive change, enabling organizations to maintain alignment between strategic intent and operational execution. Kopina (2019) reinforces this perspective by illustrating how self-organized process organizations (SOPO) use maturity assessments to drive cultural and operational change. Among the various maturity models discussed, the BPOMM is adopted as the core theoretical benchmark for this review. This choice is grounded in BPOMM's specific orientation toward integrating process thinking with strategic and digital transformation efforts, particularly within resource-constrained contexts such as SMEs. While foundational models like CMMI and BPMM inform the historical and structural evolution of maturity frameworks, BPOMM offers a context-sensitive and diagnostic approach that aligns closely with the objectives of this study. As such, BPOMM serves not only as the conceptual lens guiding the synthesis of findings but also as a comparative anchor through which other models are evaluated.

Digital Transformation Frameworks and Organizational Capabilities

The digital transformation (DT) of organizations has spurred the development of several frameworks aimed at understanding and guiding this complex process. The Digital Maturity Model (DMM), the BPMM, and BPOMM are among the leading models employed to evaluate digital readiness and implementation. The DMM captures an organization’s journey from initial digital awareness to full-scale integration, offering stages that reflect increasing digital competence. This model has proven particularly useful for SMEs, which often face capability gaps and resource constraints in executing digital initiatives (Touijer & Elabjani, 2025). In parallel, BPMM assesses process maturity with a focus on operational efficiency and strategic alignment (Borovkov et al., 2021). When used alongside DMM, it enables organizations to align digital efforts with process optimization goals (Koldewey et al., 2022; Viegas & Costa, 2023).

BPOMM adds further value by enabling SMEs to conduct diagnostic assessments of process orientation in support of digital initiatives. Its emphasis on practical, contextualized evaluation makes it especially beneficial in sectors such as agriculture and manufacturing (Utami et al., 2020). The adoption of these models is not without challenges. In technology-intensive industries, for instance, organizations often encounter barriers to advanced manufacturing technology adoption despite high strategic intent (Borovkov et al., 2021). Conversely, high digital maturity fosters agility and innovation, leading to competitive advantages (Van Looy et al., 2022). Document Management Systems (DMS) illustrate this dynamic. Research by Zabukovšek et al. (2023) and Jordan and Zabukovšek (2023) shows that DMS enhances agility and decision-making but requires sufficient process maturity for successful implementation. The combination of digital tools with maturity frameworks enables organizations to accelerate transformation while maintaining governance.

Integration of BPO Maturity Models and Digital Transformation

Empirical evidence suggests a strong linkage between BPO maturity and successful digital transformation (DT) initiatives. Maturity models offer not only a diagnostic framework but also strategic guidance for aligning digital efforts with operational realities. Studies in Croatia (Glavan, 2020) and Indonesia (ER et al., 2023) show that organizations with higher maturity levels perform

better in process management and digital adaptation. Van Looy et al. (2022) extend this by offering a taxonomy of BPO archetypes, providing comparative benchmarks that guide transformation strategies.

In SMEs, BPOMM is instrumental in mapping digital readiness. Utami et al. (2020) highlight how maturity in process orientation enhances IS implementation, ultimately strengthening innovation capabilities. Kopina (2019) further identifies cultural shifts as critical, noting that maturity supports employee engagement and fosters adaptive learning. These methods collectively enhance the diagnostic, prescriptive, and comparative functions of maturity models, enabling organizations to fine-tune their transformation roadmaps.

Table 1. Overview of Empirical and Analytical Methods Supporting BPO Maturity and Digital Transformation

Method	Description	Reference
Qualitative Self-Assessment	Uses structured internal audits to assess digital capability maturity	Yiu and Pun (2014)
MCDM with Intuitionistic Fuzzy Sets	Integrates multi-criteria decision-making under uncertainty	Viegas and Costa (2023)
Delphi-Based Framework	Employs expert consensus to structure digital maturity indicators	Touijer and Elabjani (2025)
Design Science Research	Iterative model development through artifact creation and validation	Koldewey et al. (2022)
Cluster Analysis & Statistical Methods	Empirical segmentation of maturity levels using quantitative data	Glavan (2020)

Implications for Operations and Supply Chain Management

BPOMMs play a pivotal role in operational and supply chain transformation, particularly in sectors characterized by complexity, decentralization, and rapid change. By mapping maturity levels, BPOMMs offer organizations a framework to standardize workflows, improve transparency, and align digital efforts with logistics operations. Utami et al. (2020) demonstrate how BPOMM assessments in the Indonesian agroindustry enabled SMEs to enhance IS adoption and streamline operations. Zabukovšek et al. (2023) find similar results in DMS implementation, showing gains in document control and responsiveness. Dobrosavljević et al. (2020) explore process orientation in the apparel industry, linking maturity with logistics optimization. Glavan (2020) and Koldewey et al. (2022) further illustrate that process maturity enhances agility, production performance, and value chain integration. Šimić et al. (2019) extend this to export logistics, revealing how e-business adoption tied to process maturity drives global competitiveness. These case studies consistently support the notion that BPOMM facilitates lean operations, just-in-time responsiveness, and cross-functional coordination.

Synthesis of Theoretical Convergence

Theoretical models increasingly point to a convergence between BPO maturity and DT frameworks. Touijer and Elabjani (2025) introduce a digital competitiveness framework linking digital capabilities with process maturity. Sternad Zabukovšek et al. (2023) apply PEMM to DMS, showing how maturity impacts sustainable transformation (Table 2).

Table 2. Key Mediating Factors Linking BPO Maturity to Digital Transformation

Key Mediating Factor	Source
Organizational culture	Jordan & Zabukovšek (2023)

Key Mediating Factor	Source
Digital capabilities	Touijer and Elabjani (2025)
Leadership alignment	Glavan (2020)
Resource management	ER et al. (2023)
Process metrics	Kopina (2019)
Sustainability orientation	Sternad Zabukovšek et al. (2023)
Modularized process architectures	Plugge et al. (2024)

Viegas and Costa (2023) propose a hybrid model combining MCDM with maturity frameworks, emphasizing decision-making precision. Van Looy et al. (2022) provide configuration taxonomies, while Dobrosavljević et al. (2020) demonstrate multidimensional BPO assessments. These variables collectively shape the conditions under which BPO maturity contributes to successful DT outcomes.

RESEARCH METHOD

This section outlines the methodological approach employed in conducting the systematic literature review (SLR) on Business Process Orientation Maturity Models (BPOMMs) and their role in advancing Digital Transformation (DT). The methodology follows widely accepted academic standards, ensuring transparency, replicability, and rigor through clearly defined search strategies, inclusion and exclusion criteria, screening procedures, and quality assessment tools.

Search Strategy

The literature search was conducted in Scopus, one of the most comprehensive and widely used academic databases for peer-reviewed research. The search strategy was based on a carefully designed Boolean search string that ensures coverage of relevant literature while minimizing irrelevant records. The search string used was: ("business process orientation" OR "process maturity model") AND ("digital transformation" OR "digital maturity")

This search string was chosen to capture the conceptual and practical intersections between maturity models and digital transformation. The search was limited to articles published between 2010 and 2025 to capture contemporary discussions and frameworks, especially considering the rapid evolution of digital technologies and organizational responses. To enhance the quality of retrieved literature, the search was filtered by the following conditions:

1. Document type: Article or Conference Paper
2. Language: English
3. Source: Peer-reviewed journals indexed in Scopus

This strategy aligns with established literature review practices that prioritize high-quality and relevant sources (Jordan & Zabukovšek, 2023; Looy, 2020; Touijer & Elabjani, 2025).

Inclusion and Exclusion Criteria

To ensure that the literature included in the review was relevant and credible, the following inclusion and exclusion criteria were applied:

Inclusion Criteria

1. Relevance to Maturity Models: The article must address business process orientation or organizational/process maturity, preferably through the application or evaluation of maturity models (Van Looy et al., 2022).
2. Connection to Digital Transformation: The study must explore maturity models in relation to DT outcomes, readiness, or capabilities (ER et al., 2023).

3. Empirical Evidence: Articles presenting empirical findings, case studies, or model evaluations are prioritized (Koldewey et al., 2022).
4. Peer-Reviewed: Only articles from peer-reviewed journals or conference proceedings are included (Viegas & Costa, 2023).
5. Timeframe: Articles published from 2010 to 2025.
6. Cross-Sector Applicability: Studies encompassing various industries such as healthcare, manufacturing, and services (Borovkov et al., 2021).

Exclusion Criteria

1. Non-relevant Focus: Articles not addressing either BPOMMs or DT (e.g., theology, unrelated technologies).
2. Lack of Empirical Basis: Purely theoretical papers without validation or case examples.
3. Inadequate Detail: Articles that mention maturity or DT superficially without substantive discussion (Novak & Janeš, 2019).
4. Duplicates: Repetitive publications reporting the same results.
5. Outdated Frameworks: Studies relying solely on pre-2010 frameworks with no updates.

These criteria ensure that the selected literature is both conceptually rich and methodologically sound, supporting the goals of synthesis and gap identification.

Screening and Selection Process

The article selection followed a three-stage process consistent with PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines (Figure 1):

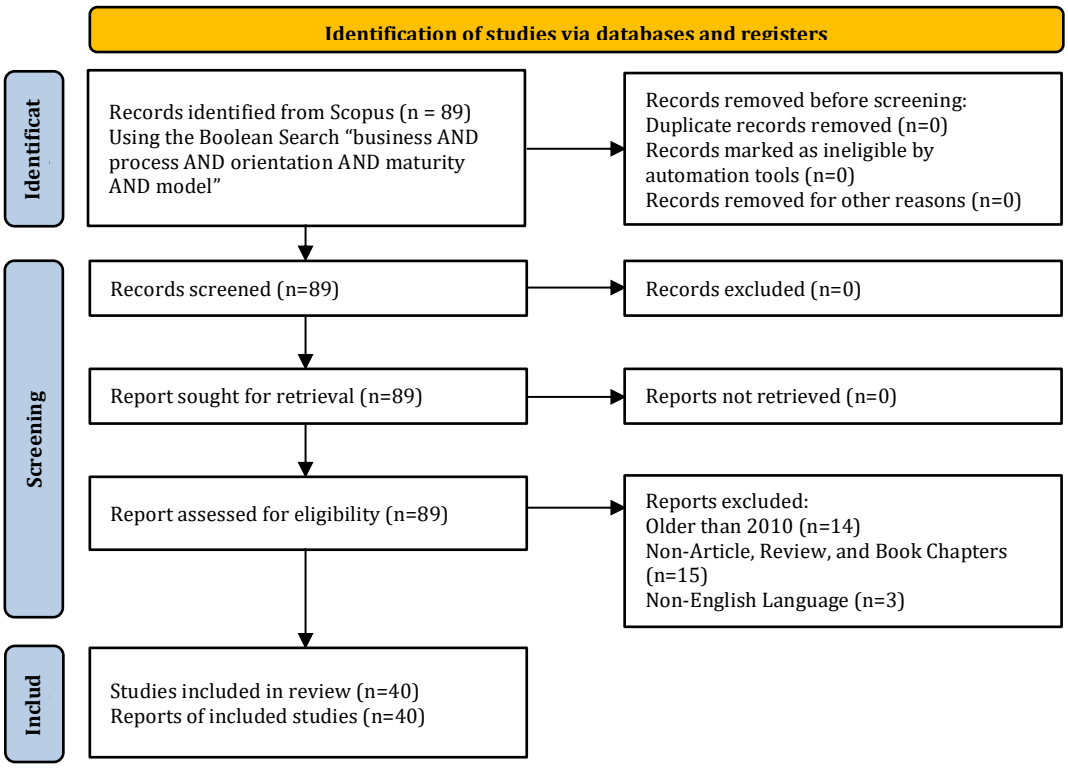


Figure 1. PRISMA Flow Diagram for Study Selection

Stage 1: Title and Abstract Screening

An initial screening of titles and abstracts was performed as part of the systematic review process. A total of 89 initial records were retrieved. Following screening, 49 reports were excluded

for the following reasons: older than 2010 (n=14), non-article/review/book chapters (n=15), non-English language (n=3), and out of scope (n=17).

Stage 2: Full-Text Review

The remaining 57 articles underwent full-text assessment. Articles were excluded if they failed to meet the inclusion criteria related to BPOMMs and digital transformation. Ultimately, 40 articles were selected for thematic synthesis.

Data Analysis Techniques

Thematic synthesis was conducted using a hybrid approach that combined inductive and deductive coding, following the guidance of Thomas and Harden (2008). An initial set of themes was derived from the research questions and theoretical frameworks (deductive), which was subsequently refined by reviewing recurring patterns across studies (inductive). Coding was performed manually, and no qualitative analysis software (e.g., NVivo or Atlas.ti) was used. The final themes were triangulated across empirical contexts and aligned with the research objectives.

This approach follows contemporary systematic literature review methodology, ensuring that the findings are theoretically grounded and methodologically robust (MacFarlane et al., 2022; Page et al., 2021).

FINDINGS AND DISCUSSION

The final corpus includes 40 peer-reviewed studies spanning various sectors such as manufacturing, healthcare, agriculture, and services. Most studies focus on SMEs and originate from diverse geographic contexts, including Southeast Asia, Europe, and North Africa. Methodologically, the dataset comprises both qualitative case studies and quantitative empirical models, providing a balanced foundation for synthesis.

Process Maturity as an Enabler for Digital Transformation

The final corpus includes 40 peer-reviewed studies spanning various sectors such as manufacturing, healthcare, agriculture, and services. Most studies focus on small and medium-sized enterprises (SMEs) and originate from diverse geographic contexts, including Southeast Asia, Europe, and North Africa. Methodologically, the dataset comprises both qualitative case studies and quantitative empirical models, providing a balanced foundation for synthesis.

The integration of digital transformation (DT) into organizational strategies has become an imperative for sustainable competitiveness, efficiency, and innovation. A recurring theme across the reviewed literature is the critical enabling role of business process maturity in achieving successful digital transformation outcomes. This section synthesizes empirical findings, measurement models, and practical implications (Table 3) to examine how varying levels of business process orientation (BPO) maturity influence digital innovation, agility, and organizational performance. The discussion also highlights best practices and aligns with established theoretical frameworks that support the strategic role of process maturity in digital advancement.

A primary contribution of this theme is the affirmation that higher levels of process maturity facilitate smoother and more impactful DT implementations. Festing and Proff (2025), through a study of 603 firms, demonstrated that digital maturity scores were significantly higher in organizations exhibiting varied and developed BPO maturity levels. Employing a regression-based Digital Maturity Index, their findings emphasize that alignment with national culture accelerates the DT process, highlighting the contextual sensitivity of maturity assessments (Table 3).

Koldewey et al. (2022) further substantiate this linkage by illustrating how a phased maturity

progression (Baseline → Target) contributes to enhanced Industry 4.0 performance. Using a four-phase maturity scoring framework, their research underlines that socio-technical integration is critical, and mature processes facilitate seamless incorporation of digital tools, creating a holistic digital ecosystem.

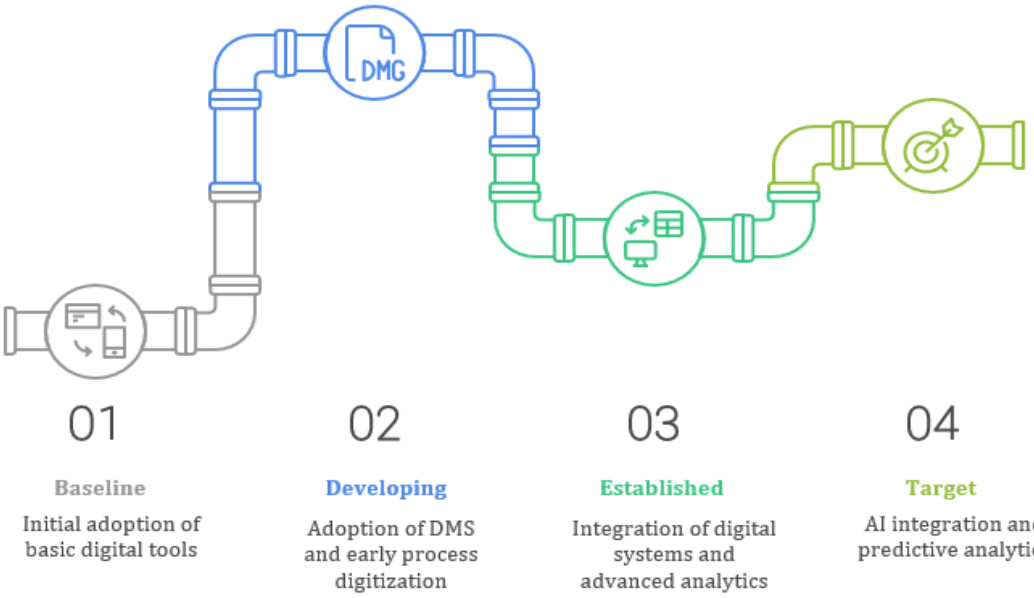


Figure 2. Phased Maturity Progression and Its Impact on Digital Transformation Outcomes

Touijer and Elabjani (2025) highlight the competitiveness of emerging SMEs through Delphi-based KPIs within a digital maturity framework. Their work supports earlier assertions that SMEs benefit most when digital initiatives are embedded in structured process foundations (Utami et al., 2020). Similarly, Plugge et al. (2024) revealed that modularized process architectures optimize service portfolios. Using PLS-SEM path coefficients, they confirmed that process modularity mediates digital transformation benefits, a core principle in strategic alignment models commonly emphasized in foundational theoretical frameworks.

Studies also show that lower maturity can hinder DT. For instance, a study by Borovkov et al. (2021) that introduced a barrier-level (%) index to reveal how low-to-medium BPO maturity impedes digital capability development in high-tech manufacturing. Their results call for capability investment roadmaps that bridge maturity gaps before implementing advanced technologies. Another study by Jordan and Zabukovšek (2023) also demonstrate how intermediate BPO levels contribute to more efficient Document Management System (DMS) life cycles. Applying the Process and Enterprise Maturity Model (PEMM), they underscore that higher maturity fosters smoother DT initiatives. The implications support earlier findings that maturity models like BPOMM and PEMM provide essential diagnostic value.

The role of initial and managed maturity stages is evident in studies by Utami et al. (2020) and Kosasi et al. (2019). Using the BPOMM 9-area survey, Utami et al. (2020) link ad hoc process formalization with improved SME readiness for DT by applying COBIT domain scores, establish that managed maturity levels improve IT-service performance, thus boosting online success.

Table 3. Process Maturity as an Enabler for Digital Transformation

Author-Year	BPO Level	DT Outcome	Measurement Criteria	Implications
Festing & Proff (2025)	Varied (603 firms)	Higher digital-maturity scores	Regression-based Digital-Maturity Index	National culture alignment accelerates DT
Koldewey et al. (2022)	Baseline→Target (4-phase)	↑ Industry 4.0 performance	4-phase maturity scoring	Socio-technical integration drives results
Touijer and Elabjani (2025)	Emerging	Competitive SMEs	Delphi DM framework KPIs	Customer-centric digital processes are essential
Plugge et al. (2024)	Modularised	Optimised service portfolio	PLS-SEM path coefficients	Process modularity mediates DT benefits
Borovkov et al. (2021)	Low-Medium	Barrier identification	Barrier-level (%) index	A capability investment roadmap is required
Jordan & Zabukovšek (2023)	Intermediate	Efficient DMS life-cycle	PEMM scores	Higher maturity ⇒ smoother DT
Utami et al. (2020)	Ad-hoc	SME readiness	BPOMM 9-area survey	Formalising processes first step
Kosasi et al. (2019)	Managed	Better IT service perf.	COBIT domain scores	Governance maturity boosts online success

Together, these empirical findings (summarized in Table 3) validate the hypothesis that process maturity significantly enhances the success of digital transformation. The evidence supports theoretical claims that maturity models (e.g., CMMI, BPMM, BPOMM) are not only diagnostic tools but strategic enablers of innovation, responsiveness, and scalability. These studies collectively reveal common metrics and instruments employed to assess maturity and its impact on DT outcomes. Delphi frameworks, regression models, PEMM, and COBIT domains each capture various facets of maturity, including readiness, governance, customer orientation, and socio-technical integration. These metrics align with maturity model typologies (e.g., BPOMM, BPMM), reinforcing their importance in DT measurement.

The implications are multifold. First, the consistent correlation between higher maturity and successful DT supports the notion of roadmap-based transformation. Organizations should establish baselines using tools such as BPOMM or COBIT and design incremental improvement strategies. Second, strategic investments in modularity, governance, and process culture are necessary precursors to technology implementation, especially for SMEs and resource-constrained sectors.

Best practices from high-maturity organizations reinforce the above. These include

continuous assessment and benchmarking (Utami et al., 2020), alignment of digital strategies with business capabilities (Viegas & Costa, 2023), and prioritization of sustainable and human-centered design (Jordan & Zabukovšek, 2023; Zabukovšek et al., 2023). The integration of BPOMMs in transformation blueprints enables data-driven planning, stakeholder engagement, and agile responses to market dynamics.

Maturity Dimensions and Framework Design

As organizations seek to navigate the complexities of digital transformation (DT), the design and structure of maturity models become pivotal. This section explores how various frameworks define maturity dimensions, differ across sectors, and are constructed to ensure adaptability, scalability, and diagnostic value. The findings are drawn from the selected literature and synthesized in Table 4. A key insight is the heterogeneity in maturity dimensions, reflecting evolving organizational needs and sectoral nuances. Poeppelbuss and Roeglinger (2011) proposed a design-principles framework incorporating purpose, stakeholder engagement, and scope as central maturity dimensions. Applied across industries, their framework offers practical guidelines for developing maturity models (MMs) that are context-sensitive and functionally robust. Their emphasis on stakeholder alignment anticipates later work, which stresses the socio-technical complexity of DT.

Van Looy (2010) contributed a comparative analysis of business process maturity models (BPMMs), emphasizing a distinction between IT-neutral and IT-driven models (Figure 3). This categorization underscores that while technology enables transformation, maturity is contingent upon process, culture, and strategic alignment, a point also echoed by Zabukovšek et al.(2023). Van Looy et al. (2022) conducted a meta-study of 61 maturity models and identified six distinct maturity types. This classification demonstrates that frameworks must be tailored to fit specific organizational contexts and strategic orientations. The structural diversity of maturity frameworks was further validated in Van Looy (2015), who experimentally compared how variations in scaling and calculation methods affect maturity assessments. Using a finance-oriented case, the study confirmed that model choice significantly alters maturity scores, highlighting the necessity for rigor in framework selection.

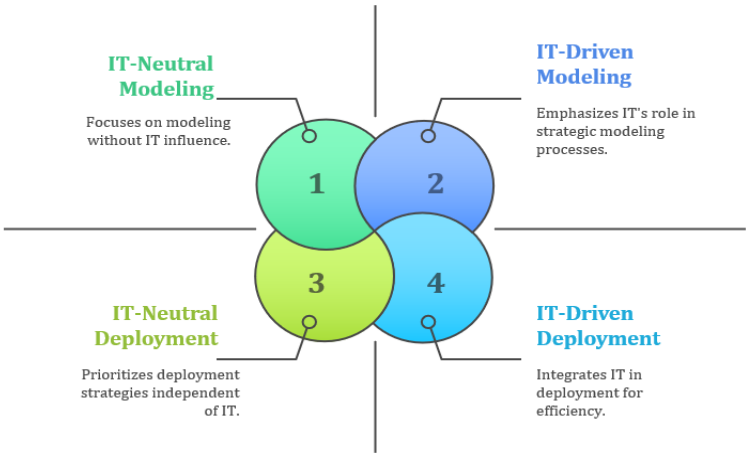


Figure 3. Typologies of Business Process Maturity Models (Based on Van Looy et al., 2010)

Looy (2020) advanced this line of inquiry by introducing a validated 62-item measurement

instrument structured into four capability areas and 13 sub-dimensions. Its validation across multiple sectors lends empirical weight to its reliability and showcases the granularity achievable in modern maturity assessments.

Table 4. Maturity Dimensions and Framework Design

Author-Year	Framework / Model	Key Dimensions	Sector / Scope	Outcome
Poeppelbuss and Roeglinger (2011)	Design-Principles Framework	Purpose, stakeholder, scope	Cross-industry	Guidelines for useful MMs
Van Looy (2010)	Comparative BPM MMs	IT-neutral vs IT-driven	Multi-sector	IT enables but need not dictate maturity
Van Looy et al. (2010)	BPMM Classification	Modelling, deployment, culture.	Meta-study (61 MMs)	Six maturity types identified
Van Looy (2015)	Experimental Comparison	Scale & calculation variants	Finance-org case	Model choice changes scores
Looy (2020)	62-item Measurement Instrument	4 capability areas, 13 sub-areas	Multi-sector	Reliable maturity scale validated
Röbel et al. (2018)	BM Mgmt MM (I4.0)	Strategy, innovation, data	Industry 4.0	Roadmap to business-model mastery
Shi et al. (2019)	Smart-Manufacturing Kaizen MM	Integration, sustainability	Manufacturing	Gap-driven improvement route

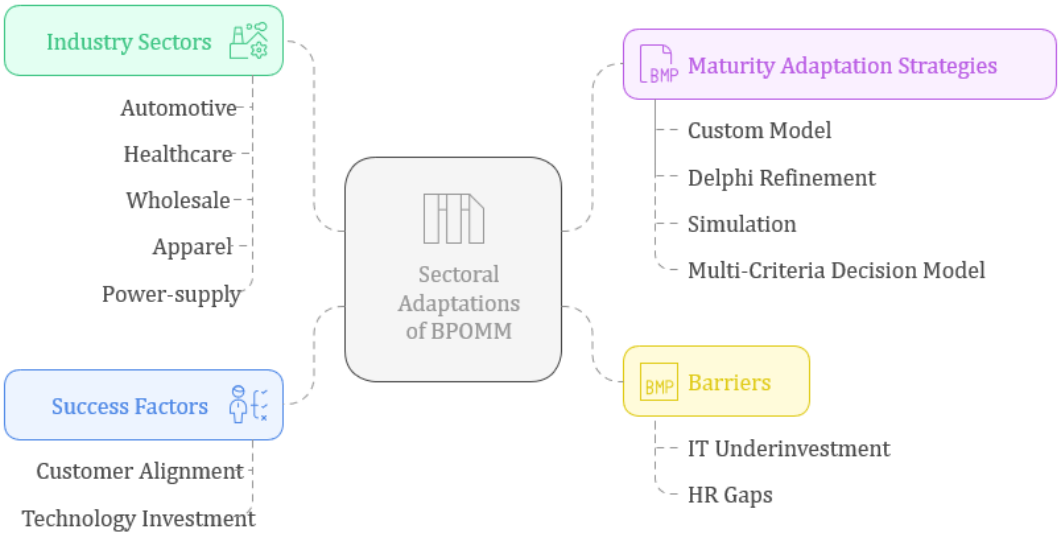
Industry-specific models also illustrate the interplay between maturity dimensions and domain needs. Röbel et al. (2018) developed the Business Model Management Maturity Model for Industry 4.0 (BM Mgmt MM I4.0), which integrates strategy, innovation, and data dimensions. Its roadmap-like structure reflects the shift from operational efficiency to business model mastery in digitally advanced industries. In the manufacturing sector, Shi et al. (2019) proposed the Smart Manufacturing Kaizen Maturity Model, emphasizing integration and sustainability. Their model aligns maturity development with continuous improvement philosophies, such as Kaizen, and defines a gap-driven route to process enhancement. This reflects the practical necessity of aligning maturity initiatives with lean manufacturing principles.

These findings reinforce arguments that maturity frameworks must be multidimensional, context-aware, and empirically grounded. Several implications arise. First, the diversity of dimensions, ranging from modeling and culture to sustainability and data, requires organizations to select or design models aligned with their strategic needs. Second, sector-specific adaptations, such as those by Shi et al. (2019) and Röbel et al. (2018), illustrate that general-purpose models must often be customized to maximize relevance and effectiveness. Finally, the review validates the hypothesis that maturity frameworks are not only evaluative tools but design mechanisms that enable strategic alignment, continuous improvement, and digital capability development. Cross-model comparisons (Van Looy, 2015; Van Looy et al., 2010) are especially useful for refining

BPOMMsby identifying robust dimensions, measurement techniques, and contextual priorities.

Sectoral Insights and Industry-Specific Adaptations

As digital transformation (DT) efforts proliferate across industries, it becomes increasingly evident that maturity models must be adapted to meet the specific challenges, operational logics, and contextual factors of different sectors. This section synthesizes findings from Table 5 to illustrate how BPOMMs are applied across various domains, and how sector-specific barriers, adaptation approaches, and success factors shape implementation outcomes. These findings directly support the theoretical insights, emphasizing the need for contextualized and responsive maturity frameworks (Figure 4).



The automotive sector, as discussed by Sliž (2021), exemplifies the importance of customer-centric process alignment. In this domain, the proprietary process orientation (PO) model was tailored to address deficiencies in process metrics and employee engagement. The study identified customer–supplier alignment as a critical success factor, aligning with theoretical constructs that emphasize stakeholder integration and customer value as core maturity dimensions. The model's sectoral customization compensates for the lack of standardized metrics by focusing on value-chain coherence (Table 5).

Healthcare represents another sector where maturity model adaptation is crucial. Schriek et al. (2016) developed a care-pathway-specific maturity model to navigate standardization difficulties, a common barrier in complex clinical environments. Using Delphi-based refinement, the framework accounts for both medical variability and process formalization, offering a practical route to process improvement. This supports findings that digital transformation frameworks in healthcare must integrate professional judgment and compliance sensitivity to drive adoption.

In a similar vein, Walser et al. (2013) explored maturity model adaptation within Swiss hospitals. By tailoring a performance management model to the Diagnosis-Related Group (DRG) system, they addressed low IT-integration challenges while leveraging robust planning and control systems to enhance operational outcomes. These findings highlight the importance of regulatory and financial alignment in the adaptation of maturity models, underscoring the role of institutional constraints in shaping maturity dimensions.

The wholesale supply chain sector, examined by Jaklič et al. (2012), utilized simulation-based tools alongside supply chain management (SCM) maturity models to overcome legacy processes.

The integration of e-business technologies proved pivotal in modernizing operations and enhancing efficiency. This reflects earlier arguments that mature digital infrastructures support agile transformations by enabling better system interoperability.

Table 5. Sectoral Insights and Industry-Specific Adaptations

Author-Year	Sector	Adaptation Approach	Barriers Identified	Success Factors
Sliž (2021)	Automotive dealerships	Proprietary PO model	No process metrics, low staff activation	Customer–supplier alignment
Walser et al. (2013)	Swiss hospitals	Perf-MM adapted to DRG	Low IT-integration	Robust planning/controlling
Schriek et al. (2016)	Healthcare pathways	Care-pathway MM	Standardisation difficulties	Delphi-based refinement
Jaklič et al. (2012)	Wholesale SC	Simulation + SCM MM	Legacy processes	Integrated e-business
Šimić et al. (2019)	Croatian exporters	OECD e-commerce MM	Weak e-ordering/research	E-mail & online promotion use
Glavan (2019)	Croatian companies	Clustered BPO levels	Strategic vision gaps	Linked-level road-mapping
Dobrosavljević et al. (2020)	Apparel SMEs	FUCOM-PIPRECIA model	HR capability gaps	HRM prioritisation
Novak and Janeš (2019)	Power-supply sector	9-element BPO survey	IT underinvestment	Technology investment

Croatian exporters, as studied by Šimić et al. (2019), adopted the OECD e-commerce maturity model to address weak e-ordering and online research capabilities. The study found that promoting e-mail and online promotional channels significantly improved digital orientation. This outcome illustrates how even modest digital interventions, when aligned with maturity benchmarks, can yield measurable DT gains in resource-constrained contexts.

Glavan (2019) proposed clustered BPO levels to accommodate diverse Croatian companies with strategic vision gaps. Linked-level road mapping emerged as a key success factor, offering a staged and pragmatic approach to transformation. This aligns with the maturity stage logic emphasized in models like BPOMM and CMMI (see Table 5), which advocate for progressive development rather than disruptive overhaul.

In the apparel sector, Dobrosavljević et al. (2020) applied the FUCOM-PIPRECIA multi-criteria decision model to SMEs, revealing HR capability gaps as a primary barrier. The prioritization of human resource management (HRM) was crucial for enhancing process performance and enabling digital transformation. This finding reinforces the criticality of the "people" dimension in maturity models, as discussed in Section Maturity Dimensions and Framework Design.

Novak and Janeš (2019) examined the power-supply sector using a nine-element BPO survey, identifying IT underinvestment as a limiting factor. Technology investment was the most influential success factor, supporting the hypothesis that technological readiness is foundational for mature DT execution. Their work demonstrates how maturity assessments can be diagnostic tools for

investment prioritization. These cases collectively affirm the theoretical position that maturity models must be sectorally adaptable and grounded in organizational realities. They also validate the hypothesis that successful DT requires not only technical enablers but also managerial, cultural, and institutional alignment.

From a methodological standpoint, these studies highlight diverse adaptation techniques, including Delphi refinement, performance metric customization, and multi-criteria decision models. Such approaches serve to bridge the generalizability-specificity gap in maturity model application, making BPOMMs more relevant and actionable across diverse contexts. The practical implications are substantial. For policymakers, recognizing industry-specific adaptation needs can inform targeted capacity-building programs. For practitioners, these insights offer guidance in selecting and customizing maturity models that align with operational realities. For researchers, these findings suggest fertile ground for comparative studies examining the effectiveness of different adaptation approaches across sectors. Taken together, the sectoral insights presented in this theme reinforce the need for a pluralistic, flexible approach to BPOMM implementation. Rather than assuming universality, effective maturity models must accommodate the socio-technical configurations and strategic constraints of specific industries. As the next section will explore, such adaptations also intersect with the analytical techniques used to assess maturity and transformation success.

Application of Analytical and Quantitative Techniques

The assessment of Business Process Orientation Maturity Models (BPOMMs) has evolved significantly through the integration of analytical and quantitative techniques. These methods not only enhance the objectivity and reproducibility of maturity evaluations but also enable a more nuanced understanding of organizational readiness for digital transformation (DT). This section discusses empirical applications of cluster analysis, Multi-Criteria Decision Making (MCDM), fuzzy logic, and simulation-based approaches as shown in Table 6. The insights align closely with theoretical constructs, particularly concerning performance metrics, configurational alignment, and technological integration.

Table 6. Analytical and Quantitative Techniques for BPO Maturity

Author-Year	Technique Used	Purpose	Dataset	Key Findings
ER et al. (2023)	Cluster + ANOVA	BPO taxonomy	6-archetype orgs (Indonesia)	High-CP clusters ⇒ high perf.
Viegas and Costa (2023)	MCDM + Int. Fuzzy	Evaluate BPM-MM	Case application	Quantitative yet flexible
Glavan (2020)	Cluster analysis	National BPO report	Croatian survey	Defined → Linked transition
Van Looy et al. (2022)	Configurational fsQCA	Identify archetypes	International dataset	7 archetypes & perf. gaps
Wahrstötter (2023)	Multi-case stage model	PPMS maturity	33 interviews (energy)	5-stage holistic PPMS
Szymański and Schreier (2012)	Resource-model mining	REST process mapping	Legacy app case	Lightweight extraction feasible
Gudelj et al. (2021)	Simulation + survey	Validate BPM model	45 orgs, 315 managers	Process orientation ↑ success

Cluster analysis emerges as a foundational tool in recent BPOMM literature. ER et al. (2023) utilized a combination of cluster analysis and ANOVA to classify Indonesian organizations into six archetypes based on their process orientation levels. The study found that clusters exhibiting high customer-process (CP) alignment demonstrated superior performance metrics. This finding supports the hypothesis that high maturity in customer-facing processes is a critical driver of digital transformation success. By statistically segmenting organizational types, the research enabled targeted maturity interventions and benchmarking, offering a scalable model for other developing economies (Table 6). Similarly, Glavan (2020) employed cluster analysis using national survey data to examine the progression between defined and linked maturity levels across Croatian organizations. The study's quantitative segmentation highlighted the transitional challenges organizations face in aligning strategic planning with operational execution. These findings reinforce theoretical discussions about the importance of vertical alignment in process orientation, demonstrating that maturity growth is often contingent upon integrative capability.

Configurational analysis also contributes to the development of BPOMMs. Van Looy et al. (2022) applied fuzzy-set Qualitative Comparative Analysis (fsQCA) across an international dataset to identify seven distinct archetypes in process maturity. These archetypes revealed systematic performance gaps associated with misalignment between structural configurations and maturity objectives. This confirms theoretical propositions regarding the need for congruence between organizational configuration and maturity criteria. FsQCA further facilitates comparative analysis between contextual variations, offering a diagnostic tool for international benchmarking. The integration of MCDM techniques has added a structured, decision-oriented dimension to BPOMM evaluations. Viegas and Costa (2023) introduced a hybrid approach combining MCDM and interval fuzzy logic to assess Business Process Management Maturity Models (BPM-MM) in case-based settings. This approach provided both flexibility and quantitative rigor, enabling practitioners to address the subjectivity inherent in maturity assessments. The method's adaptability across different organizational contexts illustrates how MCDM, when fused with fuzzy systems, enhances precision without sacrificing interpretability. This aligns with arguments about the role of adaptive frameworks in supporting digital transformation (DT).

Fuzzy logic's ability to manage ambiguity and partial truth states proves instrumental in modeling subjective assessments of maturity. Dobrosavljević et al. (2020) previously demonstrated how fuzzy-MCDM could prioritize dimensions in business process management, particularly in SMEs with limited data richness. In the context of Table 6, fuzzy logic enhances granularity in data interpretation, bridging the gap between qualitative perception and quantitative output. Such methods reinforce the conceptual framework in which organizational flexibility and subjective experience are positioned as key factors in maturity evolution. Simulation-based methods also play a pivotal role in BPOMM research. Gudelj et al. (2021) combined simulation modeling with survey-based data collection across 45 organizations and 315 managers to validate a BPM model. Their findings indicated that higher levels of process orientation directly correlated with increased organizational success. These results confirm the theoretical assertion that maturity models must reflect operational realities through feedback-informed iterations. Simulation enabled scenario testing, validating the causal relationships hypothesized in traditional maturity constructs.

Wahrstötter (2023) offered another perspective through a multi-case stage modeling approach to assess the maturity of Project and Portfolio Management Systems (PPMS) in the energy sector. Based on 33 interviews, a five-stage holistic model was developed. This work illustrated the feasibility of qualitative-quantitative integration in BPOMM design, echoing the call for hybrid frameworks that combine experiential insights with empirical rigor.

The application of resource-model mining techniques by Szymański and Schreier (2012) further illustrates the advancement of lightweight, scalable tools for maturity diagnostics. By utilizing REST-based process mapping in a legacy application environment, the authors demonstrated the feasibility of automated model extraction. This is particularly relevant for organizations operating with legacy systems, aligning with the theoretical emphasis on technology integration and infrastructure constraints. These examples highlight how analytical and quantitative techniques elevate BPOMMs from conceptual frameworks to operational tools. The triangulation of qualitative judgment and empirical data enables more comprehensive diagnostics and better-informed transformation strategies. Furthermore, the adaptability of these methods across sectors and geographies underscores their value for both research and practice.

In practical terms, the implications are multifold. For organizations, employing these techniques supports more accurate self-assessment and strategic alignment. For policymakers, it enables the development of benchmarking indices to compare maturity across regions or sectors. For scholars, the methodological pluralism demonstrated here opens avenues for future research exploring hybrid models and longitudinal maturity tracking. The integration of analytical and quantitative techniques into BPOMMs affirms the hypothesis that digitally mature organizations must combine structured methodologies with contextual agility. These methods ensure that maturity assessments are both theoretically grounded and empirically validated, enabling strategically actionable insights.

Knowledge Management and Organizational Learning

The integration of knowledge management (KM) practices and organizational learning processes plays a pivotal role in shaping Business Process Orientation Maturity Models (BPOMMs). As digital transformation (DT) efforts intensify across sectors, it becomes increasingly important to understand how KM frameworks contribute to process maturity, innovation, and adaptive capabilities. This section explores empirical evidence and conceptual frameworks detailed in Table 7, revealing the mechanisms by which KM strategies and learning paradigms support maturity progression and digital competitiveness.

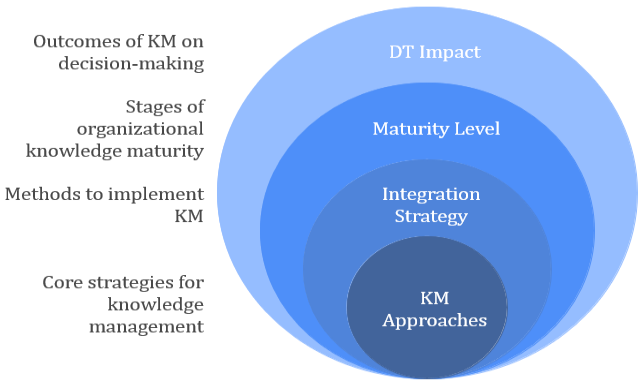


Figure 5. KM Approaches and Their Impact

Yiu and Pun (2014) developed an integrated KM model aligned with a self-assessment strategy, categorizing maturity into four levels. Their model illustrates how KM systems, when evaluated through structured internal audits, can enhance the alignment between knowledge practices and corporate objectives. The impact of this approach is twofold: it reinforces the institutionalization of KM processes and ensures that knowledge assets are effectively leveraged to support digital goals. This resonates with theoretical propositions emphasizing that digital

transformation is more successful when knowledge resources are mobilized strategically (Figure 5). The SOPO model proposed by Kopina (2019) further demonstrates the transformative potential of self-organizing knowledge practices. By deploying self-organized work teams, the model supports emergent forms of knowledge production and dissemination. This decentralized approach improves service quality and operational responsiveness, especially in dynamic service environments. The model's emphasis on horizontal coordination reflects the importance of cultural and structural enablers as key facilitators of transformation.

Potoczek (2017) offers a human resource management (HRM) competency model that integrates workforce capability building as the central strategy. Situated within a progressive maturity structure, the model illustrates how HR-driven learning initiatives enhance process maturity by aligning employee skills with organizational process objectives. This finding validates the assertion that human capital development is essential for embedding learning loops into digital transformation strategies. A broader view is provided by Siegfanz (2013), whose Knowledge Management Maturity Model (KMMM) employs customer-centric KM to bridge multi-domain maturity levels. The model's strength lies in enhancing value creation and stakeholder retention, underscoring the idea that customer-aligned KM practices reinforce both learning and strategic outcomes. This supports the theoretical perspective that external orientation and value co-creation are hallmarks of mature process systems.

Table 7. Knowledge Management & Organizational Learning

Author-Year	KM Approach	Integration Strategy	Maturity Level	Impact on DT
Yiu and Pun (2014)	Integrated KM model	Self-assessment scheme	4-level	Aligns KM & corporate goals
Kopina (2019)	SOPO model	Self-organised work teams	Emergent	Elevates service quality
Potoczek (2017)	HRM competency model	Workforce capability building	Progressive	HR drives process maturity
Siegfanz (2013)	KMMM	Customer-centric KM	Multi-domain	Enhances retention & value
Bushuyev et al. (2017)	Entrepreneurial-energy	Breakthrough competence	Competence-based	Boosts project success

Bushuyev et al. (2017) explore the entrepreneurial dimension of KM through a framework based on breakthrough competence. Their competence-based maturity model emphasizes proactive knowledge creation and application, particularly in project-based environments. The result is improved project success rates and innovation capacity, key indicators of digital agility. This reflects the idea that maturity enables greater responsiveness, which in turn feeds further maturity development.

The integration of these models into BPOMMs confirms the hypothesis that process maturity is reinforced by strategic KM deployment. Each model illustrates a different pathway through which knowledge-based practices support digital transformation. The self-assessment mechanisms of Yiu and Pun (2014) provide actionable feedback loops; the collaborative structures in the SOPO model foster innovation; HR development enhances adaptive capacity; and customer-centric KM strategies improve external alignment.

Moreover, these insights validate the theoretical proposition that knowledge creation, retention, and application are not just support functions but are foundational to maturity evolution. In practice, these models suggest that KM must be embedded into organizational processes through tools such as performance reviews, team-based learning, and customer engagement systems. The emphasis on learning also extends to the technological infrastructure supporting KM, for example, digital platforms for knowledge sharing and real-time feedback systems.

Implications for practice include the necessity for organizations to invest in KM systems that go beyond documentation and storage. Instead, the focus should be on dynamic knowledge flows that inform decision-making, process redesign, and strategic alignment. From a policy standpoint, promoting knowledge-centric maturity models could enhance national competitiveness by equipping organizations with the tools needed for sustainable transformation.

Sustainability and Future Readiness of BPOMMs

Integrating sustainability and future readiness into BPOMMs is increasingly seen as essential for long-term competitiveness and societal relevance. This theme explores how BPOMMs align with sustainability goals, ESG standards, and ethical digital practices to foster continuous process innovation and resilience. Zabukovšek et al. (2023) propose a green digitalization strategy using paperless Document Management Systems (DMS) aligned with the Process and Enterprise Maturity Model (PEMM). While DMS improves sustainability through reduced paper use and operational cost savings, user resistance hinders full implementation, highlighting the role of user-centric design in maturity assessment.

Lewrick and Raeside (2010) embed sustainability in transformation models via innovation lifecycle management, linking sustained innovation with evolving organizational capabilities. Capability transformation emerges as both a challenge and a lever for long-term process improvement. Merki and Doriat (2010) examine energy-efficient machinery within maturity progression. Their model aligns eco-efficiency goals with operational advancements and notes that competitive pressures demand strategic and benchmarked sustainability integration.

Kriegel et al. (2019) apply a SAR (Socially Assistive Robotics) maturity framework in elder-care. Despite technology benefits, ethical and user-acceptance challenges persist. The model integrates social responsibility and governance into maturity considerations. Řepa et al. (2016) embed continuous improvement into CEABPM 1001, linking alignment maintenance and strategic resilience with maturity evolution. Their approach emphasizes feedback loops and ongoing alignment as core to sustainable transformation. Each case confirms that sustainability is multi-faceted. Zabukovšek et al. (2023) highlight operational outcomes from green DMS, while Lewrick and Raeside (2010) stress adaptive capacity as central to innovation maturity. Merki and Doriat (2010) illustrate that maturity models can incorporate environmental KPIs, and Kriegel et al. (2019) frame social sustainability as a maturity driver in care settings. Řepa et al. (2016)'s contribution broadens sustainability to include institutional endurance. This underscores the need for dynamic maturity frameworks capable of detecting misalignment and adjusting strategies accordingly.

In summary, sustainability must be embedded in BPOMMs, not appended. Maturity assessments should incorporate sector-specific challenges, whether capability development, competition, or ethics, and enable adaptive, user-sensitive transformation pathways. Table 8 consolidates key contributions across these dimensions.

Table 8. Sustainability and Future Readiness of BPOMMs

Author-Year	Sustainability Focus	Framework Alignment	Challenges	Outcomes
Sternad Zabukovšek et al. (2023)	Green, paperless DMS	PEMM	Low user adoption	Paperless ops, cost savings
Lewrick and Raeside (2010)	Innovation life-cycle	Transformation model	Capability shifts	Sustained innovation
Merki and Doriat (2010)	Energy-efficient machinery	Process-maturity path	Competitive pressure	Eco-efficient products
Kriegel et al. (2019)	Socially-assistive robots	SAR maturity path	Tech–user acceptance	Value-adding elder-care
Řepa et al. (2016)	Continuous improvement	CEABPM 1001	Alignment maintenance	Long-term process resilience

These studies suggest that integrating ESG and ethical considerations into BPOMMs enhances resilience and stakeholder trust. Future-ready maturity models should be multidimensional, iterative, and aligned with digital ethics, ensuring that sustainability is a core outcome of process maturity.

CONCLUSIONS

This study conducted a systematic literature review (SLR) of 40 peer-reviewed articles to examine the role of BPOMMs in digital transformation. Six core themes emerged: process-centric transformation, multidimensional maturity models, technology enablers, knowledge integration, sustainability alignment, and methodological evolution. BPOMMs have evolved beyond technical assessments to become strategic tools that foster agility, innovation, and alignment with sustainability and ethical standards. They increasingly incorporate dimensions such as modular process design, knowledge-driven adaptability, and ESG principles.

Theoretically, this study contributes by extending maturity model literature through the identification of context-sensitive features and highlighting the convergence between BPO and digital transformation frameworks. These insights refine traditional linear models (e.g., CMMI, BPMM) into more adaptive, socio-technical systems. Practically, this review offers actionable strategies for practitioners and policymakers. First, adopt stepwise implementation beginning with baseline maturity assessments using tools like BPOMM. Second, engage stakeholders through co-design and participatory assessments to ensure strategic alignment. Third, tailor models to specific sectors, e.g., modular approaches in services or capability roadmaps in manufacturing. Finally, policymakers should develop national benchmarking systems and incentives linked to maturity progression.

This synthesis not only clarifies the strategic value of BPOMMs but also provides a roadmap for their application in varied organizational contexts. The findings bridge theoretical development with practice, offering guidance for more responsive, sustainable, and digitally capable process management frameworks.

LIMITATION & FURTHER RESEARCH

This study is subject to several limitations. It did not apply formal quality appraisal tools such as CASP or AMSTAR, which may influence methodological rigor. The manual thematic analysis without qualitative software might also affect replicability. Moreover, restricting the search to

Scopus-indexed articles from 2010–2025 could omit relevant literature from other sources or earlier periods. Future research should pursue methodological refinements, such as integrating bibliometric or meta-synthesis approaches, and using software like NVivo to enhance coding consistency. Researchers are encouraged to address underexplored areas linked to this review's key themes. Theme 2 calls for a deeper conceptualization of modular, layered BPOMMs. Theme 4 highlights the mediating role of knowledge management, while Theme 5 underscores the importance of empirically evaluating ESG alignment. Subsequent studies may also advance socio-technical maturity frameworks that are contextually adaptive and participatory in design, especially in SMEs. Aligning future inquiry with the six themes will enhance theoretical depth and real-world applicability.

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