Global Academic Journal of Economics and Business

Available online at https://www.gajrc.com
DOI: https://doi.org/10.36348/gajeb.2026.v08i04.024

OPEN ACCESS

ISSN: 2706-9001 (P)
ISSN: 2707-2584 (O)

Original Research Article

Digitalization of CAPEX Governance Processes in Advanced Food Packaging Manufacturing Operations

Mushtaq Quader Sharoz[1*]
Sig Holding (Switzerland): Neuhausen, Schaffhausen, CH

***Corresponding Author**
Mushtaq Quader Sharoz
Sig Holding (Switzerland): Neuhausen, Schaffhausen, CH

Article History
Received: 28.05.2026
Accepted: 23.07.2026
Published: 24.07.2026

Abstract: Operational governance digitalization the modernisation of approval workflows, reporting standardisation, and multi-site coordination is underexplored in Industry 4.0 research. This paper addresses that gap by proposing the Smart Governance and Operational Coordination Architecture (SGOCA), a six-layer framework for digitalized manufacturing governance and IMEA supply chain integration, and by presenting quantified implementation evidence from a regional FMCG organisation that deployed a digital governance platform across a multi-site production network in the IMEA region using Microsoft Power Apps, Power BI, and SharePoint at no additional infrastructure cost. Before deployment, approval cycles averaged 23 days, reporting consumed seven hours of manual effort per cycle, audit preparation required two weeks, and documentation completeness was approximately 55 per cent. Twelve months later, cycle time had fallen by roughly 40 per cent, reporting effort to under one hour, audit preparation to two days, and documentation completeness had risen to 87 per cent, with forecast accuracy improving by approximately 25 per cent. The implementation revealed two governance lessons not previously documented with this specificity: adoption in multi-site environments is resolved by line management expectations, not system design; and digital governance systems create behavioural incentives, including approval-threshold gaming, that require active analytics-based monitoring to detect. A five-level governance maturity progression model is introduced, with implications for executives, policymakers, and plant managers within the Saudi Vision 2030 transformation context.

Keywords: Smart Governance, CAPEX Digitalization, SGOCA, IMEA Supply Chain, Power Apps, Power BI, Governance Maturity, Vision 2030, Manufacturing Digitalisation.

1. INTRODUCTION

Manufacturing organisations in Saudi Arabia are navigating a strategic transition in which competitiveness depends as much on governance quality as on production capacity. Vision 2030 and the National Industrial Strategy have created strong incentives for localisation, advanced manufacturing, and supply chain resilience. Manufacturers serving IMEA markets simultaneously manage volatile demand, regulatory variation across borders, supplier concentration, and growing traceability expectations.

The governance challenge has become more visible as networks have grown more complex. Email-based approvals, site-level spreadsheets, and

periodic reports compiled by coordinators working across multiple time zones were adequate for simpler operational environments. They are not adequate for organisations managing a multi-site manufacturing network across the IMEA region with interconnected supply chains and a regional finance team expecting live portfolio visibility.

A critical gap in the existing literature makes this problem harder to address than it should be. Industry 4.0 research is extensive on automation and connected manufacturing. It is sparse on operational governance digitalization. Studies of Gulf manufacturing enterprises consistently identify internal governance functions such as CAPEX approval as among the most frequently cited sources of operational friction yet among the least included in formal digitalization programmes (Aljuaid, 2024). A 2023 Deloitte survey found that top-quartile digital manufacturers were three times as likely as peers to have digitalized governance and approval processes. The gap between what is researched and what matters operationally is real.

This paper addresses it through SGOCA the Smart Governance and Operational Coordination Architecture and presents implementation evidence from a regional FMCG organisation where the framework was deployed at scale, documenting the platform architecture, failure modes encountered, and verified outcomes.

2. Aim, Objectives and Review Questions

The aim is to develop a review-based smart governance framework for Saudi manufacturing and IMEA supply chain integration, grounded in documented implementation evidence. The objectives are: to identify governance dimensions enabling smart manufacturing integration; to examine alignment with Vision 2030 priorities; to evaluate IMEA integration requirements; to propose a governance maturity progression model; and to generate quantified, generalisable implementation lessons.

3. Theoretical Background

The resource-based view holds that firms gain advantage through capabilities that are valuable, rare, and difficult to imitate. In smart manufacturing, governance architecture is precisely such a capability determining whether data, automation, and supplier relationships convert to performance (Bag *et al*., 2021). The studied organisation demonstrated this directly: it operated SAP ERP, Microsoft 365, and site-level data systems before governance modernisation, yet averaged 23-day approval cycles because the governance architecture connecting those systems was absent.

Dynamic capability theory explains how organisations sense, seize, and reconfigure resources in response to change (Ivanov, 2021; Belhadi *et al.,* 2021). Smart governance supports all three: dashboards and early-warning indicators support sensing; digital approval workflows support seizing; portfolio-level visibility supports reconfiguration when disruptions require operational adjustments. Institutional theory adds the policy dimension: Vision 2030, local content requirements, and IMEA regulatory expectations shape the governance choices available to regional manufacturers.

4. METHODOLOGY

A structured literature review covering 2020 to 2025 was combined with a single-organisation implementation case study following the platform governance research design established by Jovanovic *et al*., (2021). Databases included Scopus, Web of Science, Springer, Emerald, Elsevier, MDPI, Frontiers, and Saudi industrial policy sources. Approximately 185 records were identified through database searching. After duplicate removal and title and abstract screening, 71 full texts were assessed for eligibility and included in the thematic synthesis that informed framework development. Thematic coding used five dimensions: governance domain, technology enabler, performance outcome, Saudi relevance, and IMEA integration relevance. The most representative and methodologically robust sources are cited directly; consistent with narrative review practice, the synthesis draws on the wider screened corpus without citing every screened record individually.

Implementation evidence was collected through: (a) a pre-implementation governance audit involving fourteen participants across site engineering management, regional finance, procurement, and operations functions, with sessions of 45 to 120 minutes structured around three questions (where do approvals stall; where does information get lost; what data do you need that you cannot access); (b) twelve-month post-deployment Power BI performance monitoring; and (c) follow-up qualitative interviews with five original audit participants at six and twelve months post-deployment. The author was involved in the design and deployment of the platform studied; this is acknowledged as a methodological limitation mitigated through transparent reporting of failures as well as successes. All evidence is presented in anonymised and generalised form.

Table 1: Research methodology protocol

Protocol Element	Decision	Rationale
Time period	2020–2025 plus implementation case	Captures post-pandemic resilience research and recent Saudi industrial transformation
Implementation evidence	Governance audit (14 participants); 12-month Power BI data; follow-up interviews	Grounds conceptual framework in documented organisational experience
Synthesis method	Thematic coding plus implementation evidence integration	Combines review breadth with case study depth

5. Literature Synthesis

5.1 Data Governance

Manufacturing supply chains generate large volumes of operational data, but data volume is not equivalent to data intelligence. Li *et al*., (2024) argue that operations and supply chains require explicit governance: rules for data ownership, usability, quality standards, and accountability. For Saudi manufacturers, this matters particularly because localisation targets, supplier development, export readiness, and compliance requirements all depend on accurate, consistent data spanning multiple systems and jurisdictions. The studied organisation illustrated the cost of this gap directly: seven hours of monthly manual reconciliation despite operating ERP, sensors, and site-level reporting systems, because authoritative data structures connecting those systems did not exist.

5.2 Technology-Enabled Integration and the Governance Gap

Martinez (2023) reviewed low-code platform deployments and found governance and oversight applications consistently lagging operational applications in maturity. Sanchis *et al*., (2022) noted that organisations investing in low-code tools for production improvement were often slower to apply them to investment governance. Both describe conditions observed in the studied organisation before implementation. The decision to build the platform on Microsoft Power Platform avoiding a six-to-nine-month SAP extension procurement process produced a working prototype within weeks, demonstrating that governance digitalization does not require new infrastructure: it requires governance design applied to infrastructure already present. Shi (2025) documents this democratisation effect across multiple sectors, finding that low-code platforms enable domain experts rather than specialist developers to drive digital transformation a pattern directly observed in this implementation.

5.3 Resilience and Multi-Site Coordination

The COVID-19 pandemic exposed the vulnerability of global production networks in ways that were already theorised but insufficiently designed for (Ivanov & Dolgui, 2020; Queiroz *et al*., 2020). For Saudi manufacturers in IMEA, resilience requires local supplier development, alternative logistics corridors, demand sensing, and risk-based inventory policies. The existing literature substantially underestimates the variability in governance maturity across sites in regional networks. Some facilities maintain disciplined local processes; others are entirely dependent on regional oversight. In the studied organisation, managing that variability across a multi-site regional network standardising governance while accommodating legitimate operational differences was one of the most demanding implementation challenges. Sheffi (2005) and Christopher and Peck (2004) provide the foundational resilience frameworks relevant here; both emphasise that governance structure is as important as physical redundancy in supply chain resilience.

5.4 Sustainability Governance

Sustainability metrics should be embedded in procurement, production, and reporting governance not confined to post-implementation reporting. Energy intensity, scrap rate, water consumption, emissions, and supplier sustainability compliance are all governable through the same digital approval and monitoring architecture that handles financial and operational controls. Zhu *et al*., (2008) demonstrate empirically that green supply chain management practices improve environmental and economic performance simultaneously. The SGOCA framework integrates sustainability as a governance layer rather than an external reporting obligation, converting sustainability from a compliance measure into a pre-approval scoring criterion embedded within the approval architecture.

5.5 Localisation, Workforce Development, and Vision 2030

Vision 2030 encourages domestic manufacturing capability, technology transfer, and integration into global value chains. An incidental outcome of the implementation was local workforce development: because the platform used a low-code architecture, operational team members could participate directly in workflow configuration and dashboard design. Several Saudi engineers who joined with no prior digital governance experience made substantive contributions to process improvement by deployment completion. This outcome aligned naturally with Vision 2030's digital capability objectives. Aljuaid (2024) argues that

Industry 4.0 integration for localised manufacturing under Vision 2030 depends on developing domestic technical capability rather than importing turnkey systems, and Alquraish (2025) links digital transformation directly to supply chain resilience and sustainability outcomes in Saudi manufacturing. The implementation evidence here supports both positions: low-code architectures do not only reduce implementation cost; they develop the internal governance capability needed to sustain modernisation over time.

6. The SGOCA Framework and Governance Maturity Model

6.1 Six-Layer Architecture

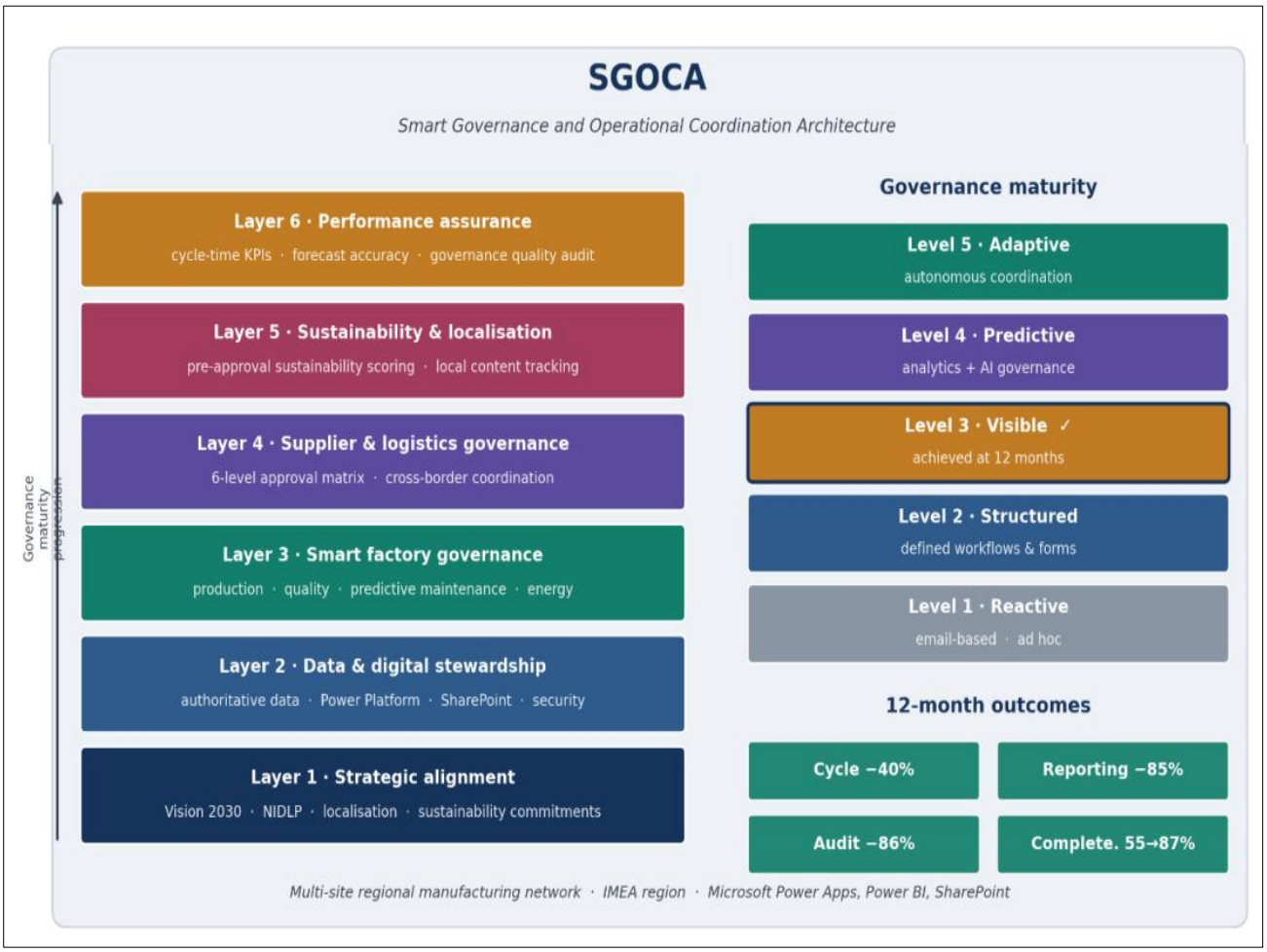

Figure 1: SGOCA: Smart Governance and Operational Coordination Architecture. Six layers from strategic alignment to performance assurance, with five-level maturity progression model (right panel) and twelve-month implementation outcomes.
Source: Author.

Layer 1 — Strategic Alignment:

Corporate objectives connected to Vision 2030, NIDLP, local content goals, export ambitions, and sustainability commitments. Governance modernisation in the studied organisation was triggered by two simultaneous pressures: a new regional director requiring live CAPEX portfolio visibility, and rising expectations around digital governance for organisations operating under Vision 2030.

Layer 2 — Digital and Data Stewardship:

Authoritative data sources, data owners, quality checks, and cybersecurity controls defined. A key implementation lesson: every field on a digital submission form must be justified by a specific decision it supports. Eliminating unjustifiable fields drove documentation completeness from 55 to 87 per cent.

Layer 3 — Smart Factory Governance:

Production scheduling, quality control, predictive maintenance, automation governance, and energy monitoring. Saudi factories adopting smart technologies need defined processes for validating sensor alerts, approving AI recommendations, and determining when supervisors override automated decisions.

Layer 4 — Supplier and Logistics Governance:

The approval matrix governed six escalation levels across all MEA legal entities, calibrated to investment value and category. Power BI analytics later detected clustering of project values just below threshold breakpoints, indicating threshold-gaming behaviour that stopped once flagged and prompted a matrix revision. Governance rules create behavioural incentives; those incentives require active analytics-based monitoring to detect and correct.

Layer 5 — Sustainability and Localisation Governance:

Sustainability converted from post-implementation reporting into pre-approval scoring within the approval architecture. Local content contribution tracked alongside financial and operational metrics.

Layer 6 — Performance Assurance:

KPIs including approval cycle time, forecast accuracy, documentation completeness, and data quality scores audit whether governance routines produce intended outcomes.

6.2 Governance Maturity Progression Model

Table 2 presents the five-level SGOCA maturity model. The studied organisation moved from Level 1 to Level 3 during the twelve-month implementation period. Level 4 capabilities — AI forecasting on accumulated project history — represent the immediate next development target.

Table 2: SGOCA governance maturity progression model. ✓ indicates achieved state at twelve months post-deployment

Level	Label	Governance characteristic	Data state	Coordination mode	IMEA integration
1	Reactive	Ad hoc; email approvals; no standard workflow	Manual site spreadsheets; no central repository	Individual escalation; informal	Each site operates independently
2	Structured	Defined workflows; standard forms; clear thresholds	Consolidated periodically; high manual effort	Structured meetings; shared templates	Partial; common forms but disconnected systems
3	Visible	Digital workflows; central repository; automated routing and escalation	Live dashboards; near real-time portfolio visibility	Digital coordination; escalation rules enforced	Connected; common platform across all sites
4	Predictive	Analytics monitoring governance quality; AI forecasting on project history	AI-assisted forecasting; threshold gaming detection	Proactive risk identification; scenario planning	Integrated; supplier data in shared governance view
5	Adaptive	Autonomous routine approvals; human oversight of strategic decisions	Self-improving models; carbon accounting integrated	Continuous; exceptions flagged automatically	Resilient; dynamic multi-tier reallocation

6.3 From Standardised Workflow Control to Digital Governance

A common misconception is that digital governance platforms create governance discipline where none existed. The implementation studied here did the opposite: it converted an already standardised but document-intensive, serial, and partly manual governance workflow into a traceable digital operating system. To characterise the pre-digital baseline in anonymised terms, two internal governance artefacts an investment guideline and a capital expenditure workflow procedure were examined through document analysis. The established workflow already defined responsibility allocation, multi-function review across finance, engineering, quality, environment, health and safety, and legal functions, value-based approval routing, mandatory supporting documentation, and post-completion review. Its limitations were not governance gaps in principle but operational friction in execution: responsibility was visible in documents rather than in live workflow status; proposal packages were distributed across multiple files with version-control exposure; approvals depended on manual signature routing with limited status visibility; cross-level handoffs were serial and follow-up dependent; and approvals were batched periodically, introducing delay.

Table 3 maps each pre-digital governance feature to the SGOCA-enabled capability that addressed its operational limitation. The transformation narrative this supports is academically stronger than a claim that digital tools improved an unstructured process: the governance logic already existed and was sound; digitalization

made it traceable, continuous, and analytically visible.

Table 3: From standardised workflow control to digital governance. Source: Author synthesis of anonymised document analysis.

Pre-digital governance feature	Operational limitation	SGOCA-enabled capability
Defined responsibility allocation	Visible in documents but not in live workflow status	Role-based digital routing with live accountability
Spreadsheet and document proposal package	Multiple files; version-control exposure	Centralised structured records
Manual signature routing	Waiting time; limited status visibility	Digital approval history with timestamps
Serial multi-level handoffs	Coordination delay; follow-up dependency	Automated routing and escalation rules
Periodic approval batching	Batch-processing delay	Continuous pipeline visibility
Document filing and notification	Fragmented retrieval and reporting	Searchable repository with dashboard reporting
Mandatory supporting documents	Manual completeness verification	Mandatory fields and completeness controls
Post-approval monitoring	Separate reporting routines	Integrated execution and portfolio monitoring

7. Implementation Evidence

7.1 Pre-Implementation Baseline

The governance audit established: approval cycle time 23 days from submission to sign-off; monthly reporting approximately seven hours of manual reconciliation per cycle; post-implementation audit preparation two weeks of document recovery from dispersed storage; documentation completeness approximately 55 per cent of submitted requests containing all required information at submission. One site engineering manager described a specific consequence: an equipment upgrade had been approved after its maintenance window closed, requiring rescheduling with associated production disruption. This single episode illustrated the operational cost of governance inadequacy more clearly than any aggregate metric.

7.2 Platform Architecture

Five integrated components constituted the platform. A standardised digital submission form with mandatory fields investment category, cost centre, risk classification, estimated value, and financial justification replaced locally formatted spreadsheets and email attachments. An automatically generated CAPEX reference number provided cross-system traceability absent before deployment. The workflow governance layer automated approval routing with a five-working-day escalation rule directly addressing the stall points identified in the audit. A SharePoint central repository with role-based access and version control replaced dispersed storage, reducing audit preparation from two weeks to two days. Power BI provided three differentiated dashboard views site engineers, regional managers, and executive sponsors arrived at through three complete redesigns after user testing showed a single dense dashboard caused managers to disengage after the first few weeks.

7.3 Twelve-Month Outcomes

Approval cycle time fell from 23 days to approximately 14 days roughly 40 per cent reduction. The target had been 12 days; the shortfall traced to two sites with undefined approval delegation, resolved through a revised delegation matrix. Monthly reporting fell from approximately seven hours to under one hour. Audit preparation fell from two weeks to two days. Documentation completeness rose from 55 to 87 per cent. Forecast accuracy improved by approximately 25 per cent, though this figure is held with appropriate caution given organisational changes during the measurement period.

7.4 Governance Lessons

Two sites persisted with email submission for six months despite improved training materials and onboarding support. Resolution was not technical: engineering managers at those sites announced that email submissions would be returned unsigned. Within four weeks, adoption normalised. Governance system adoption in multi-site manufacturing environments is a line management question, not a system design question. No level of UX improvement substitutes for clear behavioural expectations from the people whose approval engineers require.

Power BI analytics detected clustering of project values just below threshold breakpoints — a pattern revealing that some site managers were

entering estimated values at the lower end of ranges to access faster approval paths. When the pattern was flagged without attribution of blame, it stopped. The threshold matrix was subsequently revised. Digital governance systems create observable incentive structures; organisations that do not monitor usage patterns analytically may not detect the behavioural effects their governance rules produce.

8. IMEA Integration

IMEA supply chain integration requires governance at three levels. Transactional governance ensures that purchase orders, invoices, certificates, customs data, and shipment records are accurate, traceable, and consistently structured across five regulatory jurisdictions, each with different documentation requirements, tariff structures, and customs processing timelines. Operational governance synchronises production plans, inventory policies, quality approvals, and logistics schedules across sites that may be separated by thousands of kilometres and operating in different time zones. Strategic governance aligns supplier development, market expansion, risk appetite, and localisation priorities across the regional network in a coherent direction.

The studied organisation's approach was a common digital platform with standardised core workflows, while permitting site-specific configurations within the standardised architecture. This balance common enough to enable portfolio visibility, flexible enough to reflect genuine operational differences is a design principle with broader applicability to any multi-country manufacturing governance programme. The IMEA dimension also introduces regulatory variation that single-country governance frameworks do not need to accommodate: what constitutes acceptable supplier documentation, how cross-border transactions are recorded, and which approval authorities have standing in each jurisdiction must all be built into the governance architecture from the outset rather than retrofitted.

9. DISCUSSION

Table 4 positions SGOCA against four established framework families to clarify its original contribution. Existing approaches each address part of the governance challenge; none integrates operational governance digitalization, multi-site coordination, sustainability scoring, and behavioural governance into a single architecture grounded in implementation evidence.

Table 4: Comparative positioning of SGOCA against established framework families. Source: Author synthesis

Framework family	Primary focus	Coverage of operational governance digitalization	What SGOCA adds
Industry 4.0 maturity models (e.g. Acatech, SIRI)	Technology adoption levels across production systems	Limited; governance workflow digitalization rarely assessed	Approval-workflow and reporting maturity as explicit dimensions
Supply-chain resilience models (Sheffi, 2005; Christopher and Peck, 2004)	Disruption response and structural redundancy	Indirect; governance treated as enabling context	Operational governance as a measurable resilience lever
Digital governance / data-governance models (Li *et al*., 2024)	Data ownership, quality, and IT control	Partial; strong on data, light on operational workflow	Workflow, approval, and multi-site coordination integration
Conventional operational reporting systems	Retrospective performance reporting	Low; reporting separated from governance workflow	Embedded scoring and escalation within live workflow

Technology creates the possibility of governance improvement. Governance architecture realises it. The organisation studied had modern digital infrastructure and still produced 23-day approval cycles because the architecture connecting that infrastructure to decision authority was absent. Moving from Level 1 to Level 3 on the SGOCA maturity model is achievable within twelve months using existing licensing, provided senior sponsorship and line management commitment are in place.

For Saudi Vision 2030, the practical implication is that industrial transformation programmes will generate more consistent returns when governance digitalization is included alongside production modernisation investments. The incidental Saudi workforce development outcome engineers building governance design capabilities through active participation in low-code platform development points to a dimension of digitalization investment deserving deliberate attention in national programme design.

10. Managerial and Policy Implications

For executives: governance digitalization can begin with existing tools. The studied

organisation built its platform within existing Microsoft 365 licensing; the constraint was governance design and senior sponsorship, not budget. For plant managers: adoption is a line management responsibility, not a system design question. For supply chain and procurement leaders: supplier governance should include digital readiness and governance maturity as evaluation criteria alongside commercial and quality performance. For Saudi policymakers: incentives connected to governance maturity outcomes not only asset investment will produce more reliable industrial transformation returns.

Implementation runs five phases: governance baseline assessment quantifying approval cycle time, reporting effort, documentation completeness, and audit burden; governance charter design with executive approval; pilot deployment for a selected site or project family; regional scaling across IMEA corridors using common platform architecture; and institutionalisation through monthly performance reviews, continuous improvement routines, and sustainability scoring integration.

11. Limitations and Future Research

The implementation evidence comes from a single organisation; the author was involved in system design and deployment a limitation acknowledged and mitigated through transparent measurement and explicit documentation of failures including the adoption resistance at two sites and the threshold-gaming episode. The twelve-month observation window is shorter than ideal for evaluating governance transformation whose full benefits forecast improvement compounding, AI governance development, sustainability scoring maturity may take several cycles to fully emerge.

The most valuable future research would be a multi-organisation comparative study across GCC FMCG manufacturers generating governance maturity benchmarks currently absent from the literature. Future work should also examine the Level 3 to Level 4 transition: specifically, what volume and quality of accumulated project data is required before AI forecasting models become reliable enough to inform governance decisions, and how organisations validate those models before acting on their outputs.

12. CONCLUSION

Operational governance digitalization is the gap in Industry 4.0 research that manufacturing practitioners feel most acutely. SGOCA closes that gap by positioning governance as an operational coordination architecture connecting strategy, data, technology, suppliers, sustainability, and performance assurance within a framework that can be deployed using available tools and scaled across regional networks. Implementation evidence from multiple IMEA sites confirms the value: a 40 per cent reduction in approval cycle time, an 85 per cent reduction in monthly reporting effort, an 86 per cent reduction in audit preparation time, and a 32-point improvement in documentation completeness.

Two governance lessons extend beyond the studied organisation and constitute the paper's most transferable contribution: adoption is a line management question, not a system design question; and digital governance creates behavioural incentives requiring active analytics-based monitoring to detect. The SGOCA maturity model provides a diagnostic and progression tool enabling organisations to locate their current governance state and identify specific capabilities needed to advance. For Saudi Vision 2030, the framework supports digital manufacturing transformation and, through its low-code architecture, the development of Saudi industrial talent capable of sustaining governance modernisation over time.

REFERENCES

- Aljuaid, A. A., Alsultan, A., & Alharbi, M. (2024). Integrating Industry 4.0 for sustainable localized manufacturing under Saudi Vision 2030: An assessment of the Saudi automotive industry. Sustainability, 16(12), 5096.
- Alquraish, M. (2025). Digital transformation, supply chain resilience, and sustainability: A comprehensive review with implications for Saudi Arabian manufacturing. Sustainability, 17(10), 4495.
- Bag, S., Gupta, S., & Kumar, A. (2021). Industry 4.0 adoption and 10R advance manufacturing capabilities. International Journal of Production Economics, 231, 107844.
- Belhadi, A., Kamble, S., Jabbour, C. J. C., Gunasekaran, A., Ndubisi, N. O., & Venkatesh, M. (2021). Manufacturing and service supply chain resilience to the COVID-19 outbreak. Technological Forecasting and Social Change, 163, 120447.
- Christopher, M., & Peck, H. (2004). Building the resilient supply chain. International Journal of Logistics Management, 15(2), 1–14.
- Deloitte. (2023). Smart manufacturing: Unlocking the transformative potential of Industry 4.0. Deloitte Insights.
- Ivanov, D. (2021). Supply chain viability and the COVID-19 pandemic. International Journal of Production Research, 59(12), 3535–3552.
- Ivanov, D., & Dolgui, A. (2020). Viability of intertwined supply networks. International Journal of Production Research, 58(10), 2904–2915.

- Jovanovic, M., Sjodin, D., & Parida, V. (2021). Co-evolution of platform architecture, platform services, and platform governance. Journal of Business Research, 134, 556–567.
- Li, X., Cheng, Y., & Möller, C. (2024). Data governance: A critical foundation for data-driven decision-making in operations and supply chains [Preprint]. arXiv:2409.15137.
- Martinez, E. (2023). Benefits and limitations of using low-code development to support digitalization in industry. Automation in Construction, 154, 104965.
- Queiroz, M. M., Ivanov, D., Dolgui, A., & Fosso Wamba, S. (2020). Impacts of epidemic outbreaks on supply chains. Annals of Operations Research, 319, 1159–1196.
- Sanchis, R., García-Perales, Ó., Tejeda-Lorente, Á., & Poler, R. (2022). Low-code development platforms and enterprise digital transformation. Information Systems Frontiers, 24(5), 1443–1458.
- Sheffi, Y. (2005). The Resilient Enterprise: Overcoming Vulnerability for Competitive Advantage. MIT Press.
- Shi, Z., Dong, L., & Gan, C. (2025). Democratizing digital transformation: A multisector study of low-code adoption patterns, limitations, and emerging paradigms. Applied Sciences, 15(12), 6481.
- Zhu, Q., Sarkis, J., & Lai, K. H. (2008). Confirmation of a measurement model for green supply chain management practices implementation. International Journal of Production Economics, 111(2), 261–273.