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A STRATEGY FOR ENHANCING THE ROLE OF MANAGEMENT MECHANISMS IN INDUSTRIAL ENTERPRISES WITHIN THE CONTEXT OF THE DIGITAL ECONOMY

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Abstract. Industrial enterprises increasingly depend on timely coordination among production, quality, procurement, and information systems. Yet access to more data does not by itself clarify who can act on an exception, how fast a decision is needed, or how its consequences should be reviewed. This article develops a strategy for strengthening those management mechanisms through a focused conceptual synthesis of research on digital transformation, strategic renewal, and complementary organizational investment. The proposed strategy combines delegated decision authority, shared data definitions, workforce development, and periodic performance review. A twelve-month roadmap translates these elements into deliverables and criteria for progressing between phases. An illustrative quality-management scenario shows how faster decisions and lower defect rates can be evaluated alongside workload safeguards. The study offers a conceptual framework and a design for subsequent plant-level evaluation.

Keywords: digital economy, industrial enterprise, management mechanisms, decision rights, data governance, operational performance.

INTRODUCTION

Digital procurement, traceability requirements, and integrated production systems increase the number of decisions that cross organizational boundaries. A quality deviation detected on one line can affect shipment promises, the release of adjacent lots, and the allocation of technicians. When the information reaches those functions at different times or through incompatible records, each unit may make a reasonable local decision that creates additional work elsewhere.

Verhoef et al. (2021) distinguish the conversion of information into digital form, the use of digital technologies to change existing processes, and broader transformation of the enterprise. This distinction is relevant to industrial management because digitizing an exception log leaves its approval rules intact, whereas redesigning the process can redistribute authority and change how teams measure performance.

The research question is how industrial enterprises can strengthen management mechanisms so that digital information changes day-to-day decisions while preserving accountability. Here, a management mechanism is a repeatable arrangement of decision authority, information, procedures,

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and review. The article proposes a strategy that connects these elements across enterprise and plant levels and specifies how managers and researchers can assess the results.

LITERATURE REVIEW.

The study uses a purposive conceptual synthesis. Verhoef et al. (2021) provide the distinction between stages of digital change and link transformation to organizational structures and metrics. Warner and Wäger (2019) explain strategic renewal in established firms through changes in capabilities, collaboration, and culture. Brynjolfsson et al. (2018) examine how investments in complementary processes and skills can influence the timing and measurement of productivity gains. These sources were selected for their distinct analytical contributions. The synthesis does not estimate the prevalence or effect size of individual management practices.

METHODS.

The enterprise is the unit of strategy, the plant is the unit of implementation, and the individual exception is the unit of analysis for decision performance. An exception is an event that requires action outside the planned workflow, such as a quality deviation, a missing input, or a production interruption. Each event should have a unique identifier, a defined start, a responsible role, and a recorded disposition.

The analysis extracted three design requirements from the selected literature. First, changes in decision rights should accompany changes in information flows. Second, teams need routines that translate experience into revisions to the operating model. Third, implementation costs and workforce learning should be measured before mature performance is assessed. The requirements were translated into a governance model, a roadmap, and a monitoring matrix.

The proposed design was then checked against an illustrative manufacturing workflow. For each exception, the analysis followed detection, classification, authorized response, closure, and review. The check asked whether an operator knew what action was permitted, whether a supervisor could identify an overdue case, and whether an enterprise-level review could use the recorded evidence to revise rules or resources.

Evaluation separates changes in management practice from changes in operating outcomes. Practice measures include whether a responsible person was assigned and whether the disposition was recorded within the response window. Outcome measures include defect rates and workload. Time to disposition is calculated from detection to the first authorized decision. Unresolved events should be reported separately or incorporated through a time-to-event analysis so that the median for completed cases does not conceal a growing backlog.

The worked example uses synthetic baseline and follow-up data. Its comparison with a second line illustrates the arithmetic of a difference-in-differences estimate. A credible empirical application would require comparable measurement, multiple pre-intervention periods, and assessment of changes that could affect the two lines differently.

RESULTS

The strategy assigns decisions to the lowest level with enough information, authority, and competence to act within defined limits. The enterprise sets common rules for data, financial commitments, and escalation. Plants determine staffing, shift routines, and work sequencing within those rules. Operators and supervisors act within approved procedures and preserve a record for later review.

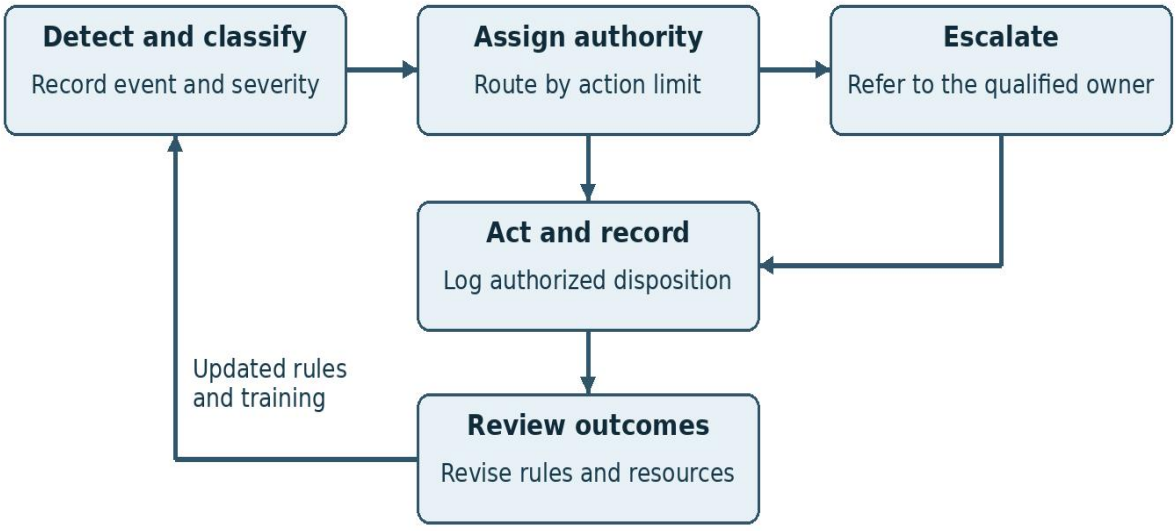
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Table 1. Management mechanisms and decision authority

Mechanism	Responsible role	Decision or routine	Evidence retained
Strategic coordination	Operations director	Set cross-plant priorities and resolve conflicts over shared resources.	Priority register and decision record.
Delegated response	Shift supervisor	Assign cases and authorize actions within documented limits.	Event severity, action, time, and owner.
Data governance	Enterprise data owner	Define event types, mandatory fields, and data access by role.	Data dictionary and audit results.
Workforce capability	Plant manager	Schedule training and authorize staff after practical assessment.	Observed task performance and qualification record.
Performance review	Plant controller	Review operating outcomes, workload, and cost with process owners.	Baseline, dashboard, and corrective actions.
Supplier coordination	Procurement lead	Agree on exception notification and evidence exchange with suppliers.	Acknowledged case record and resolution history.

A role assignment is effective when it specifies both authority and boundaries. For example, a supervisor may authorize an inspection and containment action within a defined procedure. Release of a nonconforming lot remains with the qualified quality function. Exceptions that exceed the local response window, affect several plants, or require a change to a shared specification are escalated with the relevant production and quality evidence.

Each plant uses the same minimum event record so that headquarters can compare recurring problems without replacing local context. Plants can add fields for process-specific conditions, provided they preserve the common definition of detection, disposition, and closure.



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Figure 1. Decision and feedback flow for industrial exceptions. Source: proposed framework.

The model in Figure 1 links a short operational cycle to a longer management review cycle. A detection event creates a record and starts the response clock. Classification determines who can authorize the next action. If the case exceeds delegated authority, the escalation route identifies the qualified decision maker and transfers the same evidence record. After disposition, the responsible team records the action and confirms closure when the specified checks are complete.

Shift reviews focus on open cases and actions required before production resumes or material is released. Weekly reviews examine recurring event types, delayed handoffs, and staffing constraints. The monthly enterprise review addresses problems shared across plants, such as conflicting supplier codes or uneven access to specialists. Its outputs may include a revised decision threshold, new training, or an integration change.

When a system interruption makes the digital record unavailable, the plant uses an approved fallback log with the same required fields. Once service returns, the process owner reconciles records against the event register. The review treats unreconciled cases as incomplete so that an outage does not silently improve measured performance.

Table 2 presents an indicative twelve-month sequence. The dates are planning assumptions. Progression depends on the evidence from each phase and the availability of qualified people, validated data, and usable interfaces.

Table 2. Twelve-month roadmap and conditions for progression

Phase	Timing	Principal deliverable	Condition for progression
Diagnose	Months 1–2	Map workflows, decision owners, and exception baselines.	Plant and enterprise owners agree on definitions and boundaries.
Design	Months 3–4	Approve an authority matrix, data dictionary, and training plan.	Test cases reach the correct owners and retain a complete audit record.
Pilot	Months 5–7	Implement on one line and collect comparable observations.	Response and quality targets are met within workload limits.
Replicate	Months 8–10	Extend to a comparable line using a validated rollout package.	The receiving line can operate the process and handle exceptions.
Institutionalize	Months 11–12	Embed monthly review, maintenance funding, and refresher training.	Permanent owners accept monitoring and corrective action duties.

Table 3. Metrics for tracking decision quality and operational results

Metric	Definition	Review
Decision time	Median minutes from event detection to authorized disposition.	Weekly, with unresolved count.

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Metric	Definition	Review
On-time disposition	Events decided by the applicable deadline ÷ events whose deadline has elapsed × 100.	Weekly, by severity.
Record completeness	Events with all mandatory fields ÷ logged events × 100.	Weekly, including fallback entries.
First-pass defect rate	Defective units at first inspection ÷ units first inspected × 100.	Monthly, by product family.
Escalation workload	Total supervisor hours devoted to escalations per week.	Weekly, against a staffing limit.

The operations director sponsors the program and assigns a plant-level owner. The budget includes interface work, training time, data cleanup, and support after rollout. This matters because a plant may incur substantial costs while learning the new process before the benefits become visible. Brynjolfsson et al. (2018) provide a broader productivity rationale for tracking such complementary investments and interpreting early performance with care.

Consider an enterprise introducing a digital exception workflow on Line A while Line B retains the existing workflow for the same observation window. Each period includes 20 production days. Decision time is measured from detection to authorized disposition for cases closed within the measurement window. Both periods are assumed to have complete case disposition. The figures are synthetic and demonstrate how to review results.

Table 4. Illustrative baseline and follow-up measurements

Measure	Line A baseline	Line A follow-up	Line B baseline	Line B follow-up
Median decision time	42 min	26 min	40 min	36 min
Defective units at first inspection	240 of 10,000	180 of 10,000	220 of 10,000	200 of 10,000
First-pass defect rate	2.40%	1.80%	2.20%	2.00%
Escalation workload	5.0 h/week	5.5 h/week	5.0 h/week	5.1 h/week

Line A reduces its median decision time by 16 minutes, while Line B reduces it by 4 minutes. The difference between the changes is 12 minutes. The defect rate falls by 0.60 percentage points on Line A and by 0.20 percentage points on Line B, a difference in changes of 0.40 percentage points. Supervisor workload on Line A rises by 0.5 hours per week, compared with 0.1 hours on Line B.

Suppose the plant predefines pilot targets of at least a 10-minute comparison-adjusted reduction in decision time and a 0.30-percentage-point comparison-adjusted reduction in defects. Suppose it also sets a workload ceiling of 6.0 supervisor hours per week on the pilot line. The illustrative values meet all three thresholds. A real replication decision would also check event counts, uncertainty, seasonal or product-mix differences, and whether the required staffing is available on the receiving line.

DISCUSSION

The example shows how a management strategy can be evaluated through the quality and timing of decisions, as well as production results. A response target alone could encourage premature dispositions. A defect target alone would leave the contribution of decision routines difficult to trace. Reviewing response time, defect rates, open cases, and supervisor workload together makes it possible to investigate which part of the process changed and whether the change can be sustained.

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The strategy connects strategic renewal to routine operating decisions. Warner and Wäger (2019) describe digital transformation as an ongoing process of renewal in established firms. In the proposed model, renewal occurs when operating evidence leads managers to revise authority limits, shared definitions, training, or resource allocations. A quarterly review of repeated cross-plant exceptions can also identify where coordinated changes with suppliers would reduce delays.

Two propositions follow. First, clear delegated authority and consistent event records are expected to reduce decision time most in workflows with frequent handoffs. An empirical test could interact adoption of the workflow with the baseline number of handoffs per event. Second, practice-based training and recurring review are expected to help maintain improvements after rollout. This proposition can be assessed by comparing changes in decision time and quality at six and twelve months and examining whether trained staff remain available on each shift.

The study uses a focused, non-systematic synthesis and an illustrative scenario. The proposed timeline and thresholds require calibration by sector, product risk, and plant size. The two-period comparison cannot establish parallel trends or rule out simultaneous changes in materials, staffing, or demand. A multi-plant study should collect several baseline periods, compare lines with similar pre-intervention trends, and document concurrent interventions. Event-level analysis could model time to disposition and include unresolved cases. Interviews and process audits could assess whether improvements reflect changed decision routines or changes in case mix and reporting

CONCLUSION

The proposed strategy strengthens management mechanisms by specifying who can act, which information supports the decision, how exceptions are escalated, and how recurring problems change enterprise policy. Its roadmap links implementation to observed decision performance, operational outcomes, and workload. The next empirical step is to test the framework across comparable lines and examine whether gains persist after the workflow becomes part of routine production.

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