

Digital Readiness and Action Prioritization in Small Cosmetics Manufacturers

Original Article

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Abstract

Small cosmetics manufacturers frequently adopt digital applications before their internal routines, data controls, and workforce capabilities are ready to support them. This condition creates operational fragmentation rather than integrated transformation. This study assesses digital readiness, identifies the factors that support and constrain transformation, and develops a staged set of managerial priorities for a resource-limited cosmetics manufacturer in Indonesia. An explanatory sequential mixed-method design was used. The first stage applied the Indonesia Industry 4.0 Readiness Index survey to 33 respondents across five readiness dimensions, while the second stage used a cross-functional focus group discussion involving seven participants to interpret the survey results. The company obtained an overall readiness score of 1.21, which indicates initial readiness. People and culture had the strongest score at 1.87, whereas management and organization had the weakest score at 0.21. The evidence shows that employee willingness, management awareness, and an existing internal application provide a starting point, but progress is limited by the absence of a roadmap, formal team, dedicated budget, systematic training, and dependable real-time data. The study implies that early digital transformation should prioritize disciplined data entry, clear process ownership, and capability development before large technology investment.

Keywords: Data Governance, Factory Operations, Industry Readiness, Mixed Methods, Transformation Roadmap.

1. Introduction

Digitalization is no longer an optional improvement for small manufacturing firms; it increasingly shapes how they coordinate work, serve customers, and sustain competitiveness. Nevertheless, technology ownership by itself does not determine whether a small firm transforms successfully. Outcomes depend on leadership commitment, work design, employee capability, process maturity, and external market pressure. Recent studies on small and medium-sized enterprises underline the importance of clear strategy, shared responsibility, learning capability, dynamic capabilities, and gradual implementation instead of disconnected purchases of digital tools (Matarazzo et al., 2021; Sagala & Óri, 2024; Silva et al., 2025; Soluk & Kammerlander, 2021). For firms with limited resources, the practical issue is how to order digital initiatives so that early actions are feasible and useful.

The cosmetics manufacturing context makes this issue more urgent. Producers must maintain product documentation, traceability, quality-control evidence, and quick communication with clients. Digital technologies can support these requirements, but they generate value only when employees and managers are able to interpret and use digital information in daily decisions (Cascavilla et al., 2026). Manufacturing data also become less



useful when production, inventory, and logistics information are entered inconsistently or managed separately across systems (Freitas et al., 2026; Tufano, 2023).

The case analyzed in this article is an anonymized Indonesian small cosmetics manufacturer that produces its own brands and also provides contract-manufacturing services. The firm has already introduced several digital practices, including a Java-based application for recording production and inventory information. However, these practices have not yet formed a coordinated transformation system. The company still faces repeated schedule adjustments, delayed data updates, slow report preparation, and coordination issues across functions, particularly when clients request digital documentation quickly.

Although digital readiness scholarship has grown, three limitations become visible when previous empirical studies are compared with the present context. First, empirical work on SMEs has commonly examined broad digital transformation capability, customer value creation, Industry 4.0 adoption, or general readiness models (Ghobakhloo et al., 2022; Matarazzo et al., 2021; Pingali et al., 2023; Silva et al., 2025), but these studies do not specifically explain how small cosmetics manufacturers manage traceability, quality documentation, client reporting, and production data under resource constraints. Studies on Indonesian manufacturing readiness and roadmaps have also focused on sectors such as food manufacturing or larger industrial contexts (Purbaya & Noviaristanti, 2024; Rahmatulloh et al., 2024), leaving the cosmetics manufacturing setting underexplored. Second, existing readiness assessments often produce maturity scores without sufficiently explaining why the scores appear differently across organizational dimensions. Third, the literature still offers limited practical guidance on how a resource-constrained manufacturer should convert readiness results into a staged sequence of feasible actions. These gaps indicate the need for a study that connects empirical readiness measurement with organizational explanation and action prioritization in a small cosmetics manufacturing context.

Responding to these gaps, this study combines readiness diagnosis, cross-functional qualitative explanation, and action prioritization through an explanatory sequential mixed-method case study. The study contributes by showing how a readiness score can be interpreted as an organizational capability profile and then translated into practical managerial priorities. The objectives are to measure the company's readiness, explain the drivers and barriers behind the readiness profile, and formulate priority actions that match the firm's limited resources. The study addresses three questions: (1) What is the company's readiness level across the five dimensions of the Indonesia Industry 4.0 Readiness Index? (2) Which conditions enable and inhibit its digital transformation? (3) Which actions should be prioritized first under resource constraints?

2. Literature Review

2.1. Digital Readiness as a Transformation Capability

Digital readiness describes the extent to which an organization can recognize digital opportunities, adjust to changing conditions, and apply technology in ways that improve value creation. For small and medium-sized enterprises, this readiness is not limited to hardware, software, or connectivity. It is a socio-technical capability involving leadership, culture, work discipline, and implementation behavior (Pingali et al., 2023; Silva et al., 2025). Recent readiness models also place attention on strategy, leadership, governance, process control, and collaboration because these dimensions influence whether digital tools can produce practical benefits (Silva et al., 2025).

Digital transformation can therefore be understood as a broader organizational change process rather than a simple act of technology adoption. It reshapes structures, routines, decision practices, value creation, and adaptation through the use of digital technologies (Hanelt et al., 2021; Kraus et al., 2022; Verhoef et al., 2021). This broader view is especially important for firms with limited resources because poor coordination or poorly timed investment can weaken the benefits of digital tools. Previous reviews show that leadership orientation, organizational learning, information-technology alignment, dynamic capabilities, and incremental implementation are central conditions for successful transformation in smaller firms (Leso et al., 2023; Matarazzo et al., 2021; Nasiri et al., 2022; Sagala & Óri, 2024).

2.2. Assessing Manufacturing Readiness

The Indonesia Industry 4.0 Readiness Index provides a structured instrument for examining readiness in manufacturing firms. Developed by the Indonesian Ministry of Industry, the framework evaluates five areas: management and organization, people and culture, products and services, technology, and factory operations. These areas help identify whether a firm has the managerial, human, technological, service, and operational foundations required for Industry 4.0-oriented development. At the same time, adoption research emphasizes that enabling conditions and barriers should be understood before a firm expands its technology base (Ghobakhloo et al., 2022).

For small manufacturers, a readiness score should be treated as a diagnostic starting point rather than a final label. The score helps managers locate weak capabilities, determine where coordination is fragile, and select realistic improvement steps. This view is aligned with studies showing that smaller firms often struggle with digital literacy, informal training, limited investment, resource scarcity, uneven access to technology, and value-chain preparedness (Ghobakhloo et al., 2022; Okfalisa et al., 2022; Pingali et al., 2023).

2.3. Analytical Framework and Priority Setting

The conceptual framework of this study follows an explanatory sequential logic. The study first administered the Indonesia Industry 4.0 Readiness Index (INDI 4.0) survey to obtain the readiness profile of PT XYZ across five readiness dimensions: management and organization, people and culture, products and services, technology, and factory operations. The survey results produced the overall readiness score and dimensional scores, which served as the initial diagnostic basis for understanding the company's digital readiness condition.

The readiness scores were then used as the basis for a focus group discussion involving seven cross-functional informants. The FGD was designed to interpret the score pattern, identify supporting and inhibiting factors of digital readiness, and formulate possible improvement strategies with the informants. These candidate strategies were subsequently organized using the Eisenhower Matrix by considering urgency and importance. The process produced priority results, which were then translated into strategic actions for the company's early digital transformation.

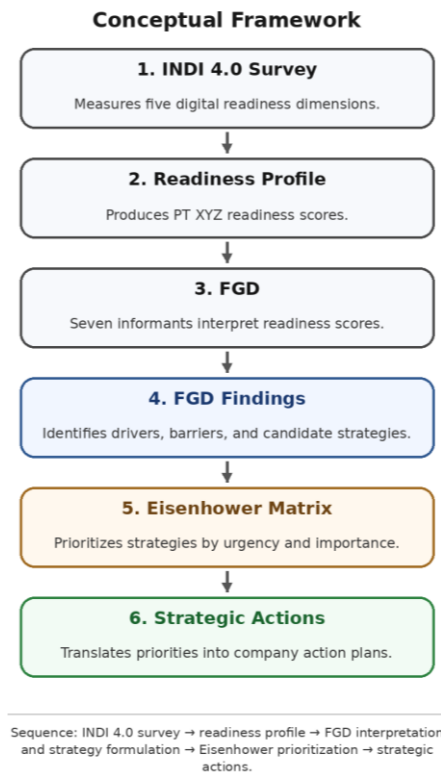


Figure 1. Conceptual Framework for Translating INDI 4.0 Readiness Scores and FGD Findings into Strategic Actions

Note: The framework shows the sequence from survey-based readiness diagnosis, FGD interpretation and strategy formulation, prioritization using the Eisenhower Matrix, and translation into strategic company actions.

3. Methods

3.1. Design and Context

The research used a single-case explanatory sequential mixed-method design. This design was selected because the study required an initial numerical diagnosis followed by qualitative explanation of the observed scores. Recent mixed-methods literature notes that explanatory sequential designs are appropriate when quantitative results need to be connected with, clarified by, and integrated with qualitative findings (James et al., 2024; Rahmatulloh et al., 2024). To maintain confidentiality, the organization is referred to as the case company. It is a cosmetics manufacturer in East Java, Indonesia, employing 56 workers and serving both own-brand production and contract-manufacturing activities. The assessment was cross-sectional. Data collection began with the survey stage, followed by the focus group discussion stage. The qualitative stage was designed to explain and validate the quantitative profile and to provide practical information for prioritizing improvement actions. This order enabled the research to move from measurement to interpretation and then to managerial recommendation.

3.2. Survey Stage

The survey used the Indonesia Industry 4.0 Readiness Index, which measures readiness in management and organization, people and culture, products and services, technology, and factory operations. A purposive sampling approach was used to select 33 respondents from managerial, low-management, and non-management positions. All respondents had worked

for more than three years, so they had sufficient familiarity with the company's processes and digital practices. Each item was scored on a 0-4 scale, where 0 represents no readiness and 4 represents advanced implementation. The analysis covered 23 readiness items, of which 18 met the validity criterion. Internal consistency was acceptable, with Cronbach's alpha of 0.681. Several items showed very low variation because respondents consistently indicated that formal strategy, earmarked investment, and structured training were absent. This pattern was treated as evidence of early readiness conditions rather than as a statistical nuisance.

3.3. Discussion Stage

The qualitative stage consisted of a 180-minute focus group discussion with seven participants. They represented the director's secretariat, production planning and inventory control, finance, production, quality control, personnel or human resources, and production staff. The participants were chosen purposively because their roles were directly connected with coordination, reporting, planning, workforce management, or operational execution. The discussion guide was organized around the five readiness dimensions and asked participants to explain supporting factors, obstacles, and realistic implementation options. Participation was voluntary, and all company and participant identities were anonymized. Since the purpose was diagnostic and exploratory, the study did not formulate hypotheses; instead, the framework directed the movement from readiness measurement to explanation and priority setting.

3.4. Analysis and Integration Procedures

Survey data were summarized descriptively to calculate dimensional scores and the overall readiness level. Focus group data were analyzed thematically through four steps. First, field notes and discussion transcripts were reviewed repeatedly to understand the full context of the participants' explanations. Second, meaningful statements related to digital practices, operational problems, managerial support, employee capability, data entry, and client requirements were coded. Third, similar codes were grouped under the five readiness dimensions and then clustered into broader themes, namely strategic governance, human readiness, systems and data, and market pressure. Fourth, the themes were compared with the survey scores to explain why some dimensions were stronger or weaker than others. The two forms of evidence were integrated through a joint display that connected readiness scores, qualitative explanations, and managerial meanings. The integrated findings were then classified using the Eisenhower Matrix. Urgency was determined by whether an issue affected daily scheduling, stock visibility, quality-control reporting, data reliability, or client response time, while importance was determined by whether the action strengthened long-term readiness and addressed weak readiness dimensions.

4. Results and Discussion

4.1. Research Results

4.1.1. Profile of Respondents

Thirty-three employees completed the survey. Most respondents worked in roles connected to day-to-day operations, making their responses relevant for evaluating actual digital work practices. Their average tenure was 12.63 years, with the shortest tenure at 3.59 years and the longest at 20.19 years. This tenure profile indicates that the respondents had enough organizational experience to evaluate the firm's current readiness condition.

Table 1. Characteristics of Survey Respondents

Characteristic	Category	Frequency	Percentage
Gender	Female	22	66.7%
	Male	11	33.3%
Position	Low management	18	54.5%
	Non-management	10	30.3%
	Middle management	5	15.2%
Education	Junior high school	3	9.1%
	Senior high school	14	42.4%
	Vocational high school	11	33.3%
	Bachelor degree	5	15.2%

Note. n = 33. Average tenure was 12.63 years

Source: Survey data processed by the author

4.1.2. Readiness Scores

The overall readiness score was 1.21, which places the company in the initial readiness category. Among the five dimensions, people and culture produced the strongest score at 1.87, while management and organization produced the weakest score at 0.21. Products and services, technology, and factory operations also remained within the initial readiness range. The score pattern suggests that the organization has a more prepared human foundation than formal managerial governance.

The low management and organization score indicates that essential transformation mechanisms have not yet been formalized. There is no dedicated digital transformation team, no written roadmap, and no specific investment allocation for digital development. Meanwhile, the higher people and culture score shows that employees are comparatively willing to learn and adjust. However, this willingness has not become a standardized capability because training remains limited and informal.

The contrast between these two dimensions is strategically important. It indicates that the company’s main readiness gap is not employee rejection of digitalization, but the absence of formal governance that can convert employee willingness into coordinated organizational capability. Without a roadmap, process owners, budget discipline, and monitoring routines, human openness remains fragmented and cannot consistently support operational decision making.

Table 2. Readiness Scores by Dimension

Dimension	Score	Category
Management and organization	0.21	Not ready
People and culture	1.87	Initial readiness
Products and services	1.41	Initial readiness
Technology	1.13	Initial readiness
Factory operations	1.44	Initial readiness
Overall readiness	1.21	Initial readiness

Note: The scores were produced from the Indonesia Industry 4.0 Readiness Index survey.

4.1.3. Drivers and Barriers

The focus group discussion clarified the uneven pattern in the readiness scores. The evidence clustered into four themes: strategic governance, human readiness, systems and data, and market pressure. Overall, the company is not starting from zero. Management already recognizes the need for digitalization, employees show openness toward change, and an internal Java-based application is in use. Even so, these strengths are weakened by unclear

ownership, constrained investment, uneven digital competence, and operational data that are not yet consistently reliable.

Participants from production planning, production, and quality control described how a single late or inaccurate input could affect scheduling, testing, and reporting across departments. The finance perspective added that digital investment must be balanced with cash-flow caution. These accounts show that the barriers are not caused by rejection of digitalization. Instead, the main problem is the gap between operational urgency and formal organizational commitment.

The relationship among the findings also shows that technology and factory operations cannot be interpreted separately. The existing Java-based application provides a basic digital infrastructure, but factory operations remain vulnerable because the data entered into the system are not always timely, complete, or consistently verified. Therefore, the technology dimension reflects partial availability of tools, while the factory operations dimension reveals whether those tools have been embedded into reliable daily routines.

Table 3. Integrated Themes from Survey and Discussion

Theme	Integrated Evidence	Managerial Meaning
Strategic governance	Management recognizes the need for digitalization, but no roadmap, transformation team, or earmarked budget exists.	Operational need is visible, but transformation lacks formal ownership.
Human readiness	Employees are open to learning and younger staff adapt quickly, but skills are uneven and training remains informal.	People are not the main source of resistance, but willingness has not yet become standardized capability.
Systems and data	A Java-based application supports stock and production visibility, yet delayed manual input causes cascading errors.	The central bottleneck is data governance, not the total absence of technology.
Market pressure	Contract-manufacturing clients increasingly expect fast updates, digital documentation, and transparent quality information.	External pressure strengthens the business case for digitalization.

Note: The themes combine the survey profile with explanations from the focus group discussion.

4.1.4. Priority Actions

Because resources are limited, the most relevant question is not what the ideal digital system would look like, but what the company should do first. The immediate priority is to strengthen low-cost governance practices. This includes standardizing data-entry rules and holding daily cross-functional checks to confirm critical stock, production, and quality-control information. The next priority is capability development through phased training, a simple roadmap, and gradual improvement of the existing Java-based application so that it can support more reliable real-time use.

A dedicated daily communication channel can be used as a temporary coordination mechanism while system integration remains incomplete. Large software or hardware purchases should be delayed until process discipline, employee skills, and cash-flow conditions are stronger. This sequence reduces the risk of buying technology before the organization is ready to use it effectively.

The strategic implication is that the firm should treat digital transformation as a sequencing problem rather than a purchasing problem. The first stage should stabilize data governance and cross-functional ownership; the second stage should strengthen employee capability and roadmap discipline; and only after these foundations improve should the company expand system integration or invest in larger technology upgrades.

Table 4. Priority Sequence for Digitalization

Quadrant	Priority Action	Expected Role
Important and urgent	Standardize and enforce data-entry procedures; conduct daily cross-functional data checks.	Stabilizes shared operational data and reduces rescheduling.
Important but not urgent	Deliver phased digital training; prepare a simple digital roadmap; gradually enhance the Java-based system.	Builds capability and aligns longer-term transformation.
Urgent but less important	Create a dedicated channel for daily stock and production updates.	Provides temporary coordination while deeper integration is absent.
Not urgent and not important	Postpone major software or hardware investment until governance, skills, and cash flow are more stable.	Prevents premature spending and low-return digitalization.

Note: The sequence was developed from the integrated findings using the Eisenhower Matrix.

4.2. Discussion

The results indicate that digital readiness in a small manufacturer can be uneven rather than uniformly weak. Employees may be receptive to change and digital tools may already exist, while formal governance remains underdeveloped. This finding supports studies arguing that transformation in smaller firms relies on leadership direction, explicit strategy, distributed responsibility, learning, dynamic capabilities, and staged capability development rather than on technology possession alone (Leso et al., 2023; Matarazzo et al., 2021; Sagala & Óri, 2024; Silva et al., 2025; Soluk & Kammerlander, 2021). In this case, the workforce dimension is more prepared than the governance dimension.

This pattern is important for interpreting low readiness scores. A low overall score does not automatically mean that a firm has no willingness to change or no exposure to digital tools. It can also mean that existing willingness has not yet been institutionalized through routines, role ownership, budget arrangements, and monitoring practices. This explains why management and organization became the lowest-scoring dimension even though people and culture became the highest.

Another important finding is the central role of data governance. The company already uses digital tools, but the value of those tools is reduced when shared operational data are late, inconsistent, or weakly controlled. The main operational problems therefore arise less from the absence of software and more from unreliable information flows between departments. This interpretation is consistent with research that highlights governance, monitoring, value-chain readiness, data quality, and process management as key dimensions of digital readiness and manufacturing data management (Freitas et al., 2026; Ghobakhloo et al., 2022; Silva et al., 2025; Tufano, 2023).

Taken together, the readiness dimensions form a dependency chain rather than a set of isolated scores. Management and organization provide formal direction, people and culture provide behavioral readiness, technology provides the digital tool base, and factory operations show whether the tool base is converted into stable work practices. In the case company, the

weakest link is governance; this weakness limits the value of positive employee attitudes and the existing application. Conceptually, this indicates that digital readiness in small manufacturers should be read as a capability alignment problem: the organization may have motivated employees and basic tools, but transformation remains fragile when authority, routines, budget, and data controls are not aligned.

For cosmetics manufacturers, weak data discipline creates consequences beyond administrative delay. It can disrupt schedule stability, reduce batch visibility, slow client responses, and weaken the credibility of quality records. This aligns with manufacturing data-governance literature linking data consistency with inventory control, productivity, logistics, and operational quality (Freitas et al., 2026; Tufano, 2023). It also supports cosmetics-sector evidence that digital value depends on the combination of tools and human capability (Cascavilla et al., 2026).

The final implication concerns sequencing and explains the basis for the Eisenhower Matrix classification. Actions were considered urgent when they directly affected daily production scheduling, stock visibility, quality-control documentation, data reliability, or client reporting. Actions were considered important when they strengthened the weakest readiness dimensions and created reusable organizational capability. Therefore, data-entry standardization and daily cross-functional checks were placed in the important-and-urgent quadrant because they address immediate operational disruptions and build data discipline. Phased training, roadmap preparation, and gradual application improvement were classified as important but less urgent because they support longer-term capability building. A dedicated communication channel was treated as urgent but less important because it solves short-term coordination needs without replacing system integration. Major software or hardware investment was postponed because it may create low-return spending if governance, skills, and data discipline remain weak. This path is consistent with staged transformation research, which argues that digital adoption requires knowledge sharing, organizational readiness, dynamic capabilities, and implementation capability (Ghobakhloo et al., 2022; Hanelt et al., 2021; Rahmatulloh et al., 2024; Soluk & Kammerlander, 2021).

5. Conclusion

The study finds that the cosmetics manufacturer examined in this case is still at an initial stage of digital readiness. Its strongest readiness area is people and culture, while its weakest area is management and organization. Although the firm already has a partial digital base and recognizes operational problems, transformation is still limited by weak governance, uneven capability development, and unreliable shared data.

Theoretically, this study extends digital readiness literature by showing that readiness in small manufacturers may develop unevenly across organizational dimensions. Human openness to digital change can exist before formal governance mechanisms are established. This finding supports the view that digital readiness should be understood as a socio-technical capability rather than merely a technological condition.

Scientifically, the study contributes to the limited empirical discussion on digital readiness in small cosmetics manufacturers in emerging economies. It demonstrates that readiness assessment becomes more useful when it is integrated with qualitative explanation and managerial prioritization. In this way, the study moves beyond maturity scoring and shows how diagnostic results can be translated into staged action priorities.

For managers, the findings suggest that early digital transformation should begin with practical and affordable actions. A practical implementation plan can start with four steps.

First, assign one process owner in production planning, inventory, production, and quality control to validate daily data input. Second, prepare short standard operating procedures covering input timing, minimum data fields, validation responsibility, and correction procedures. Third, hold a 10-15 minute daily cross-functional check to reconcile stock position, production schedule, and quality-control status. Fourth, conduct monthly digital training and collect user feedback on the Java-based application before deciding on larger system investment. For small cosmetics manufacturers, this sequence helps maintain traceability, production visibility, client documentation, and reporting speed without requiring immediate large capital expenditure.

The study is limited because it focuses on one company and uses a single cross-sectional assessment. Future studies could compare several cosmetics manufacturers, measure outcomes after implementation, or examine readiness changes over time after the roadmap is executed.

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