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People Readiness in the Digital Transformation of PT Cahaya Berkah's Manufacturing

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Abstract

Digital transformation has become essential for manufacturing competitiveness, yet technology adoption alone does not guarantee improvement because workforce readiness influences implementation success. This study examines people readiness for digital manufacturing transformation at PT Cahaya Berkah, focusing on employees' knowledge, hard skills, soft skills, and attitudes. It aims to identify competency gaps and formulate interventions supporting Energy Management and Overall Equipment Effectiveness Online initiatives. A quantitative descriptive, cross-sectional design was employed, supported by a Focus Group Discussion. Data were collected through a four-point Likert questionnaire distributed to 1,780 shop-floor-related employees across Powder, Liquid, and Semisolid factories, generating 1,608 responses. Data analysis included descriptive statistics, corrected item-total correlation, Cronbach's alpha, gap analysis, and normalized Human Development Index assessment. The findings show that all questionnaire items were valid and highly reliable. Knowledge recorded the largest gap and was classified as not ready, while hard skills were categorized as ready. Soft skills and attitudes achieved optimal readiness. Major weaknesses concerned Tableau dashboard interpretation, OEE calculation logic, real-time deviation response, digital documentation, sensor calibration, and data-based problem solving. The study concludes that PT Cahaya Berkah requires structured learning, shop-floor coaching, SOP integration, performance reviews, and reinforcement mechanisms to convert positive attitudes into sustainable operational capability.

INTRODUCTION

The rapid development of digital technology has significantly transformed the global business landscape, particularly within the manufacturing industry. According to a 2020 McKinsey Global Survey, the COVID-19 crisis has accelerated the adoption of digital technologies by approximately three to four years across industries worldwide. The most significant changes occurred in internal operations, supply chain management, and customer interactions, indicating that digital transformation has become a strategic necessity rather than a nice to have initiative (Ismail et al., 2017; Schneider & Kokshagina, 2021; Singh et al., 2022).

In the manufacturing sector, digital transformation is increasingly recognized as a key driver of operational resilience, improvement of productivity, and sustainable competitiveness (Alquraish, 2025; Chavarnakul et al., 2025). Manufacturing companies are adopting various Industry 4.0 technologies such as Internet of Things (IoT), Artificial Intelligence (AI), robotics, big data analytics, and advanced automation systems to improve operational performance and business sustainability (Camarinha-Matos et al., 2024; Piprani et al., 2024). Mordor Intelligence (2024) estimated that the digital transformation market in manufacturing would reach approximately USD 0.44 trillion annually by 2025. These technologies enable organizations to improve productivity, step up on agility, reduce operational costs, enhance end to end process visibility, and fasten decision-making process.

Digital transformation of manufacturing is highly relevant in South-East Asian region, especially Indonesia (Zhou et al., 2022). In many ASEAN countries, the contribution of manufacturing to GDP is about 20-25% (ASEAN Statistics Web Portal, 2024), hence manufacturing is one of the most critical sectors in regional economic development. The "Making Indonesia 4.0" project indicates the intention of the Indonesian government to enhance the competitiveness of the national manufacturing sector through industrial digitalization and advanced manufacturing technology (Labrunie et al., 2020; Li, 2018).

In many companies, using Industry 4.0 technologies has shown a significant operational benefit. Franceschini & Midali, (2023) discovered that IoT-based predictive maintenance can save maintenance expenses by as much as 25% with a 10-20% rise in equipment availability. AI systems can process vast amounts of data, increasing the accuracy of forecasts, production efficiency and quality control. Collaborative robots (cobots) offer operational precision and minimize workplace dangers. Additive manufacturing technologies, including 3D printing, speed up product development and minimize material waste. These developments prove that digital manufacturing has emerged as a key enabler for operational excellence and sustainable growth.

But prior research has demonstrated that digital transformation programs often fail to deliver sustained results, even when these technology improvements are in place. A 2018 poll indicated that only 16% of firms realized sustainable performance improvements from digital transformation programs, while only 7% reported partial improvements that were not durable over time. The data suggest that the mere adoption of technology is not enough to ensure the success of transformation.

Workforce readiness is one of the most crucial success factors of digital transformation. Research and industrial practice show that successful digital transformation is not only about technological investments, but also about employees' ability and attitude to embrace new ways of working. For instance, Siemens executed a major workforce upskilling and digital capacity development effort through its Siemens Digital Enterprise architecture, resulting in about 30% decrease in manufacturing costs and 20% productivity improvement. This story emphasizes the need of improving personnel readiness in conjunction with technological adoption. Workforce readiness consists of knowledge, skills, and attitudes to digital transformation. Employees will not only need to be able to run digital system but also need to know how to integrate digital processes, use data as to implement continuous improvement. However, one of the biggest challenges of digital transformation is the adaptation of the employee toward new technology and new work procedures. Employees could perceive digitalization as a threat to their job security or disrupt their conventional ways of working. Therefore, companies need to put serious attention on employee's engagement, building their capabilities, and organized change management initiatives to facilitate successful execution of digital transformation (Galli, 2018). Previous studies on Industry 4.0 and digital transformation mainly focus on technology, operational efficiency and organizational performance. However, few studies have researched the readiness of people in the context of blue-collar manufacturing employees of FMCG sectors, especially in Indonesia. Furthermore, most of the earlier studies consider readiness either from technological perspective or behavioral perspective independently and do not integrate competency readiness, change management readiness and organizational alignment into one framework.

Thus, this study intends to measure the people's readiness for digital manufacturing transformation at PT. Cahaya Berkah by integrating Knowledge-Skill-Attitude (KSA) framework, ADKAR change management model, and Galbraith Star Model. This study aims to identify key competency gaps of manufacturing employees and develop organizational solutions to enable the implementation of sustainable digital transformation in manufacturing operation.

Research based on real-life experiences of both global and regional manufactures points at the workforce readiness as a key factor that determines digital transformation. In industrial automation, the company, Siemens, is among the few firms that demonstrate the importance of investing in employee preparedness or readiness. By relying on the Siemens Digital Enterprise framework, training and upskilling of the workforce was also conducted in a broad manner as a manner to ready the firm for Industry 4.0 technologies. This approach cut production cost by 30% and at the same time boosted productivity by 20% as a clear testament to how modern technology, especially the 4th industrial revolution, will propel workforce development towards success by 2024 (Siemens).

As these examples show, technology remains but an enabler that can be readily harnessed and which, on its own, is insufficient to guarantee success. Digital initiatives succeed or fail based on the individuals that are heading and/or supporting those initiatives. Workforce readiness is all about preparing the employee by ensuring the employee is ready to go and ready to thrash out the right solution but it's a combination of creating a culture that will allow that employee to be innovative and be ready to adapt to a future that is unpredictable (Buvat et al., 2017). One of the main challenges of the digitization process is the reactions of employees when they perceive new digital changes as a menace to their job security or as situations that would make them change their working procedure with which they are comfortable with (Errida & Lotfi, 2021).

That is why employee engagement and involvement have to become the focus of companies right from the start in order to overcome these challenges. If employees are engaged at the beginning of the transformation initiative to the organization, they may offer insights from the field that will guide leaders in the development of programs that form part of the change agenda. To support this, context-specific training and reskilling initiatives are an essential component in creating confidence and competence to staff to support the organization's digital transformation plan.

Digital transformations fail for a variety of reasons, many of which have been extensively discussed in many publications. However, a lot of these explanations come down to one: people. These kinds of transformations frequently fall flat because most businesses overlook the fact that people are the driving force behind these crucial initiatives, which range from creating a strategy and developing a vision to presenting it to the rest of the company and carrying it out.

There are two group of people that contributes to the success of digital transformation in the organization, which are leaders and employee. Leaders should be able to motivate staff to work toward a clear vision of the organization's digital future. They can swiftly adjust and change course as obstacles arise, all the while maintaining an eye on the wider picture. Leaders will also make investments in individuals who can use technology to further the objectives of the company.

Since naturally human tends to oppose new ideas, employee buy-in is crucial for the success of digital transformation initiative. Studies indicate that in successful digital transitions, employees across organization shows a high level of engagement. Early involvement of employee will help leaders to get valuable insight from the front lines, enabling them to develop a highly effective digital transformation program with a strong likelihood of success. It is due to the employee who has deep knowledge about front line operational could give valuable feedback about potential enhancement in the business processes or procedures that will enrich program.

PT. Cahaya Berkah's digital manufacturing transformation is currently anchored on the Enterprise Resource Planning (ERP) backbone provided by SAP S/4HANA, which has been implemented and is presently in a company-wide stabilization phase. As organizational resources are concentrated on stabilizing this core system, the Manufacturing Control Tower is scheduled to begin substantive work in the second half of 2026. As of the time of writing, no software development has yet commenced; work to date has been limited to concept development, dashboard visualization design, and the definition of calculation logic for each metric.

The development approach differs by use case. OEE Online will be built using internal resources for the software layer, while the hardware component Operational Technology (OT) sensors and data-collection infrastructure on the shop floor will be supported by third-party providers. Energy Management, by contrast, will be fully supported by an external party with established experience in industrial energy monitoring systems, a decision intended to accelerate a transformation that management considers strategically important to the company.

METHOD

Research Design

This study used a quantitative descriptive and cross-sectional research design, supported by Focus Group Discussion (FGD) for solution formulation (Creswell & Creswell, 2018). The quantitative survey captures employee readiness at one point in time, while the FGD validates the findings and translates them into practical action plans (Fischer et al., 2023).

The unit of analysis is blue-collar and shop-floor-related employees in manufacturing operations. People readiness is measured using the Knowledge, Skill, and Attitude (KSA) framework, which is operationalized into four dimensions: Knowledge, Hard Skill, Soft Skill, and Attitude. The overall research process follows these steps: problem identification, literature review, questionnaire design, data collection, validity and reliability testing, gap and HDI analysis, FGD validation, and recommendation formulation.

Table 1. Research design alignment

Research Element	**Description**	**Relevance to the Study**
Research approach	Quantitative descriptive analysis supported by FGD	Measures readiness statistically and translates the findings into practical action plans

Research Element	Description	Relevance to the Study
Time horizon	Cross-sectional	Captures the readiness condition before the implementation of Energy Management and OEE Online
Unit of analysis	Blue-collar and shop-floor-related employees	Focuses on employees who will use or support digital manufacturing routines
Measurement framework	Knowledge, Hard Skill, Soft Skill, and Attitude	Separates cognitive, technical, behavioral, and mindset readiness
Solution framework	ADKAR and Galbraith Star Model	Connects individual change readiness with organizational alignment

Below is a flowchart of the research process, as it outlines the various stages of data collection, data analysis and report writing and shows that the various stages of the study process are well thought out and consistent.

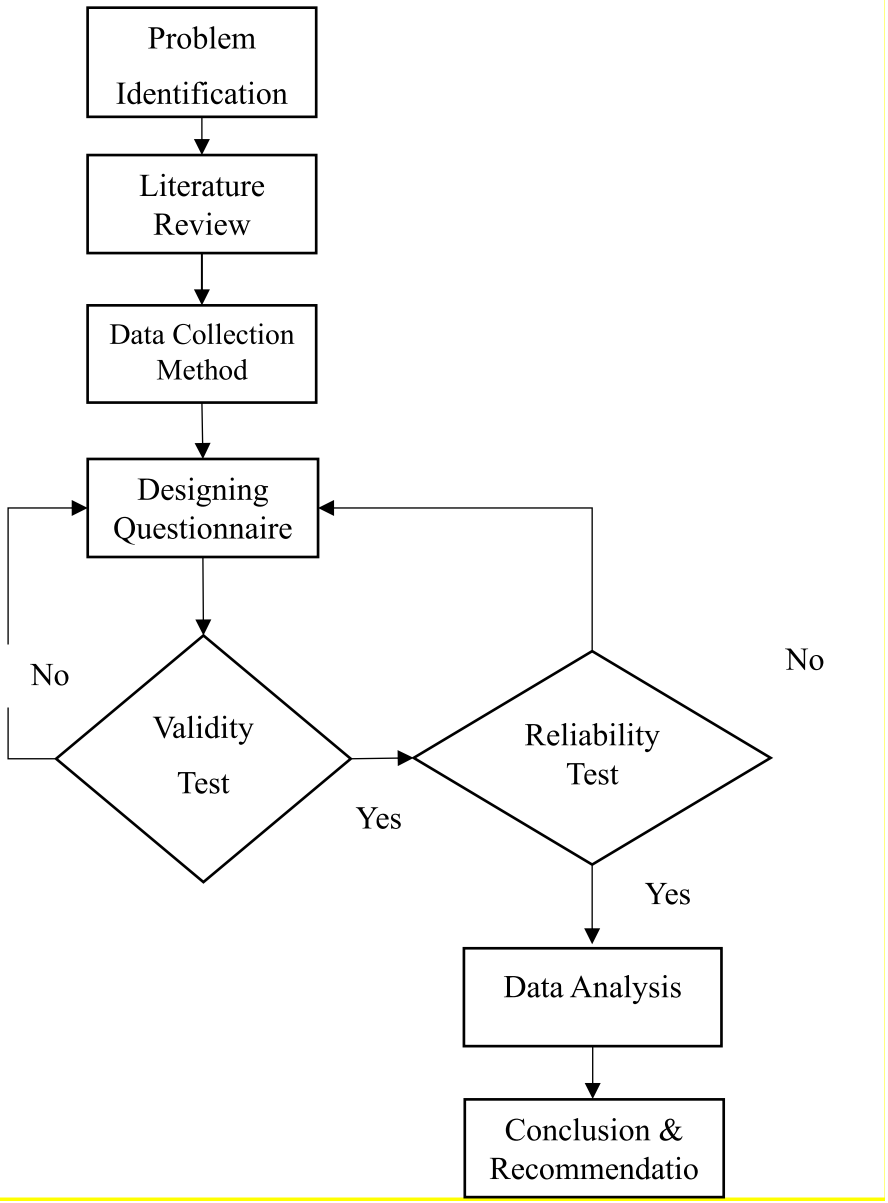

Figure 2. Research Process

Data Collection Methods

The primary data were collected using a structured questionnaire and FGD. The questionnaire was used to measure current and expected readiness conditions, while the FGD was used to validate the quantitative results and define improvement actions.

- Questionnaire survey: distributed to 1,780 respondents across Powder, Liquid, and Semi Solid factories.
- Respondent coverage: Production, Engineering, Quality, Safety, and selected supporting functions related to daily manufacturing operations.
- Measurement scale: Likert-scale format to capture current and expected readiness conditions for each item.
- FGD participants: Plant Head, Production Section Head, HR Business Partner, Manufacturing Excellence Head, Engineering Section Head, Digital Transformation Lead, and Manufacturing Academy Lead.

Questionnaire Development Process (Figure)

The questionnaire development process followed in this study is summarized in Figure III.3 below with rationale for each stage as follows

- **Start from a validated source instrument.** The questionnaire adapted Hendarman et al.'s (2021) KSA scale, which already had acceptable reliability/validity and the same current-vs-expected/HDI structure — giving the new instrument a head start on credibility.
- **Customize with the stakeholders who own the outcome.** Generic Industry 4.0 items don't diagnose anything specific. The HR Business Partner, Digital Transformation Lead, and Plant Head rewrote the item pool around actual use cases: OEE calculation logic, Tableau dashboard interpretation, PLC/HMI functions, and batch traceability (Deloitte, 2024).
- **Simplify the scale when respondents skew toward the midpoint.** The most transferable lesson here: blue-collar respondents defaulted to the neutral midpoint on a 5-point scale regardless of true condition, compressing results. Narrowing to 4 points (no neutral option) reduces this central-tendency/satisficing bias (Chyung et al., 2017) — but should only be triggered by an observed pattern like pilot-test midpoint clustering, not applied by default.
- **Localize to the respondent's language, not the thesis's.** The thesis is in English for the institution; the instrument was in Bahasa Indonesia because that's what produces honest, accurate responses from a blue-collar
- **Choose a distribution channel the population can actually use.** Google Form was used across all three factories for its reach and low technical barrier — not researcher convenience.
- **Report response rate against target, not just raw N.** 1,608 responses (~90% of the eligible population) exceeded the internal target — showing representativeness, not just size.

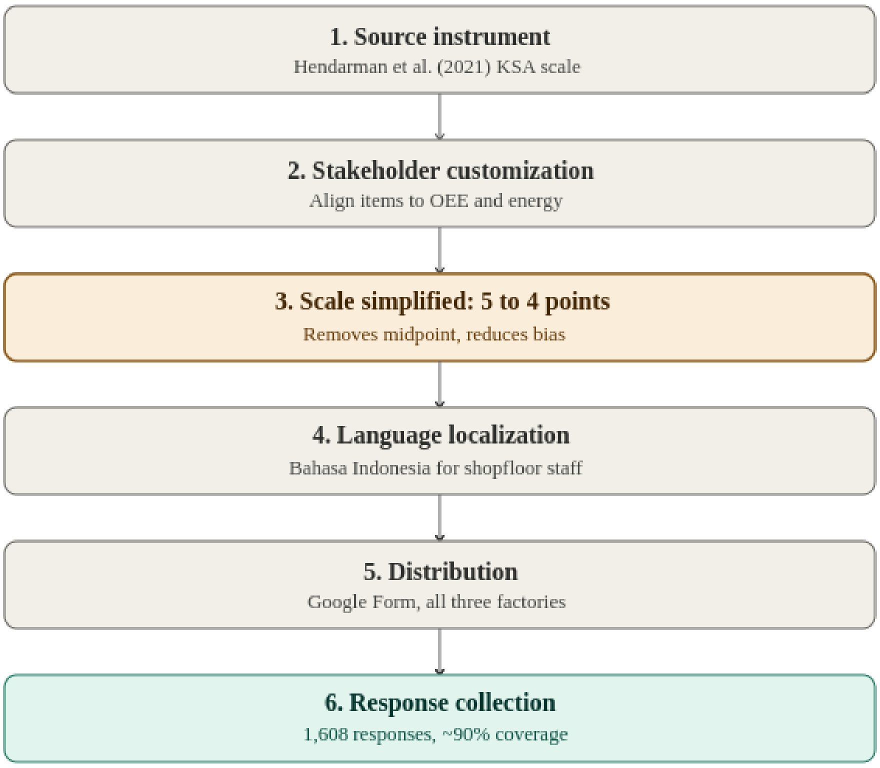

Figure 3. Questionnaire development process for this study

Data Analysis Method(s)

The data analysis in this study was conducted using quantitative analysis supported by Focus Group Discussion for solution formulation. The quantitative analysis consisted of descriptive statistical analysis, validity testing, reliability testing, gap analysis, and Human Development Index analysis. Descriptive statistics were used to calculate the current and expected mean scores for each factor and questionnaire item. Validity testing was conducted using Corrected Item-Total Correlation, while reliability testing was conducted using Cronbach's Alpha. Gap analysis was used to measure the difference between expected and current conditions, while HDI analysis was used to normalize the gap and classify readiness levels.

The analysis was conducted at both factor level and questionnaire item level to identify overall readiness patterns and specific improvement priorities. The factor-level analysis was used to determine which readiness dimension required the highest managerial attention, while the questionnaire-level analysis was used to identify more detailed action areas. Finally, FGD was conducted with key stakeholders to validate the quantitative findings and formulate action plans using the ADKAR change management model and the Galbraith Star Model. This combined method ensures that the study not only measures people readiness, but also translates the findings into practical recommendations for digital manufacturing transformation.

Descriptive Statistics

Descriptive statistical analysis is used to summarize the respondents' answers and describe the current condition of people readiness in digital manufacturing transformation. The main statistical measurement used in this stage is the mean score for each questionnaire item and each readiness factor.

This analysis is conducted at two levels:

- Factor level, covering Knowledge, Hard Skill, Soft Skill, and Attitude.
- **Questionnaire item level**, covering each individual question under the four readiness factors.

The descriptive analysis provides the basis for identifying the current readiness condition and comparing it with the expected readiness condition. The output of this stage is the average current score and expected score for each factor and each questionnaire item.

Validity Testing

Validity testing is conducted to ensure that each questionnaire item properly measures the intended construct. In this study, validity is tested using **Corrected Item-Total Correlation**. This method measures the correlation between each individual item and the total score of its respective factor.

The decision rule for validity testing is as follows:

- An item is considered **valid** if the calculated correlation value is higher than the r-table value.
- An item is considered **not valid** if the calculated correlation value is lower than or equal to the r-table value.

The purpose of this test is to confirm whether the questionnaire items can be retained for further analysis. Valid items are then used in reliability testing, gap analysis, and HDI analysis.

Reliability Testing

To confirm validity of the data obtained from the questionnaires, reliability tests will be used. Reliability testing is defined as the determination of stability and consistency of measurement device or tool in providing reliable results over time (Amirrudin et al., 2020). Co-efficient of Cronbach's Alpha will in turn be determined for the knowledge, skills, attitudes, and people readiness constructs. Cronbach's Alpha of 0.7 or higher is considered acceptable, meaning the instrument demonstrates a satisfactory level of internal consistency among its items.

The reliability interpretation used in this study is as follows:

Table 2. Reliability interpretation

Cronbach's Alpha Value	Interpretation
≥ 0.90	Excellent reliability
0.80–0.89	Good reliability
0.70–0.79	Acceptable reliability
< 0.70	Not reliable

The reliability test is conducted separately for Knowledge, Hard Skill, Soft Skill, and Attitude. If the factor is reliable, the items within that factor are considered internally consistent and suitable for further analysis.

Gap Analysis

Gap analysis is used to measure the difference between the expected condition and the current condition of people readiness. The gap value shows how far the current condition is from the desired level of readiness.

The formula used is:

Gap = Expected Score − Current Score
The interpretation of the gap is as follows:

- A **higher gap** indicates a larger distance between current readiness and expected readiness.
- A **lower gap** indicates that the current condition is closer to the expected condition.
- The factor or item with the highest gap becomes the main priority for improvement.

In this study, gap analysis is conducted at both factor level and questionnaire item level. The factor-level gap identifies which readiness dimension requires the most attention, while the item-level gap identifies the specific behaviors, capabilities, or knowledge areas that need targeted intervention.

Human Development Index

After the gap is calculated, the study applies the **Human Development Index (HDI)** method to normalize the gap values. HDI is used to compare readiness across factors and questionnaire items on a standardized scale.

The formula used is:

HDI = (X − Xmin) / (Xmax − Xmin)

Where:

X = gap value of a specific factor or item

- Xmin = minimum gap value in the dataset
- Xmax = maximum gap value in the dataset

The HDI value ranges from 0 to 1. A higher HDI value indicates a larger relative gap and therefore lower readiness. A lower HDI value indicates a smaller relative gap and therefore higher readiness,with the classification as shown in Table 3.

Table 3. Readiness Level Classification

HDI Range	Readiness Level	Interpretation
0.00–0.20	Optimal	Very small gap; condition is close to expected
0.21–0.40	Receptive	Small gap; generally ready with minor improvement
0.41–0.60	Ready	Moderate gap; requires structured improvement
0.61–0.80	Early Stage	Large gap; readiness is still low
0.81–1.00	Not Ready	Very large gap; not ready

This study uses the Human Development Index (HDI) method based on gap normalization to measure readiness. The gap is the difference between the expected state and the current state. To get the HDI, the gap values are then normalized using the following formula:

HDI = (X – Xmin) / (Xmax – Xmin),

X is the gap value for each indicator, and Xmin and Xmax are the lowest and highest gap values in the dataset, respectively. This normalization process makes sure that the readiness measurement is the same for all indicators and factors.

This method makes it easier to prioritize areas that need improvement because factors with higher HDI values show bigger gaps and need more immediate attention in capability development.

Questionnaire-Level Priority Analysis

In addition to factor-level analysis, this study also conducts questionnaire-level priority analysis. This analysis is important because factor-level results only show the general readiness condition, while questionnaire-level results provide more specific information about which operational behaviors or capabilities require improvement.

The questionnaire-level analysis includes:

- Current mean score of each item.
- Expected score of each item.
- Gap value of each item.
- HDI value of each item.
- Readiness classification of each item.

The result of this analysis is used to identify priority action areas. For example, if an item related to dashboard interpretation, OEE understanding, real-time deviation response, or digital documentation has a high HDI value, then that item becomes a priority for improvement in the business solution.

Focus Group Discussion for Solution Formulation

The Focus Group Discussion (FGD) was conducted to validate the quantitative HDI findings against actual shop-floor practice and to convert those findings into feasible organizational interventions. The FGD used the ADKAR model to diagnose the nature of each priority gap (whether it reflects an awareness, desire, knowledge, ability, or reinforcement barrier) and the Galbraith Star Model to design an organizational-level response across Strategy, Structure, Process, Rewards, and People, so that the resulting solution is not limited to training alone.

The participants of the FGD include:

- Plant Head
- Production Section Head
- HR Business Partner
- Manufacturing Excellence Head
- Engineering Section Head
- Digital Transformation Lead
- Manufacturing Academy Lead

The FGD is used to discuss the results of the gap and HDI analysis, identify the root causes behind the largest readiness gaps, and define action plans to improve people readiness. The discussion focuses on converting survey findings into implementable programs.

Three defined roles structured the session: a Moderator to guide questions and manage time, a Scribe to capture quotes and decisions, and a Timekeeper to signal remaining time per segment. Ground rules established at the outset ensured confidentiality (comments used for solution design, not individual assessment), evidence-based discussion anchored to actual shop-floor practice, no hierarchy bias, and a solution-oriented focus.

Table 4. One-hour FGD protocol

Time (minutes)	Activity	Output
0–5	Opening and consent	Objective, confidentiality, rules, roles confirmed
5–12	Data briefing	HDI baseline and priority items presented

Time (minutes)	Activity	Output
12–25	ADKAR diagnosis	Barrier identified for each priority gap
25–45	Galbraith solution design	Interventions mapped to organizational levers
45–55	Prioritization	Impact–feasibility voting and ownership assigned
55–60	Closure	Decisions and next steps confirmed

Traceability from survey to FGD. Each discussion topic in the FGD was drawn directly from the item-level priority ranking produced in the quantitative analysis (Section IV.1.5), so that the FGD is not a separate exercise but a direct continuation of the survey results. The ten highest-priority items by HDI, led by K6 (Tableau dashboard interpretation), K3 (OEE calculation logic), HS6 (real-time deviation response), and HS3 (digital changeover documentation), were used as the discussion agenda during the ADKAR diagnosis segment, ensuring that every root cause discussed in the FGD corresponds to a specific, numbered gap identified in the survey.

The full root-cause probing worksheet and the ADKAR-by-Galbraith solution matrix used during the session are provided in Appendix B. The validated root causes and resulting solution design are presented in Section IV.2.1.

Summary of Data Analysis Method

The overall data analysis method is summarized in Table 5 below.

Table 5. Summary of data analysis method

Analysis Method	**Purpose**	**Output**
Descriptive Statistical Analysis	To describe current and expected readiness conditions	Mean score by factor and questionnaire item
Validity Test	To ensure each item measures the intended construct	Valid or not valid item status
Reliability Test	To test internal consistency of each factor	Cronbach's Alpha value
Gap Analysis	To identify the difference between expected and current conditions	Gap value by factor and item
Focus Group Discussion	To validate quantitative gaps against shop-floor practice and design interventions	Validated root causes and ADKAR × Galbraith solution matrix
HDI Analysis	To normalize the gap and classify readiness	HDI score and readiness level
Questionnaire-Level Priority Analysis	To identify specific improvement priorities	Priority items for intervention

Research Limitation and Ethical Consideration

Research Limitations

This study has several limitations. First, the research is conducted only in PT. Cahaya Berkah, so the findings are specific to the company's manufacturing context and should not be generalized without contextual adjustment. Second, the study focuses on blue-collar and shop-floor-related employees in Powder, Liquid, and Semi Solid factories. Third, the data are collected at one point in time, so the study does not measure readiness improvement after implementation. Fourth, the questionnaire is perception-based, although validity and reliability tests are used to ensure instrument quality. Finally, the study does not assess system architecture, software configuration, sensor accuracy, financial investment, or post-implementation performance impact.

Ethical Considerations

This study will adhere to ethical guidelines to ensure that participants' rights and privacy are protected throughout the research process:

Informed Consent

The participants will be offered an informed consent to sign in order to give them details about the study goals and activities, the potential hazards involved. The study will be an opt-in study, and the participants will be encouraged to discontinue with their participation at any time of the study with no repercussions.

Confidentiality

All the data gleaned from participants' information and responses to the questions will remain anonymous. All data collected will be anonymized and no identifying information will be used in the report.

Voluntary Participation

The involvement in this study will be voluntary in the sense that individuals will be different from study participants. The following steps will however be taken to ensure that no participant has to participate in the study; i.e. If participants are not comfortable with the study, they will not be forced to continue with the study Researchers will however give participants a chance to ask questions about the study before they allow them to participate in the study.

RESULTS AND DISCUSSION

Respondent Demographic Profile

The 1,608 respondents were distributed across four factory departments, split between Operator and Non-Operator roles, as summarized in Table 6.

Table 6. Respondent distribution by department and role

Department	Operator	Non-Operator	Total	% of total
Liquid Factory	301	352	653	40.6%
Semisolid Factory	389	204	593	36.9%
Powder Factory	125	231	356	22.1%
Indirect Factory		6	6	0.4%
Grand Total	**815**	**793**	**1608**	**100%**

Liquid Factory accounts for the largest share of respondents (40.6%), followed by Semisolid (36.9%) and Powder (22.1%); the Indirect Factory group contributes a negligible 0.4% and consists entirely of non-operator staff. Across the sample as a whole, Operator and Non-Operator roles are nearly balanced (815 vs. 793, or 50.7% vs. 49.3%), though this balance varies meaningfully by department: Semisolid skews toward Operators (65.6%), while Powder and Liquid skew toward Non-Operators (64.9% and 53.9%, respectively).

Validity Test Results

The validity testing with corrected item-total correlation shows that all of the questionnaire items in the Knowledge, Hard Skill, Soft Skill, and Attitude dimensions have r-count values that are higher than the r-table value of 0.0489. The minimum r-count values for each factor are still well above the threshold, which means that all of the items are strongly and statistically significantly related to their respective constructs. So, all of the questions on the questionnaire are valid and will be kept for more analysis.

Table 7. Validity Test by Factor

Factor	Items	Max r-count	r-table	Conclusion
Knowledge	10	0,7187	0,0489	All items valid
Hard Skill	7	0,6861	0,0489	All items valid
Soft Skill	8	0,6745	0,0489	All items valid
Attitude	15	0,7795	0,0489	All items valid

Reliability Test Results

This study employed Cronbach's Alpha for reliability testing to evaluate the internal consistency of the questionnaire items across each dimension. Hair et al. (2019) say that a Cronbach's Alpha value higher than 0.70 means the data is reliable, and a value higher than 0.80 means it is very reliable.

The results show that all dimensions have Cronbach's Alpha values that are much higher than the minimum value of 0.70. The Knowledge dimension got a score of 0.89, the Hard Skill dimension got a score of 0.87, the Soft Skill dimension got a score of 0.91, and the Attitude dimension got a score of 0.93. The results show that all the constructs are very internally consistent. This means that the items in each dimension consistently measure the same underlying idea.

Table 8. Reliability Test by Factor

Factor	Items	Cronbach Alpha	Reliability Status
Knowledge	10	0,9007	Highly Reliable
Hard Skill	7	0,8497	Highly Reliable
Soft Skill	8	0,8546	Highly Reliable
Attitude	15	0,9382	Highly Reliable

The Attitude and Soft Skill dimensions have the highest reliability values, which means that people's behavioral and perceptual responses are very consistent. Knowledge and Hard Skill also show strong reliability, which means that the measurement tool is stable and reliable for measuring both technical and cognitive aspects of digital readiness.

Consequently, it can be inferred that the questionnaire employed in this study is highly reliable, and all items are appropriate for subsequent analysis, including gap analysis and Human Development Index (HDI) assessment.

Gap Analysis and HDI

The results indicate that Knowledge and Hard Skill exhibit the largest gaps, suggesting significant deficiencies in technical capability and understanding. The HDI analysis shows that employees are strong in Soft Skill and Attitude but weak in Knowledge and Hard Skill.

Table 9. Gap and HDI by Factor

Factor	Items	Current	Expected	Gap	HDI	Readiness Level
Knowledge	10	3,05	3,80	0,75	1,00	Not Ready
Hard Skill	7	3,03	3,57	0,54	0,41	Ready
Soft Skill	8	3,20	3,63	0,42	0,09	Optimal
Attitude	15	3,48	3,87	0,39	0,00	Optimal

Item-Level Top Gap and HDIs

Below are Top 10 (ten) of Key Gap and HDIs that coming out from the questionaries, that will become priorities for the company to improve to ensure a successful Digital Manufacturing Transformation in the Factory.

Table 10. Top Gap and HDI by Questionnaire Item

Code	Question	Gap	HDI	Readiness Level
K6	Saya paham cara membaca dashboard Tableau untuk output, problem/ issue, dan tren anomali.	1,17	1,00	Not Ready
HS6	Saya membandingkan output real-time vs target dan bertindak saat deviasi dalam ≤30 menit.	1,01	1,00	Not Ready
SS2	Saya menggunakan data untuk analisis 5-Why/ pareto pada masalah kualitas (big Q).	0,87	1,00	Not Ready
A15	Superiormu mengendorse dan mengecek secara kontinu penggunaan/ peningkatan teknologi	0,64	1,00	Not Ready
HS3	Saya mendokumentasikan waktu changeover & ide perbaikan di form digital.	0,97	0,96	Not Ready
SS7	Saya meminta/ mengecek kalibrasi sensor saat ada indikasi bacaan tidak wajar.	0,77	0,89	Not Ready
K3	Saya mememahami komponen perhitungan OEE (Availability, Performance, Quality) dan dari mana angkanya diperoleh.	1,04	0,87	Not Ready
SS3	Saya tanggap terhadap alarm/ indikator anomali dan melakukan eskalasi sesuai prosedur.	0,73	0,84	Not Ready
A12	Saya melihat manfaat langsung digitalisasi bagi efisiensi pekerjaan saya.	0,51	0,83	Not Ready
A13	Saya yakin data dan privasi saya terlindungi dengan baik dalam sistem digital.	0,51	0,82	Not Ready

The questionnaire-level results show that the most critical gaps are concentrated in four operational capability themes:

- Digital performance visibility: employees need stronger capability to read Tableau dashboards, understand output trends, identify issues, and recognize anomaly patterns.
- Manufacturing performance logic: employees need deeper understanding of OEE, including Availability, Performance, Quality, and how each number is generated from shop-floor data.
- Real-time response discipline: employees need stronger ability to compare real-time output against targets and take timely action when deviation occurs.

- Digital documentation and improvement routines: employees need to document changeover time and improvement ideas consistently in digital forms so that improvement actions are traceable.

The item-level findings are aligned with the strategic priority of Energy Management and OEE Online. Energy Management requires employees to understand abnormal energy consumption, relate energy data to machine status, and investigate anomalies. OEE Online requires employees to understand data sources, read dashboards, record losses accurately, and respond quickly to deviations. Therefore, closing the item-level gaps is directly connected to improving the success probability of the first digital manufacturing use cases.

Business Solution & Implementation Plan

Business Solution

The findings of this study reveal that the main barrier to the organization's digital transformation is not a resistance to change but a structural capability gap, especially in the Knowledge and Hard Skill domains. While the comparatively excellent performance in Attitude and Soft Skill demonstrates that employees are quite open and ready to adjust their behavior for digital transformation projects. The situation reflects a deep imbalance, where the organization has been able to generate a receptive mindset, but has not yet established the structures necessary to translate this readiness into operational capacity. Thus, the recommended business solution should not be limited to individual training initiatives but rather aim at getting the complete organization to work together.

The FGD converted the quantitative priority gaps into validated root causes and organization-wide interventions. Table IV.6 presents the ADKAR-by-Galbraith solution matrix produced during the session, linking each stage of individual change to the organizational lever required to support it.

Table 11. ADKAR × Galbraith solution matrix

ADKAR barrier	Potential intervention	Galbraith lever
Awareness	Communicate why digital systems matter to safety, quality, OEE, and workload	Strategy + People
Desire	Personal benefit, career relevance, reduced rework, recognition	Rewards + People
Knowledge	Dashboard/OEE/data-flow literacy curriculum and short modules	People + Process
Ability	Hands-on simulation, shop-floor coaching, task certification	People + Structure
Reinforcement	KPI, leader routine, recognition, review cadence	Rewards + Process

From this matrix, five solution hypotheses were proposed and validated with participants as the concrete basis for the implementation plan in Chapter V.

Participants confirmed that the primary issue is capability readiness rather than resistance to change: Knowledge and Hard Skill gaps (HDI 1.000 and 0.410, respectively) were validated as the two dimensions requiring the most immediate intervention, while Soft Skill and Attitude (HDI 0.087 and 0.000) were confirmed as existing strengths that can be leveraged as change enablers rather than targets for further investment.

Table 12. Solution hypotheses validated during the FGD

Solution	Description	Primary Galbraith lever
Knowledge Academy Sprint	2–3 hour modular learning on dashboard literacy, OEE logic, real-time vs. historical data, traceability, and master data	People
Shopfloor Digital Coaching	Digital Champion supports operators and supervisors during shift routines on actual lines and dashboards	Structure
SOP and Daily Management Integration	Embed dashboard reading, deviation escalation, changeover logging, and 5-Why/Pareto into standard work	Process
Digital Performance Review	Weekly area review of system usage, data accuracy, top loss, and improvement action closure	Process
Recognition and KPI Reinforcement	Recognition for accurate data, timely action, digital documentation, and improvement contribution	Rewards

Implementation Plan & Justification

The implementation plan is designed for twelve months. The sequence follows the logic of building awareness first, developing knowledge and ability, integrating the new ways of working into daily processes, and reinforcing behavior through leadership and performance management. Sufficient time is needed to ensure a quick ramp up and a consistent implementation that will lead to a successful Digital Transformation in the Factory

Table 13. Implementation Plan Gantt Chart

Phase	Month	Key Focus	Key Activities	Main Owner
1	1-2	Awareness and alignment	Launch program, communicate business case, define KSA, confirm priority gaps, select digital champions	Manufacturing Excellence, Digital Transformation Lead, HRBP
2	3-5	Knowledge building	Training on OEE logic, Tableau dashboard, real-time data, energy management, master data, traceability, and cybersecurity.	Manufacturing Academy, Manufacturing Excellence
3	6-8	Ability building	Hands-on practice, dashboard drills, abnormality response simulation, changeover documentation, energy anomaly investigation.	Plant Head, Production Section Head, Engineering Section Head
4	9-10	Process integration	Update SOP, integrate dashboard review into daily management system, standardize escalation and loss documentation.	Manufacturing Excellence, Plant Team
5	11-12	Reinforcement	Track usage, data accuracy, response time, digital improvement ideas; recognize digital champions and teams. Communication management to relevant stakeholders	Plant Head, HRBP, Manufacturing Excellence

CONCLUSION

This study concludes that people readiness is a critical determinant in the success of digital manufacturing transformation at PT Cahaya Berkah. The findings demonstrate that employees generally possess positive attitudes and adequate soft skills toward digital transformation; however, significant capability gaps remain in knowledge and technical competencies, particularly related to Tableau dashboard interpretation, OEE calculation understanding, real-time production deviation response, digital documentation, and data-driven problem-solving. The validity and reliability assessments confirmed that the measurement instrument effectively captured the readiness dimensions of knowledge, hard skills, soft skills, and attitudes. The HDI analysis further revealed that knowledge represents the most critical readiness gap, indicating that technological transformation initiatives require stronger employee capability development rather than merely technology implementation. Therefore, organizational interventions should focus on structured digital learning programs, shop-floor coaching, integration of digital practices into standard operating procedures, continuous performance monitoring, and reinforcement mechanisms involving leadership support. By strengthening employee capability and aligning organizational systems with transformation objectives, PT Cahaya Berkah can improve the sustainability and effectiveness of its digital manufacturing initiatives.

Future research is recommended to expand the scope by involving multiple manufacturing companies across different industries and organizational contexts to improve the generalizability of findings. Longitudinal studies are also suggested to evaluate changes in employee readiness after the implementation of training programs, digital tools, and change management interventions. Further studies may incorporate additional variables such as digital leadership, organizational culture, technology acceptance, cybersecurity awareness, and actual operational performance indicators to provide a more comprehensive understanding of digital transformation readiness. Moreover, future researchers can explore the relationship between workforce readiness levels and measurable business outcomes, including productivity improvement, quality performance, operational efficiency, and return on digital investment. Such research would provide deeper insights into how human capability development contributes to long-term success in Industry 4.0 transformation.

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