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數位轉型對台灣紡織公司之影響：

以宏遠興業工業 4.0 智慧工廠為例

The Effects of Digital Transformation

on Taiwan's Textile Industry:

A Case Study of Everest Textile's Industry 4.0 Smart Factory

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## 中文摘要

本論文透過宏遠興業股份有限公司（Everest Textile Co., Ltd.）的個案研究，探討數位轉型對台灣紡織產業的影響。由於勞動力短缺及全球競爭日益激烈，台灣的紡織產業正借助工業 4.0 的浪潮進行現代化改革。宏遠興業作為智慧工廠發展的先驅，導入了物聯網（IoT）、自動化、雲端運算與資料分析等數位技術，以提升生產效率、改善品質控管，並促進永續發展。

本研究採用 acatech 工業 4.0 成熟度指數（Industrie 4.0 Maturity Index）作為評估架構，涵蓋四大面向：資源、資訊系統、組織結構與文化。資料來自於與宏遠興業協理的半結構式訪談及現地觀察。研究發現顯示，宏遠在多數面向已達第四至第五級的成熟度，特別在感測器部署、分散式決策、系統整合、創新與持續學習的文化等方面展現高度成熟。

整體而言，本研究凸顯了宏遠在數位轉型上的計畫性與前瞻性，同時為台灣其他紡織業者提供可行的轉型建議。研究也針對提升數位領導力與文化、系統互聯與預測性資料分析等面向提出具體建議。本研究補充了學術與產業界對於傳統製造業如何透過數位轉型取得競爭優勢的討論。

**關鍵字：** 數位轉型、工業 4.0、智慧工廠、台灣紡織產業、宏遠興業、數位成熟度、acatech 成熟度指數、物聯網、自動化

## Abstract

This thesis explores the influence of digital transformation on Taiwan's textile industry through a case study of Everest Textile Co., Ltd. Due to labor shortages and increased global competition, Taiwan's textile industry is drawing on the Industry 4.0 revolution to modernize its operations. Everest Textile is a pioneer of smart factory development, employing digital technologies, including the internet of things (IoT), automation, cloud computing, and data analytics, to assist in achieving production efficiencies, improve quality controls, and promote sustainability.

By using the acatech Industrie 4.0 Maturity Index framework to assess Everest's maturity, four domains are included; resource, information systems, organizational structure, and culture. The research collected data from a semi-structured interview with Everest Assistant Vice President and onsite observations during the data collection. The findings indicate Everest operates at maturity levels four to five in most domains. Everest demonstrated strong maturity regarding sensor deployments, decentralized decision making, systems integration, and a culture of innovation and continuous learning. Overall, this research serves to highlight Everest's planned and thoughtful approach to digital transformation while providing actionable insights for other textile manufacturers in Taiwan. Additionally, the research provides recommendations for increasing digital leadership and cultural aspects, interconnecting systems, and predictive data analytics. The study adds to the academic and industry conversation about leveraging digital transformation to obtain a competitive advantage in more traditional manufacturing sectors.

**Keywords:** digital transformation, Industry 4.0, smart factory, Taiwan textile industry, Everest Textile, digital maturity, acatech Maturity Index, IoT, automation

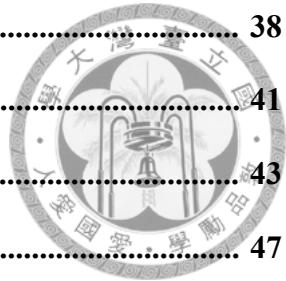
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## Chapter 1: Introduction



### 1.1 Background

The textile industry in Taiwan has been one of key drivers of national economic development, particularly in contributing to the nation's growth. However, in the past three decades, the industry has encountered challenges such as labor shortages and competitive global competition. For instance, in 2017, approximately 78% of employers in Taiwan reported facing talent shortages. The industrial and service sectors experienced around 218,000 manpower vacancies, especially among mid-level technicians and professionals (National Development Council, 2019). These structural challenges require the urgent need for reform in the textile sector.

Textile manufacturers increasingly embraced digital transformation to remain competitive in the world's increasingly digital and automated competition. Digital transformation is a comprehensive and holistic digital technology evolution across production systems, business operations, and the supply chain. Digital transformation covers many Industry 4.0 technologies, including IoT, cloud computing, big data analytics, automation, and cyber-physical systems (Moeuf et al., 2018). In relation to manufacturing, these technologies are associated with benefits such as increased operational efficiency, reduced lead times, increased product customization, improved quality control, and sustainability (Frank et al., 2019).

Taiwan's textile industry is taking advantage of this transformation to address longstanding challenges such as labor shortages and increased production costs. For instance, the country's synthetic fibers market is expected to grow from USD 2,878.5 million in 2022 to USD 4,588.8 million by 2030, with a compound annual growth rate (CAGR) of 6%, resulting in the growing technological capacity and market demand. (Grand View Research, 2023).

Technological innovation, especially the transition to integrated digital systems, provides

a game-changing opportunity for the textile industry. Automated dyeing systems, for example, allow manufacturers to utilize digital production monitoring and scheduled maintenance analytics, which allows for reduced machine downtime, improved fabric quality, and enhanced energy efficiency. Manufacturers can be more responsive, have fewer defects, and reduce the reliance on operators, which can all be very beneficial as the global market continues to evolve so quickly.

In Taiwan's textile industry, Everest Textile Co., Ltd., is a pioneer as a leading example of digital transformation. The company announced its "Everest 4.0" initiative to move the company's operations into a smart factory in 2014. It has utilized digitized tools such as a cloud monitoring system, IoT enhancements to machines, and an automated quality control system (Taiwan Today, 2017). Through the digital transformation, Everest aims to improve productivity, reduce operational inefficiencies, and offer solutions that can address environmental issues due to the textile production.

This research examines how Everest Textile's digital transformation has been implemented in four key areas, including resources, information system, organizational structure, and culture. The case study will be guided by semi-structured interviews with Everest's Assistant Vice President and direct onsite observations. By conducting an analysis of Everest's transformation journey, this study aims to offer a deeper understanding of how digitalization can be leveraged within Taiwan's textile sector. It will also provide practical implications for firms pursuing similar initiatives and contribute to the broader academic discourse on smart manufacturing and Industry 4.0.

## **1.2 Purpose of Study and Research Questions**

The study aims to analyze the effect of digital transformation on textile industry in Taiwan through a case study of Everest Textile's Industry 4.0 smart factory. The research is to explore how

the implementation of Industry 4.0 technology, such as automation, IoT, cloud computing, and data analytics adoption impacted production efficiency, product quality, sustainability, and innovation at Everest Textile. The research also seeks to assess the company's readiness and maturity level in its digital transformation journey using the industry 4.0 Maturity Index. By doing so, the study offers practical insights for other textile manufacturers in Taiwan facing similar operational and strategic challenges.

1. What types of digital transformation systems are currently used at Everest Textile, and how do they support decision-making and process automation?
2. What impact has the industry 4.0 adoption had on Everest Textile's production efficiency, product quality, and sustainability performance?
3. What lessons from Everest Textile's digital transformation can be applied to other Taiwanese textile companies facing similar industry pressures?

### **1.3 Relevance and Importance of the Research**

This research is highly relevant to the current transformation of Taiwan's textile industry, which is facing critical challenges such as increasing global competition, labor shortages, and rising demands for sustainable production. These challenges have significantly impacted the industry's growth potential, highlighting the urgent need for operational innovation and technological advancement.

By focusing on the digital transformation journey of Everest Textile, this study provides valuable insights into how textile manufacturers in Taiwan can integrate Industry 4.0 technologies to modernize their operations. The findings aim to serve as a practical guideline for other textile firms seeking to enhance production efficiency, reduce dependence on manual labor, and remain

competitive in an increasingly digital global market. Finally, this research offers policymakers and industry stakeholders a strategic framework for accelerating digital transformation across the textile sector, promoting long-term resilience and global competitiveness.



#### 1.4 Scope and Limitations of the Study

This research examined the digital transformation journey of Everest Textile Co., Ltd, a leading textile manufacturer in Taiwan, and has applied the acatech Industrie 4.0 Maturity Index to measure Everest's readiness and maturity in four key domains: resources, information systems, organizational structure, and culture. This research details how Everest adopted IoT, cloud systems, automation, and real-time data analytics to create an overall improvement in operational efficiency, product quality, and organizational adaptability. Data were collected through a semi-structured interview of Everest's Assistant Vice President and observations while on site in the smart factory.

However, there are a few limitations of this study. First, it is a single case study, which limits the potential for generalizing the results for the application to other firms, especially for small or medium-sized enterprises (SMEs) with less capability. Second, the collection of data relies mainly on the perspective of one senior executive. Although it is insightful, the data may not provide the full extent of the perspectives of all Everest employees. Third, quantitative data related to performance metrics including cost savings, production output, or return on investment (ROI) could not be included due to confidentiality, thus limiting the ability to measure transformation outcomes in numeric measurements.

Lastly, digital transformation is ongoing, thus the findings referred to the status of Everest at the time of this study and can change as it may implement new technologies. Despite these

limitations, this study has provided valuable insights into the real-life issues and methods of implementation of Industry 4.0 in Taiwan's textile industry.



## Chapter 2: Review of Literature

Digital transformation is a growing theme in the advancement of the textile industry. Today, global markets are putting pressure on companies to be more efficient, flexible, and sustainable. The term "digital transformation" refers to companies embracing various technologies including automation, the Internet of Things (IoT), cloud computing, big data analytics, and artificial intelligence, within their traditional manufacturing processes. The emergence of smart factories, which integrate new digital technologies into manufacturing, allows for decision-making based on real-time data, reduces labor, offers predictive maintenance, optimizes supply chains, and decreases environmental impacts, giving manufacturers a competitive edge. In Taiwan, textile companies have leveraged digital technologies to address industry challenges including labor shortages, higher production costs, and customer demand for quicker product customization. This literature review analyzes prior research on digital transformation in textile manufacturing on six focus areas: production optimizations, smart factories, workforce upskilling, sustainability, assessing digital maturity, and organizational challenges with transitioning to Industry 4.0.

### 2.1 Digital Transformation in the Textile Industry

The adoption of digital transformation in manufacturing has become a core driver of competitiveness in the era of Industry 4.0. Digital transformation refers to the holistic integration of digital technologies, including automation, the Internet of Things (IoT), cloud computing, big data analytics, cyber-physical systems, and artificial intelligence. These technologies are across business operations and production processes (Moeuf et al., 2018). For the textile industry, this shift is particularly crucial given its dependence on precision, mass customization, and global supply chain coordination.

## 2.2 Smart Manufacturing and Industry 4.0 in Textiles

Textile companies around the world adopt smart manufacturing systems to enhance operational processes, improve flexibility and responsiveness to consumers or the market. With the use of connected devices and sensors, manufacturers can obtain real-time insights across production lines in order to make better decisions and to predict trends (Frank et al., 2019). These advancements can help to improve lead times, reduce excess waste, and increase energy efficiency, which are all becoming more of a concern in a sustainability-driven industry.

One of many examples of digital transformation is Everest Textile Co., Ltd. in Taiwan. The company announced its "Everest 4.0" program in 2014, which mentioned a wide range of technologies such as IoT, cloud-based systems, automated dyeing, digital quality monitoring, and dataviz in attempts to replace their traditional manufacturing process (Taiwan Today, 2017). Today, Everest has built a smart factory ecosystem, showcasing the company's functional and sustainable textile solutions.

Digital transformation also facilitates increased configurability and responsiveness to consumer needs. Smart factories can use real time demand signals to aggressively recalibrate production quantities and product designs for dynamically changing fashion and sporting goods markets, consistent with Everest's operational activities.

## 2.3 Assessing Digital Maturity in the Textile Industry

To measure and guide their transformation efforts, many organizations use maturity models. The Industry 4.0 Maturity Index, developed by acatech, is particularly relevant as it evaluates companies across four dimensions: resources, information systems, organizational structure, and culture. The index classifies their progress through six maturity stages from computerization to

adaptability (Schuh et al., 2017). This framework provides a structured approach for identifying gaps and prioritizing areas of improvement.

In this research, the Industry 4.0 Maturity Index will be used to assess Everest Textile's transformation status, linking interview insights to a broader strategic evaluation of its smart factory development.



The framework assesses organizational readiness across **four core dimensions**:

- **Resources**: Availability and digital integration of machinery, production equipment, and infrastructure.
- **Information Systems**: Capabilities for data collection, connectivity, visibility, and analytics.
- **Organizational Structure**: Flexibility of operations, decentralization of decisions, and process integration.
- **Culture**: Openness to change, innovation, and cross-functional collaboration.

Each dimension is evaluated through **six maturity levels**:

1. **Computerization** – Use of IT systems for basic tasks
2. **Connectivity** – Systems and machines are connected
3. **Visibility** – Real-time status data is available
4. **Transparency** – Data is interpreted to generate insights
5. **Predictive Capacity** – Systems can predict future events
6. **Adaptability** – Systems can autonomously respond to changes

This maturity model is particularly valuable in identifying gaps in current capabilities and prioritizing areas for investment and improvement. Compared to other frameworks like RAMI 4.0 or Singapore's Smart Industry Readiness Index, the Acatech model is uniquely process-oriented and allows companies to self-assess in a modular, scalable manner (Moeuf et al., 2018). In the

context of Taiwan's textile sector, which faces significant challenges in labor shortages and operational efficiency, the maturity index offers a practical tool to evaluate the effectiveness of digital transformation initiatives at the firm level.



## 2.4 Challenges of Digital Transformation

While the potential offered by digital transformation is truly substantial, several barriers must be overcome. Legacy systems compatibility presents a major hurdle, as most firms still utilize older systems which are unlikely to be compatible with newer digital systems. In addition to legacy systems, many firms face other challenges in their digital transformation including data quality, cybersecurity, and employee digital literacy (Schuh et al., 2017). Moreover, the high costs of deploying smart technologies are sometimes prohibitive for many firms, an issue that especially affects small and medium-sized enterprises (Espina-Romero et al., 2024).

A third major consideration is organizational readiness. Successful digital transformation relies on a supportive company culture, leadership support, strategic alignment, and willingness from employees to adapt to new ways of working (Moeuf et al., 2018). To be ready for these emerging roles in the digital economy, firms will need to commit to up-skilling and re-skilling their employees into new roles including data analysts, automation engineers, or system integrators. The literature shows that digital transformation, supported by Industry 4.0 technologies, can significantly enhance competitiveness in the textile industry. It enables process optimization, sustainability improvements, and greater responsiveness to market demands. Everest Textile's proactive adoption of digital tools set an example of how companies can transition toward smarter, more resilient operations. However, challenges in integration, investment, and workforce development must be carefully managed to fully realize these benefits. This study aims to build

upon the existing literature by using a case study of Everest Textile to explore the operational and strategic impacts of digital transformation in Taiwan's textile sector.



## Chapter 3: Research Methodology



### 3.1 Research Design and Data Collection

The in-depth interviews as a qualitative approach will be conducted for this proposed research. This will be an original data collection method as it directly engages a primary data collection process with the Assistant Vice President at Everest Textile. The main objective is to understand the impact of digital transformation implementation on various aspects of Taiwan's textile industry. By analyzing the insights from a key decision-maker, the study aims to explore the impact of digital transformation on production efficiency, product quality, and innovation within the company.

The study's research questions address specific areas of interest, such as the types of automation, IoT systems implemented, their effects on operational performance, challenges encountered during adoption, and their contributions to sustainability. While this method offers deep and valuable insights, it may be limited by its reliance on a single participant's perspective, which might not fully represent the organization's broader experiences. Nonetheless, the study design ensures a rigorous and systematic approach to exploring the potential of digital transformation in Taiwan's textile industry.

### 3.2 Interview Framework Based on acatech Maturity Index

To systematically assess Everest Textile's digital transformation readiness, this study developed a comprehensive interview framework grounded in the acatech Industrie 4.0 Maturity Index (Schuh et al., 2017). This study will apply the Industry 4.0 Maturity Index as a diagnostic tool to assess Everest Textile's digital transformation readiness. The six-dimensional framework will guide the thematic analysis of interview responses, allowing the researcher to classify

Everest's maturity level in key domains such as information systems, resources, and organizational strategy.



The maturity levels (from Computerization to Adaptability) will be used as a qualitative scale to interpret Everest's status and identify areas of strength or improvement. By integrating this maturity model, the research aims to provide a holistic view of Everest Textile's smart factory development. This does not only cover implemented technologies but also includes its cultural and organizational readiness for digital transformation.

The interview targeted an Assistant Vice President (AVP) at Everest Textile, who holds senior responsibility for digitalization initiatives within the company. By grounding the interview in the acatech framework and systematically covering critical dimensions, this study ensured a rigorous and holistic evaluation of Everest Textile's Industry 4.0 maturity.

The interview questions were structured around four key structural areas critical to Industry 4.0 readiness:

- **Resources**
- **Information Systems**
- **Organizational Structure**
- **Culture**

Each structural area was further divided into two guiding principles, following the acatech model. Within these principles, detailed questions were developed to explore the company's

capabilities, mapping to the six maturity stages: **Computerization, Connectivity, Visibility, Transparency, Predictive Capacity, and Adaptability.**



The interview guide was organized as follows:

## I. Resources

- Digital Competency Development:

Questions examined the company's efforts to ensure employee digital skills, interdisciplinary knowledge sharing, and empowerment to leverage digital tools.

- Human-Machine Interface Design:

The interview explored usability and ergonomic considerations in the deployment of digital technologies.

- Sensor and Actuator Usage:

Topics included the extent of sensor deployment, types of collected data, and relevance definition processes.

- Internal Communication Systems:

Questions addressed the integration of IT platforms for communication, management of role-based access, and use of digital approval workflows.

- Decentralized Data Processing:

The degree of local (edge) processing of sensor data before central analysis was investigated.



## II. Information Systems

- Systems Integration:

The interview explored how well different IT systems (e.g., ERP, MES, PLM, CRM, IoT platforms) were connected and how data flowed between systems.

- Data Governance:

The discussion covered established data governance policies related to data quality, storage, and access management.

- IT Security Measures:

Questions examined cybersecurity standards and controls, such as compliance with IEC 62443.

- Data Use and Analytics:

Topics included how operational data was analyzed, the level of predictive analytics adoption, and integration of real-time insights into decision-making.

## III. Organizational Structure

- Internal Flexibility:

The interview investigated the formation of cross-functional teams, the decentralization of decision-making, and adoption of agile project management methodologies.

- External Collaboration:

Questions examined how Everest Textile digitally collaborates with suppliers and customers, uses digital platforms, and integrates customer feedback into production and innovation efforts.



#### IV. Culture

- Willingness to Change:

The discussion explored openness to innovation, support for data-driven decision-making, and encouragement of continuous employee development.

- Social Collaboration and Communication:

Questions focused on leadership styles, mechanisms for open communication, confidence in information systems, and employee involvement in system design and improvement initiatives.

Each interview question was carefully mapped to one or more maturity stages and structural dimensions, allowing for a structured thematic analysis. This ensured that the responses could be systematically analyzed to:

- Identify Everest Textile's current maturity stage across multiple dimensions.
- Highlight strengths, gaps, and opportunities for further digital transformation.
- Provide actionable recommendations based on both technical and organizational readiness factors.

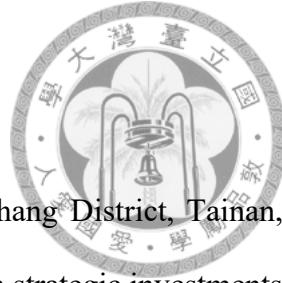
The interview was conducted in a semi-structured format to allow flexibility while maintaining alignment with the research objectives. The participant was encouraged to elaborate

on their experiences, providing depth to the thematic coding during analysis. The interview process was carefully planned, including developing an open-ended question guide, scheduling the session at a mutually convenient time, and recording the discussion with consent. Ethical considerations such as informed consent, confidentiality, and the participant's right to withdraw will be strictly adhered to. The data was transcribed and analyzed using thematic analysis to identify patterns and insights relevant to the research questions.

### **3.3 Onsite Observation**

In addition to interviewing an Assistant Vice President at Everest Textile, this study also included an onsite observation at the company's factory. The purpose was to directly see how the production process works and how digital transformation implications are used in daily operations. During the visit, the researcher observed important steps such as fabric preparation, dyeing, lab dipping, digital printing, and quality checks. Notes were taken on how machines and people worked together, and where digital transformation helped improve the process. These observations helped support and explain the interview findings by giving a real-world view of how AI affects production speed, product quality, and decision-making. By combining interviews and factory visits, the study provides a more complete and reliable picture of how digital transformation is used at Everest Textile.

## Chapter 4: Case Analysis



### 4.1 Company Background – Everest Textile

Everest Textile was founded in 1988 and headquartered in Shanshang District, Tainan, Taiwan. It had evolved into a vertically integrated textile enterprise through strategic investments in upstream processes such as yarn texturizing and weaving, Everest positioned itself to control quality and innovation across the entire textile production chain. Today the company is a leading manufacturer of high-performance and eco-friendly textiles. (Everest Textile n.d.).

In the mid-1990s, Everest established a research and development center to drive innovation, focusing on functional fabrics for sports, outdoor, and performance apparel. This emphasis on R&D allowed the company to become a trusted supplier to many international brands, including Nike, Lululemon, and The North Face. Its product offerings include advanced fabric technologies such as moisture-wicking, UV protection, antibacterial treatment, and eco-friendly finishes. Throughout the 2000s, Everest expanded its manufacturing footprint globally, establishing facilities in Thailand, the United States, and China to meet increasing demand and support international operations. A key milestone came in 2016 when the company built a smart factory in Taiwan, embracing Industry 4.0 technologies such as AI, IoT, and automation to enhance production efficiency and precision (Everest Textile n.d.).

Sustainability has become a core pillar of Everest's strategy. The company is certified by global standards such as Bluesign®, OEKO-TEX®, and GRS, and actively incorporates recycled PET, bio-based fibers, and low-impact processes into its operations. Through its forward-looking innovation and green initiatives, Everest Textile continues to lead the industry in functional, sustainable textile solutions for the global market (Everest Textile n.d.).

Everest Textile's journey toward digital transformation began with foundational ERP systems prior to 2015. Between 2015 and 2022, the company focused on systematization and automation, introducing applications such as AI-based color matching, fabric defect detection, and robotic process automation (RPA), including AGVs and AR/VR technologies. Since 2023, Everest has advanced into an Industry 3.5+ stage, integrating AIoT systems, real-time monitoring, and cloud-based platforms like Wise-PaaS and Microsoft Azure. The company implemented MES, Power BI dashboards, 5G-enabled logistics, and AI-enhanced decision tools to optimize scheduling, maintenance, and energy use. These developments enable cross-system data integration, enhance production flexibility, and foster a data-driven manufacturing environment characterized by resilience and efficiency.

## 4.2 Resource Maturity Level

According to the acatech Industrie 4.0 Maturity Index, the Resources dimension encompasses the physical and tangible assets within an organization, such as human resources, machinery, tools, materials, and final products (acatech, 2017). Within this domain, two key principles are identified: Digital Capability and Structured Communication.

The Digital Capability principle emphasizes ensuring that employees possess the necessary competencies to operate digital tools and that technical systems are digitally prepared for information-based workflows. This includes providing digital skills, fostering interdisciplinary approaches, designing task-oriented and ergonomic digital interfaces, utilizing sensors and actuators for data acquisition, enabling internal communication through IT systems, and implementing decentralized pre-processing of sensor data before transmission to central systems (acatech, 2017). Closely related is the principle of Structured Communication, which focuses on the organized exchange of data between individuals and machines. Capabilities associated with

digital competencies, data acquisition, efficient communication, and decentralized data processing contribute directly to this principle.



#### **4.2.1 Digital Competency Development**

Everest Textile has made significant strides in ensuring its workforce is digitally capable—a key aspect of the “Digital Capability” principle. To support skill development, the company established a structured and layered training mechanism. Internally, Everest created a digital transformation task force with representatives from various departments to lead and coordinate training, project planning, and capability building. Employees are encouraged to engage in continuous learning through multiple channels. For example, some staff were sent to the Taiwan AI Academy to undertake structured courses ranging from technical skills to managerial know-how. Everest also offers in-house training sessions facilitated by external lecturers to enhance relevance. Additionally, a company-built e-learning platform provides self-paced courses on digital tools, process optimization, and general competencies. Employees who complete professional certifications are rewarded with financial subsidies, further incentivizing learning. These initiatives collectively reflect Everest’s maturity at Level 4 (Transparency) to Level 5 (Predictive Capacity), where training is not only structured and aligned with digital strategies but also forward-looking, encouraging employees to anticipate and prepare for future digital demands (Schuh et al., 2017; RT Tzeng, 2025).

#### **4.2.2 Human-Machine Interface Design**

Everest Textile has placed significant emphasis on designing user-friendly digital interfaces to support production decision-making. Systems such as SAP and ABS are customized to present centralized dashboards, reducing the need for users to switch between multiple systems. These

dashboards include drill-down functions, allowing employees to quickly move from summary views to detailed data. Layouts are adjusted based on job roles and user needs, considering ergonomic principles and accessibility, especially for frontline workers, including foreign employees. One notable example is the Dyeing Machine Real-Time Kanban system used in Everest's dyeing process as shown in Figure 1. This interface integrates machine schedules, work-in-progress (WIP), and real-time operational status. Machines are color-coded for immediate visual recognition, helping supervisors and operators quickly assess which machines are in use, idle, or ready for unloading. The display is segmented by aisle and presents clear numeric indicators, enabling fast, accurate decisions with minimal training. This type of ergonomic and role-specific visualization directly enhances productivity and reduces miscommunication on the shop floor (Everest Textile, 2023).

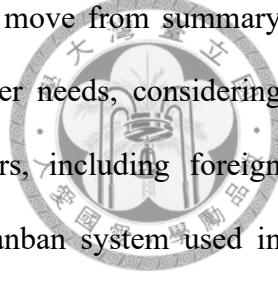


Figure 1. Dyeing Machine Real-Time Kanban Current System (Everest Textile, 2023)

| Factory 1 of unloading the dye machine current kanban |     |   |   |  |        |     |   |   |       |     |   |   |
|---|-----|---|---|--|--------|-----|---|---|-------|-----|---|---|
| 東慶300   | D39 | 0 | 2 |  | 東慶300  | D20 | 2 | 2 | 亞穡600 |     |   |   |
| 東慶300   | D28 | 2 | 3 |  | 東慶300  | D19 | 5 | 0 | D15   | 2   | 2 |   |
| 東慶300   | D27 | 0 | 4 |  | 東慶300  | D18 | 0 | 5 | 亞穡600 | D14 | 2 | 5 |
| 東慶300   | D26 | 4 | 1 |  | 東慶300  | D17 | 2 | 3 | 亞穡300 | D13 | 1 | 1 |
| 東慶300   | D25 | 0 | 6 |  | 東慶300  | D16 | 2 | 1 | 亞穡300 | D12 | 3 | 0 |
| 新東慶600  | D24 | 0 | 0 |  | 小野森    | D29 | 2 | 1 | 東慶300 | D11 | 0 | 3 |
| 新東慶600  | D23 | 0 | 0 |  | 小野森    | D30 | 1 | 2 | 東慶600 | D10 | 1 | 5 |
| 新東慶600  | D22 | 0 | 0 |  | 大昆南600 | D38 | 0 | 0 | 東慶600 | D09 | 2 | 2 |
| 新東慶300  | D21 | 0 | 0 |  | 大昆南600 | D37 | 4 | 0 | 一廠草管  | D37 | 4 | 0 |
| Aisle   |     |   |   |  | Aisle  |     |   |   |       |     |   |   |
| 亞穡300   | D08 | 2 | 4 |  | 亞穡600  | D07 | 3 | 2 |       |     |   |   |
| 亞穡600   | D06 | 1 | 1 |  | 東慶600  | D05 | 2 | 2 |       |     |   |   |
| 東慶300   | D04 | 1 | 3 |  | 東慶600  | D04 | 1 | 3 |       |     |   |   |
| 東慶300   | D03 | 1 | 3 |  | 東慶600  | D02 | 3 | 1 |       |     |   |   |
| 東慶600   | D01 | 1 | 2 |  | 東慶300  | D31 | 4 | 3 |       |     |   |   |
| 東慶300   | D32 | 1 | 2 |  | 東慶300  | D32 | 1 | 2 |       |     |   |   |
| 東慶300   | D33 | 3 | 1 |  | 東慶300  | D33 | 3 | 1 |       |     |   |   |
| 東慶600   | D34 | 0 | 3 |  | 東慶600  | D34 | 0 | 3 |       |     |   |   |
| 東慶600   | D35 | 2 | 3 |  | 東慶600  | D35 | 2 | 3 |       |     |   |   |
| 一廠草管  | D36 | 5 | 0 |  | 一廠草管   | D36 | 5 | 0 |       |     |   |   |
| 亞穡100   | D81 | 3 | 3 |  | 昆南75   | D54 | 5 | 1 |       |     |   |   |

The importance of user-oriented interface design is further reinforced by interview insights. According to the Assistant Vice President of the Digital Service Center, “departments like

production planning, R&D, sales, and finance treat digital tools and dashboards as standard. For example, production planners and managers use digital dashboards to track progress, output, and issues for real-time decisions. Employees also give feedback to IT for interface improvements, and dashboards are regularly used in cross-departmental meetings to support executive-level decisions (RT Tzeng, 2025).



These features collectively place Everest in the Level 4 to Level 5 range of digital maturity in Human-Machine Interface Design under the acatech framework—where digital systems not only present real-time data but also deliver usable, context-aware, and task-optimized interfaces that empower decision-making (Schuh et al., 2017).

#### **4.2.3 Data Acquisition via Sensors and Actuators**

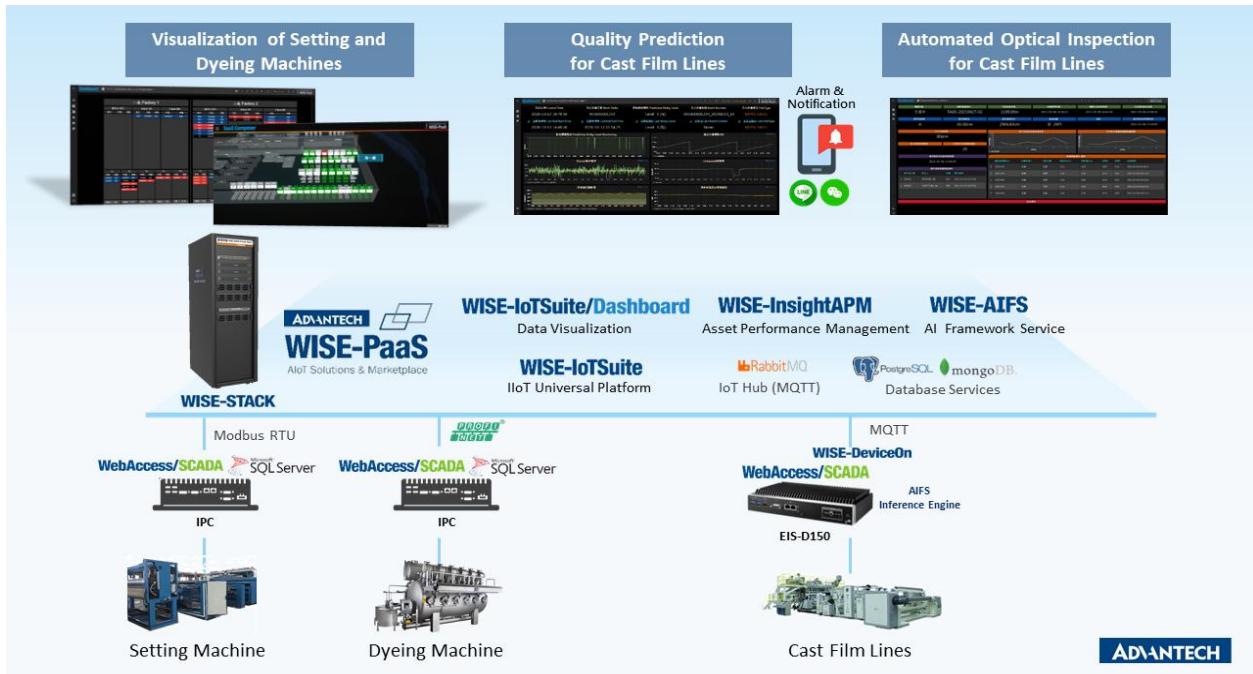
Everest Textile has implemented a strategic approach to sensor and actuator deployment, focusing on high-impact machinery across its production lines. Rather than equipping all equipment with sensors, the company prioritizes key assets such as looms, dyeing machines, and stenter machines. For example, sensors installed in dyeing units monitor temperature, chemical concentrations, and tension, which are critical for ensuring fabric quality consistency and color accuracy. In the weaving area, all looms are equipped with digital monitoring systems that provide real-time feedback, enabling quick responses to abnormalities and reducing the risk of defects or operational delays.

This approach is further supported by advanced Industrial IoT (IIoT) platforms like Advantech's WISE-PaaS, as illustrated in Figure 2. The system architecture connects dyeing and setting machines to centralized SCADA interfaces through industrial PCs (IPCs), which then feed data into a cloud-based platform for real-time visualization, alarm notifications, and predictive

analytics. The platform includes modules such as WISE-IoTSuite for data collection, WISE-InsightAPM for asset performance monitoring, and WISE-AIFS for AI-based quality prediction and automated optical inspection. These tools allow Everest to process sensor data locally on edge devices (e.g., EIS-D150), filter it, and transmit relevant information via MQTT protocols to central databases like PostgreSQL or MongoDB for further analysis.

This integrated setup enables proactive monitoring of machine performance, supports predictive maintenance, and reduces manual oversight. These capabilities position Everest in the Level 5 (Predictive Capacity) to Level 6 (Adaptability) range on the acatech maturity scale, where machines not only detect but also respond to events in near real time (Schuh et al., 2017; Advantech, n.d.).

*Figure 2. Industrial IoT platform for smart monitoring and AI quality control (Advantech, n.d.)*



#### 4.2.4 Efficient Communication

Communication systems at Everest demonstrate a thoughtful blend of practicality and integration. The company uses LINE as its primary internal communication tool, favored for its familiarity and ease of use. Importantly, Everest has extended its functionality by integrating LINE with internal systems through APIs to push automated alerts—such as stock-in notifications or quality warnings—directly to relevant employees. For formal operations, Everest uses ERP systems that ensure traceable, structured communication, particularly in procurement, HR, and inventory. Moreover, digital signatures are employed for multi-level approvals, which accelerates decision-making while maintaining accountability and transparency. These processes show Everest's alignment with Level 4–5 maturity in Structured Communication, where information systems support traceable workflows, deliver insights to appropriate roles, and enhance coordination across departments (RT Tzeng, 2025).



#### 4.2.5 Decentralized (Edge) Data Processing

One of the most advanced features of Everest's digital infrastructure is its use of decentralized data processing, or edge computing. Sensor data from machines is initially processed locally on edge devices to remove noise and highlight meaningful insights before being transmitted to central systems. This step reduces the computational burden on centralized platforms and speeds up real-time responses for operational decisions. For example, if a loom shows abnormal tension levels, the local system can trigger immediate intervention without waiting for central validation. This architecture allows Everest to move toward Level 6 (Adaptability), where systems can support real-time decision-making and semi-autonomous responses. Edge processing not only enhances responsiveness but also contributes to more efficient bandwidth usage and system

reliability (Everest Textile, 2025).



#### 4.2.6 Real-World Integration Examples

Everest Textile's maturity in the resource domain is further demonstrated through practical integration examples. In its greige weaving operation, Everest employs a tension control system and real-time monitoring to ensure fabric quality, reducing defects and downtime. During the lab dipping process, spectrophotometers connected to centralized databases allow precise color matching and faster customer approvals. The dye receipt system is supported by a barcode-based inventory platform that enhances traceability and reduces manual data entry.

Moreover, Everest is piloting an AI-powered logistics platform with 5G, visual recognition, and robotic dispatch. This system identifies fabric carts in storage areas and automates vehicle assignments based on production priorities and wait times. Figure 3 below shows the AI-driven robotic vehicle transporting textile rolls, a core part of Everest's smart logistics pilot. These real-world applications demonstrate Everest's commitment to automation, data integration, and proactive management. This features characteristic of organizations approaching Level 6 (Adaptability) in digital maturity (Schuh et al., 2017; RT Tzeng, 2025).

Figure 3. AI-driven robotic vehicle (Everest Textile, 2025)



#### 4.2.7 Overall Assessment on Resource

Taking all elements together, Everest Textile has clearly moved beyond the early stages of computerization and connectivity. Its focus on employee upskilling, smart sensor deployment, responsive communication platforms, and edge computing reflects a strong position in the Visibility to Predictive Capacity range of the acatech maturity model. Some operations, such as logistics and dyeing control, show early signs of Adaptability, where systems are becoming capable of making autonomous or near-autonomous decisions. Although Everest has not conducted a formal numerical maturity score, qualitative evidence indicates substantial progress and readiness for future digital evolution.

### 4.3. Information System Maturity Level

The “Information Systems” dimension of the acatech Industrie 4.0 Maturity Index evaluates how well a company connects, manages, and uses its digital infrastructure for integrated

decision-making. Everest Textile shows significant maturity in this area, especially through its efforts in IT system integration, data governance, cybersecurity, and business intelligence. These capabilities indicate Everest is operating at Level 4 (Transparency) and advancing toward Level 5 (Predictive Capacity) across many aspects of its digital ecosystem.



### 4.3.1 Systems Integration

One of the most critical milestones is Everest's development of a "Digital Twin" platform, which integrates its core IT systems—ERP (Enterprise Resource Planning), MES (Manufacturing Execution System), PLM (Product Lifecycle Management), and IoT machine data—into a single visual environment. This unified platform enables real-time dashboards, performance monitoring, and centralized decision-making. In addition, Everest is building a Data Lake to consolidate structured and unstructured data from various systems. This move supports the company's goal of achieving a Single Source of Truth (SSOT), where different departments can access consistent and up-to-date data for planning, analytics, and cross-functional collaboration (RT Tzeng, 2025).

### 4.3.2 Data Governance

To support this infrastructure, Everest applies data governance policies through a Business Process Management (BPM) system. Employees must submit access requests with a clear business justification, and approvals are routed through IT, information security, and department heads. Access rights are strictly role-based, following the "least privilege" rule. Regular audits are conducted to review permissions and remove redundant authorizations. This structured approach to data access reflects maturity at Level 4, where access is traceable, contextual, and tied to

operational responsibilities (Schuh et al., 2017; RT Tzeng, personal communication, 2025).



### 4.3.3 IT Security

Everest Textile has implemented a comprehensive cybersecurity strategy aimed at achieving “Zero Information Security Risks.” The company has developed a multi-tiered information security framework involving governance, execution, and oversight, supported by dedicated personnel and an internal Information Security Committee. To strengthen its digital infrastructure, Everest secures critical network segments with firewalls, anti-virus tools, intrusion detection systems, and remote backups, including Azure cloud storage. Access control is strictly enforced through personnel account audits, regular ERP password resets, and remote access restrictions. File safety is maintained by designated personnel who manage regular server and application backups alongside automated remote archival systems. Real-time security is enhanced by internal virus protection and external monitoring for abnormal network behavior, helping prevent hacker intrusions and personal data leaks. The company also runs HA-based system recovery drills and server virtualization with redundant storage mechanisms to ensure fast recovery from incidents. In addition, Everest fosters employee security awareness through ongoing training and requires developers to meet baseline cybersecurity competencies. By 2023, the company initiated implementation of AI-based threat detection tools and multi-factor authentication to intelligently block intrusions and enhance account protection. These combined efforts reflect a Level 5 (Predictive Capacity) IT maturity, positioning Everest to anticipate, detect, and contain cyber threats proactively (Everest Textile Co., Ltd., 2023; RT Tzeng, 2025).

#### 4.3.4 Overall Assessment on Information System

Although Everest has not yet deployed full artificial intelligence capabilities, it is actively preparing for it. Business users currently rely on business intelligence (BI) tools and statistical platforms for performance tracking. However, the company is building a foundation for AutoML (Automated Machine Learning), aiming to empower non-technical users to create predictive models with minimal coding. Once implemented, this will elevate Everest to Level 5 and possibly Level 6 (Adaptability), where AI-driven insights can inform and automate operational decisions in real time (RT Tzeng, 2025).

Collectively, Everest's actions in system integration, governance, security, and AI readiness show strong alignment with the higher tiers of digital maturity. The company is transitioning from systems that only describe the past (Visibility) to platforms that interpret, predict, and soon, autonomously act upon digital signals across the organization.

### 4.4 Organizational Structure

The “Organizational Structure” domain in the acatech Industrie 4.0 Maturity Index focuses on a company’s internal flexibility, decentralization of decisions, agile management, and external collaboration. Everest Textile demonstrates significant maturity in these areas, particularly in how it structures internal teams to lead digital transformation, decentralizes operational decision-making, and facilitates data-driven collaboration across departments. These practices reflect Everest’s position at Level 4 (Transparency) and in some areas Level 5 (Predictive Capacity) of digital maturity.



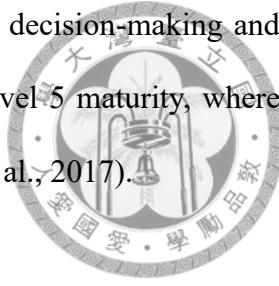
#### 4.4.1 Flexible Communities

One key structural strategy is Everest's implementation of a "seed staff" system, where each department nominates 2 to 3 digitally capable team members to act as internal champions for digital tools and transformation projects. These individuals play a dual role: supporting their team's understanding of new systems and acting as a bridge to the IT department by translating daily operational needs into system requirements. For larger cross-functional projects, Everest assigns dedicated IT leads and forms working groups across departments to ensure smooth implementation. This model demonstrates a flexible internal structure that supports decentralized learning and digital execution—an indicator of Level 4 maturity, where collaboration is structured, transparent, and increasingly proactive (RT Tzeng, 2025).

Everest Textile's approach to decision-making reflects a clear shift toward decentralization, particularly through the use of real-time data tools and role-based digital workflows. As noted by the company's Assistant Vice President, production planners and managers across departments such as R&D, sales, and finance actively use digital dashboards to monitor progress, track issues, and make real-time operational decisions without requiring upper-level approval. One incident involved an employee who reported, "The system isn't working, I can't do my job," after a dashboard failure—highlighting how essential these tools are to frontline autonomy (RT Tzeng, 2025). Additionally, Everest enforces a role-based access model through its Business Process Management (BPM) system. Employees receive system permissions based on their responsibilities, and approvals are routed accordingly to streamline operational workflows. Regular audits are conducted to ensure access aligns with job functions and to prevent over-permissioning (Everest Textile Co., Ltd., 2023). Together, these practices illustrate how Everest decentralizes routine and tactical decision-making, allowing employees to act quickly while maintaining governance and



traceability. This illustrates that real-time systems have become central to decision-making and that frontline users are authorized to act on insights—characteristic of Level 5 maturity, where decision rights align with digital tools and predictive information (Schuh et al., 2017).



#### **4.4.2 Agile Management**

Regarding agile management, Everest is in a transition phase. While formal agile frameworks like Scrum are not widely institutionalized, the company has adopted iterative and user-focused practices in digital system development. Teams actively collect user feedback on system interfaces (e.g., SAP, ABS), optimize workflows, and quickly adjust dashboard features to better support daily operations. This reflects Level 4 maturity, where iterative improvement cycles and user involvement in design are becoming systematic, though not yet fully agile.

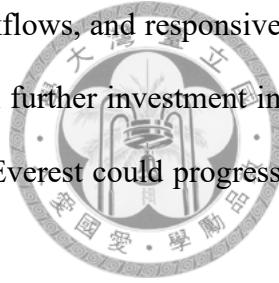
#### **4.4.3 Focus on Customer Benefits**

Externally, Everest is also improving its collaborative structure with partners. Through customized traceability systems and responsive IT adjustments, the company shares digital production and quality data with customers, particularly key clients with high standards. Though most data sharing is still structured and not yet fully automated, Everest has shown the ability to adapt processes to customer needs—suggesting a Level 4 maturity in external collaboration and movement toward predictive partnership coordination.

#### **4.4.4 Overall Assessment on Organizational Structure**

In summary, Everest Textile's organizational structure is well-aligned with the transparency and predictive stages of the acatech maturity model. Its internal seed staff network,

decentralized decision-making enabled by data tools, iterative project workflows, and responsive external collaboration demonstrate a high degree of digital readiness. With further investment in formal agile methods and broader real-time data exchange with partners, Everest could progress toward Level 6 (Adaptability) in this dimension.



#### 4.5 Culture

In the acatech Industrie 4.0 Maturity Index, the “Culture” dimension assesses how open an organization is to change, how well employees collaborate across levels and departments, and how decisions are supported by data. Based on Everest Textile’s case, the company has built a culture that encourages digital adoption, learning from mistakes, and data-driven decision-making. These behaviors place Everest in Level 4 (Transparency) and progressing toward Level 5 (Predictive Capacity).

A defining feature of Everest’s culture is its openness to innovation and willingness to change. The leadership actively supports digital transformation and promotes a learning mindset. For example, the current COO encourages transparency and accepts mistakes as part of improvement. Employees are allowed to voice issues and propose solutions, which are taken seriously by leadership. This marks a cultural shift from traditional command-and-control toward empowered problem-solving. This shows characteristic of Level 4 maturity, where mistakes are discussed openly and used to find root causes, not to assign blame (Schuh et al., 2017; RT Tzeng, 2025;).

Data-driven decision-making is also embedded into Everest’s daily operations. Teams across production, R&D, and sales rely on dashboards and digital tools to guide actions. For instance, production managers track real-time output and downtime data to adjust schedules on the

spot. Employees also provide feedback to improve dashboards, which shows their trust in systems and engagement with digital tools. These behaviors align with Level 5 maturity, where decisions are not just based on real-time information but also on predictive insights and proactive planning (Everest Textile, 2025).



In terms of learning and professional development, Everest supports continuous skill-building through an internal e-learning platform, external training programs, and certification incentives. Employees can identify their own learning needs, especially for digital tools, and are encouraged to take courses aligned with their job functions. This setup supports a culture of self-directed growth, a marker of Level 5 maturity where employees anticipate future skill demands and help shape their own learning paths (Schuh et al., 2017).

Everest also emphasizes collaboration and communication across roles and departments. Mechanisms such as digital “seed staff” networks and small-group training sessions encourage sharing of knowledge and best practices. Furthermore, employees are involved in system design and are regularly asked for feedback, helping to improve usability and relevance. This aligns with Level 4–5 maturity, where knowledge-sharing is structured, employee voices are valued, and cross-functional learning drives improvement (RT Tzeng, 2025).

Overall, Everest Textile’s culture shows strong alignment with the principles of transparency, learning, and collaboration outlined in the acatech model. The company has moved beyond isolated digital trials to embrace a workplace environment where digital tools, employee input, and continuous learning are central to how people work and lead. With further development in autonomous decision-making and full integration of predictive analytics into everyday routines, Everest is on a clear path toward reaching Level 6 (Adaptability).

## Chapter 5: Conclusion



### 5.1 Summary

This thesis explored the impact of digital transformation on Taiwan's textile industry through an in-depth case study of Everest Textile. The research focused on how Industry 4.0 technologies—such as IoT, automation, cloud computing, and predictive analytics—have been adopted to improve production efficiency, quality control, sustainability, and organizational agility. Using the acatech Industrie 4.0 Maturity Index, Everest's digital readiness was assessed across four domains: resources, information systems, organizational structure, and culture. The study relied on an expert interview with Everest's Assistant Vice President, supported by on-site observations of its smart factory operations.

### 5.2 Key Findings

Everest Textile's digital transformation has significantly advanced its operational, strategic, and cultural capabilities. First, operational performance has improved through targeted use of IoT sensors, real-time dashboards, and edge computing. These technologies enable accurate monitoring, predictive maintenance, and quicker decision-making in processes such as dyeing, weaving, and logistics. Real-world examples like the AI-driven logistics platform and smart tension control systems show clear gains in efficiency and quality.

Second, the company's organizational structure has become more flexible and decentralized. With its “seed staff” system and cross-departmental task forces, Everest empowers local teams to lead digital initiatives and make decisions based on real-time data. Frontline workers rely on dashboards for daily planning, and feedback loops between users and IT support continuous improvement. While Everest has not fully institutionalized agile frameworks, iterative

development practices are in place.

Third, Everest's strategic digital capability is growing through integrated platforms like Digital Twin and a developing Data Lake. These systems consolidate data from ERP, MES, and IoT sources, aiming to provide a "Single Source of Truth." Enhanced data governance, cybersecurity practices, and role-based access controls have created a secure and structured environment for digital operations. The company is preparing to adopt AutoML to enable predictive analytics with minimal technical effort, positioning itself for higher digital adaptability.

Culturally, Everest demonstrates strong support for innovation and employee learning. Training programs, external certifications, and internal e-learning platforms equip staff with digital skills. The leadership promotes transparency, learning from mistakes, and employee-driven improvement. Digital tools are widely used, from frontline foreign workers to executives, indicating deep cultural integration. Employees provide feedback on system interfaces and data tools, reflecting high trust in digital systems.

These findings suggest that Everest operates at Levels 4 to 5 across most maturity dimensions, with some features reaching Level 6 (Adaptability), especially in edge processing and smart logistics. For Taiwan's textile industry, Everest provides a viable model for scaling digital transformation. The case highlights that with strategic investment, clear governance, and cultural openness, even traditional manufacturers can build agile, data-driven operations. Other firms can learn from Everest's step-by-step approach—starting with key use cases, building internal champions, and gradually integrating data systems. A summary of Everest Textile's digital maturity across the four assessed domains is presented in Table 1. To further illustrate these maturity levels, Figure 4 provides a radar chart visualization based on the acatech Industrie 4.0 Maturity Index (Schuh et al., 2017).

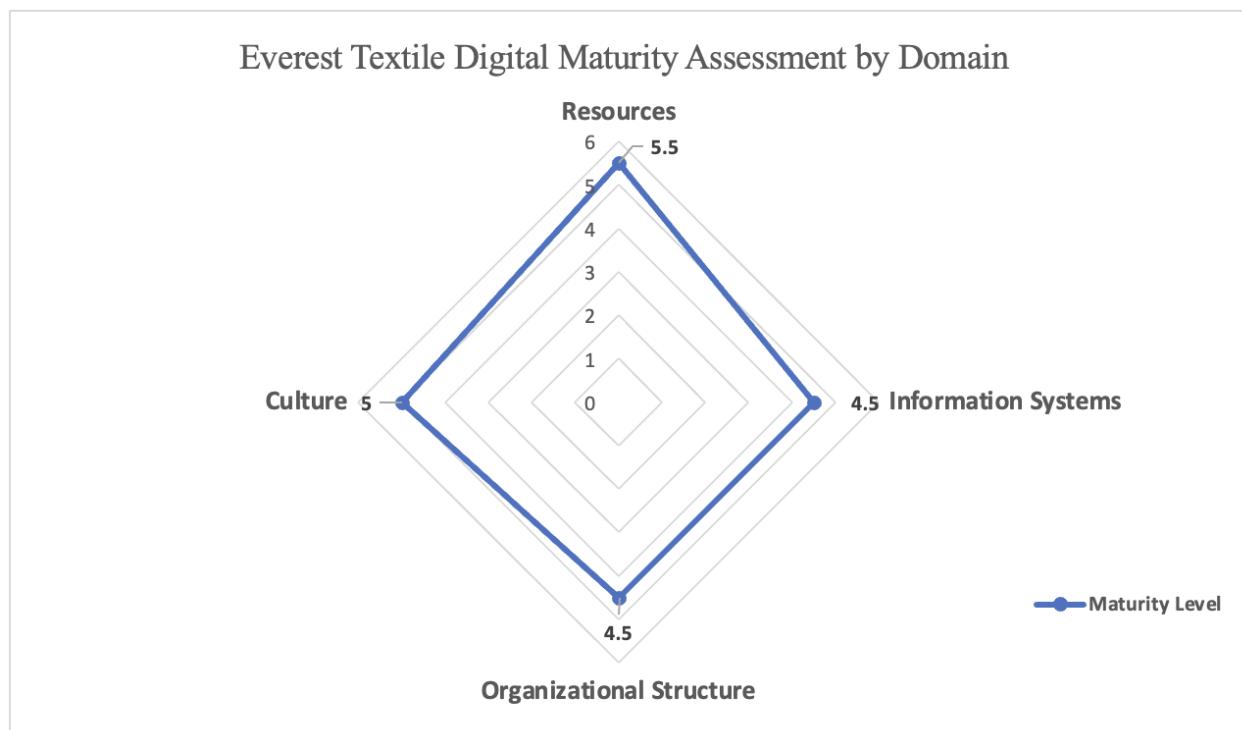


Table 1. Summary of Everest Textile's Digital Maturity by Domain

| Domain                          | Key Dimensions  | Maturity Level          | Notes  |
|---------------------------------|---|-------------------------|--|
| <b>Resources</b>                | Digital competency, sensors, communication, edge processing | Level 5–6               | High automation and structured training          |
| <b>Information Systems</b>      | IT integration, governance, cybersecurity, analytics        | Level 4–5               | Strong integration; preparing for AI             |
| <b>Organizational Structure</b> | Decentralization, agile methods, collaboration              | Level 4–5               | Flexible teams, dashboards drive decisions       |
| <b>Culture</b>                  | Innovation mindset, open feedback, learning environment     | Level 4–5, some Level 6 | Empowered culture with cross-department learning |

Note. Maturity levels are based on the acatech Industrie 4.0 Maturity Index, ranging from Level 1 (Computerization) to Level 6 (Adaptability) (Schuh et al., 2017)

Figure 4. Radar chart of Everest Textile's digital maturity across four domains



Note. Maturity levels range from 1 (Computerization) to 6 (Adaptability) following the acatech Industrie 4.0 Maturity Index (Schuh et al., 2017).

### 5.3 Hidden Challenges in Everest Textile's Digital Transformation

#### *The Unexpected Maintenance Burden of High-Tech IoT Solutions*

Everest Textile's attempt to digitize its logistics through IoT-based fabric cart tracking uncovered a significant and unexpected maintenance challenge. The company initially installed sensors on over 1,000 fabric carts to enable real-time tracking; however, the sensors required frequent battery replacements, which quickly became operationally unsustainable. As noted by the Assistant Vice President, managing battery changes daily for such a large number of carts was impractical and resource-draining (RT Tzeng, 2025). This burden ultimately outweighed the benefits of real-time tracking, prompting Everest to pivot toward a simpler solution, QR code tracking, using employees' smartphones to scan cart locations at an area level. This shift highlights a critical consideration in digital transformation projects: the long-term maintenance requirements of hardware solutions. While high-tech implementations often appear efficient during pilot phases, their hidden maintenance costs can render them unworkable at scale. Everest's experience illustrates that maintainability and total cost of ownership must be evaluated alongside technical functionality when deploying IoT systems in traditional manufacturing contexts.

#### *Old Factory Layout and Infrastructure Limitations Hindering AGV Deployment*

In another initiative aimed at digitalizing logistics, Everest Textile piloted a 5G-enabled automated guided vehicle (AGV) dispatch system to streamline fabric cart movement. While the technology proved viable, the company faced unexpected obstacles due to the physical layout of its legacy factory. Specifically, embedded ground bars in the flooring posed significant navigation challenges for the AGVs, causing errors and stoppages (RT Tzeng, 2025). The Assistant Vice President noted that retrofitting the entire factory layout to support AGVs would require extensive reconfiguration and investment, making full deployment economically unfeasible. This case



underscores a frequently underestimated challenge in digital transformation: the misalignment between existing physical infrastructure and new digital technologies. For companies with long-standing facilities, digital innovation can be constrained not by technological readiness but by spatial and structural incompatibilities. Everest's case suggests that any automation plan must begin with a thorough site assessment and a realistic cost-benefit analysis of infrastructure upgrades.

### *The Cost and Practicality of Comprehensive Carbon Tracking Instrumentation*

As part of its sustainability goals, Everest Textile has invested in tracking its carbon footprint through monitoring water, steam, and electricity usage across production. However, fully instrumenting each machine with sensors to gather precise energy data for every order proved financially unviable. According to the Assistant Vice President, Everest—unlike high-tech industries such as semiconductors—lacks the resources to install energy sensors on all machines (RT Tzeng, 2025). Instead, the company adopted a pragmatic approach by installing sensors on a limited number of “important machines.” These selected machines provide data used to calculate baseline energy consumption models, which are then extrapolated to similar machines. This strategy balances the need for sustainability reporting with economic practicality. The case demonstrates that for traditional manufacturers, strategic under-instrumentation and data estimation may be more effective than pursuing full-precision tracking, especially when working within cost constraints. It also reflects a broader trend of adapting digital sustainability tools to fit the realities of older, resource-sensitive industrial environments.

## Chapter 6: Recommendations



Based on the findings from this study, several recommendations are proposed for Taiwanese textile manufacturers seeking to pursue digital transformation. These suggestions draw on Everest Textile's experience and the principles of the acatech Industrie 4.0 Maturity Index (Schuh et al., 2017) to provide both strategic direction and practical actions.

First, manufacturers should begin with high-impact use cases that solve immediate operational issues. As demonstrated by Everest's focus on dyeing and logistics, deploying digital tools such as IoT sensors and real-time dashboards in specific, high-value areas can produce clear efficiency gains while limiting risk (RT Tzeng, 2025). This targeted approach allows companies to measure returns early and build internal support for broader transformation.

Second, firms should cultivate internal digital leaders. Everest's "seed staff" model—where selected employees act as digital ambassadors within their departments—has proven effective in promoting system adoption and bridging communication gaps between IT and operations (RT Tzeng, 2025). Companies are encouraged to identify similar champions who can lead peer training, gather user feedback, and drive localized innovation.

Third, digital system integration must be prioritized. Everest's creation of a "Digital Twin" platform and Data Lake reflects a strategic commitment to unify ERP, MES, and IoT systems. This integration supports real-time monitoring and centralized decision-making, which is essential for scalable digital operations (RT Tzeng, 2025). Firms should adopt middleware solutions or cloud platforms that facilitate cross-functional data exchange and move toward a single source of truth (Schuh et al., 2017).

Fourth, investment in edge computing and real-time data processing should be considered. Everest's use of edge devices enables local filtering of sensor data and supports faster, autonomous

responses to operational anomalies. This approach not only enhances decision speed but also reduces the burden on central IT infrastructure (Advantech, 2021). Companies with complex production environments may benefit from piloting such architectures in high-priority areas.

Fifth, firms must establish robust data governance and cybersecurity frameworks. Everest applies strict access controls, digital approval systems, and multi-layer cybersecurity defenses in line with standards like IEC 62443 (Everest Textile Co., Ltd., 2023). Organizations should implement similar measures to ensure data integrity, protect sensitive information, and meet compliance requirements.

Furthermore, fostering a culture that embraces change and supports continuous learning is essential. Everest's leadership encourages openness, transparency, and learning from failure, supported by internal e-learning platforms and external training subsidies (RT Tzeng, 2025). Companies should promote digital literacy through structured programs and provide incentives for employees to pursue certifications or participate in transformation initiatives.

In addition to internal transformation, companies should enhance digital collaboration with external partners and customers. Everest's traceability systems and data-sharing practices demonstrate how firms can create value through supply chain transparency and responsiveness (RT Tzeng, 2025). Manufacturers should explore customer portals, API-based communication, or collaborative dashboards to strengthen trust and responsiveness in their value networks.

Lastly, firms should prepare for predictive analytics and AI-driven operations. Although Everest has not yet fully implemented AI, it is actively building data infrastructure and exploring AutoML tools to democratize analytics (RT Tzeng, 2025). Other companies should similarly invest in clean, centralized data systems and provide training in data analysis to lay the foundation for future adoption of AI technologies.

In summary, these recommendations offer a practical roadmap for textile manufacturers aiming to digitize their operations. While each company's path will differ based on its resources and capabilities, Everest's experience shows that strategic focus, cultural alignment, and structured governance are critical to realizing the benefits of Industry 4.0.



## Chapter 7: Future Direction



While this thesis has offered useful insights into Everest Textile's experience of digital transformation, there is a need for further research to enhance understanding and enable greater application across Taiwan's textile industry. One future direction is to take further steps to broaden the scope of analysis beyond a single case study. Everest is a leading example of digital maturity, but small and medium enterprises (SMEs) may face different challenges related to limited budgets, technical resources, or organizational readiness. Comparative studies across different textile firms could better identify common barriers, diverse strategies, and scalable solutions tailored to different firm sizes and market segments.

Another opportunity for moving forward is the integration of quantitative performance metrics into any future research in this area. While data confidentiality was relevant in this exploratory study, future studies could identify performance datasets such as production volumes, defect rates, or energy consumption to allow an improved evaluation of the effectiveness of digital technologies. Future studies might follow a mixed-methods design to assess the relationship of specific technologies, such as predictive maintenance systems and AI scheduling tools.

Longitudinal research will be required to understand how organizations' digital transformations evolve over time. Industry 4.0 implementation is not a one-time project, but a continuous journey. Observing firms like Everest over multiple years would offer insights into sustainability, scalability, and organizational learning. Future studies could examine how firms manage technological obsolescence, adapt to emerging tools like generative AI, and align digital strategies with market shifts.

In addition, further exploration is warranted into workforce development and digital talent cultivation. This study highlighted Everest's strong emphasis on internal training, but more

research is needed to understand how companies across the sector can effectively upskill employees, redesign job roles, and retain digital talent. Policymakers and industry associations may also play a role in establishing sector-wide training platforms or certification systems to support transformation at scale.



Finally, future research should consider factors operating at the policy and ecosystem level. Government programs, industry consortia and digital service providers significantly influence a firm's ability to adopt Industry 4.0 technologies. Therefore, it's recommended to research into the collective role of the systems of support, such as tax incentives, funding in government programs, or Industrial R&D facilitation. This can provide a better understanding of what leverages or inhibits digital advancement within the textile industry.

In summary, while Everest Textile presents a successful case of digital transformation, future research should expand the conversation and engagement between these multi-dimensional topics of examining more firms, a greater diversity of data types and variety of timeframes. These efforts are important for developing a more inclusive, evidence-based, and future-oriented roadmap for the future of digital innovation in Taiwan's textile sector.

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## Appendix



### Everest Textile Digital Maturity Assessment Framework

#### I. Resources

**Principle 1:** Digital Capability - Focuses on the competencies of the workforce and the digital readiness of machinery and equipment.

##### Provide digital competencies:

- To what extent does Everest Textile ensure that its employees have enough digital skills to leverage the digital tools and systems it has used in its Industry 4.0 initiatives? Please provide some examples of training or upskilling programs.

Level 1 – Computerization: Mistakes seen as failures. No formal review processes.

Level 2 – Connectivity: Some mistake records exist. No sharing across teams.

Level 3 – Visibility: Errors are tracked. Some patterns start to show.

Level 4 – Transparency: Root causes are found using data. Insights are shared.

Level 5 – Predictive Capacity: Systems forecast possible mistakes based on past data.

Level 6 – Adaptability: Processes adjust to prevent or quickly fix mistakes. Learnings drive improvement.

- How are employees encouraged to use digital technologies? How is knowledge of the use and benefits of digital technologies shared and across different departments?

Level 1 – Computerization: Use of basic digital tools for routine tasks. No cross-team knowledge sharing.

Level 2 – Connectivity: Some tools are linked within departments. Limited knowledge sharing across teams.

Level 3 – Visibility: Real-time data access. Focus on monitoring, not deep insights. Basic dashboard sharing.

Level 4 – Transparency: Employees analyze data to find causes and support decisions. Structured knowledge sharing starts.

Level 5 – Predictive Capacity: Tools help forecast issues. Teams share predictions for future planning.

Level 6 – Adaptability: Employees lead change using digital tools. Open, constant knowledge sharing and skill growth.



- How are employees able to use their decision-making and problem-solving skills along with digital systems? Could you provide some examples where employees had good insights to improve parts of the digital process?

Level 1 – Computerization: Digital tools are used alone. No data-driven decisions. Insights aren't captured.

Level 2 – Connectivity: Tools are linked in parts. Some decisions use data. Insights stay within teams.

Level 3 – Visibility: Real-time data helps spot issues. Fixes are ad hoc, not structured.

Level 4 – Transparency: Data is analyzed to find causes. Decisions and improvements are insight-based.

Level 5 – Predictive Capacity: Employees use forecasts to plan ahead. Insights help shape predictive systems.

Level 6 – Adaptability: Employees drive change using real-time and predictive data. Insights reshape systems across teams.

- How does Everest Textile design of interfaces for its digital tools and systems to ensure ease of use and efficiency for employees in their specific tasks?

Level 1 – Computerization: Interfaces are basic, isolated, and not user-friendly. No unified design approach.

Level 2 – Connectivity: Some systems are linked. Interfaces vary and lack focus on usability.

Level 3 – Visibility: Dashboards show real-time data. Design supports monitoring, not action. Basic ergonomics applied.

Level 4 – Transparency: Interfaces help explain why things happen. Design improves usability for better reactions.

Level 5 – Predictive Capacity: Interfaces show future risks. Advanced visuals like AR support clear, proactive planning.

Level 6 – Adaptability: Interfaces are smart, intuitive, and personalized. Design supports fast, confident decisions and learning.

- How does Everest Textile make decisions on the design of interfaces for its digital tools and systems so that employees can use their systems to complete tasks without confusion, and efficiently?



Level 1 – Computerization: Basic, machine-tied interfaces. Poor usability and design consistency.

Level 2 – Connectivity: Connected but inconsistent interfaces. Not user-friendly or task-focused.

Level 3 – Visibility: Interfaces show “what’s happening.” Design ignores employee task needs.

Level 4 – Transparency: Interfaces explain “why” with context-aware data. Some task-specific design. Ergonomics improves.

Level 5 – Predictive Capacity: Interfaces use predictive data and rich visuals (e.g., AR). Support proactive decisions.

Level 6 – Adaptability: Smart, responsive interfaces adapt to users and tasks. Advanced, ergonomic, real-time design.

- Are ergonomic considerations acknowledged when deploying digital technologies in the operational areas? Can you provide examples?

Level 1 – Computerization: Digital tools are set up machine-by-machine. Ergonomics ignored or fixed after issues arise.

Level 2 – Connectivity: Systems are connected, but interfaces and layouts lack ergonomic planning or design checks.

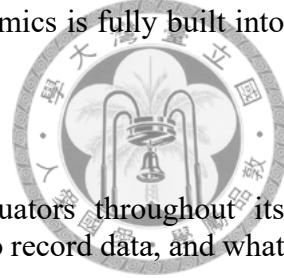
Level 3 – Visibility: Dashboards show status. Hardware placement is basic. Interface design overlooks user interaction needs.

Level 4 – Transparency: Interfaces help explain “why.” Usability improves. Some ergonomic design supports user understanding.

Level 5 – Predictive Capacity:

Interfaces show predictions using tools like AR. Ergonomic design supports easy, proactive use.

Level 6 – Adaptability: Interfaces adapt to users and tasks. Ergonomics is fully built into all system design.



### **Data acquisition through sensors and actuators:**

- To what extent does Everest Textile employ sensors and actuators **throughout** its production processes (yarn spinning, dyeing, inspection, packing) to record data, and what data does it collect?

Level 1 – Computerization: Sensors are isolated. Data is basic and mostly collected by hand.

Level 2 – Connectivity: Some machines are linked. Data is shared, but limited and not real-time.

Level 3 – Visibility: Sensors give real-time status across processes. Data shows “what is happening.”

Level 4 – Transparency: Linked data helps explain “why” events happen. Root causes can be found.

Level 5 – Predictive Capability: Sensor data feeds models to predict failures or issues before they happen.

Level 6 – Adaptability: Sensors and systems adapt in real time. Data enables fast or autonomous decisions.

- How does Everest Textile define the significance of the recorded data, and how does it select the right sensors?

Level 1 – Computerization: Sensors are picked based on vendor specs. No plan for integration or future use.

Level 2 – Connectivity: Sensors enable basic data sharing. Data use is minimal and narrowly defined.

Level 3 – Visibility: Sensors are chosen to cover all areas. Focus is on full real-time monitoring.

Level 4 – Transparency: Sensors collect data to explain causes. Data is linked for deeper analysis.

Level 5 – Predictive Capacity: Sensors provide data needed for forecasting. Selection supports predictive models.

Level 6 – Adaptability: Sensor use adapts with system needs. Data supports smart, autonomous decisions.

- Is there a system that enables the digital location of objects (material, product and tools) in the production environment? If yes, what do they do with it?



Level 1 – Computerization: Object ID is manual and isolated. No system tracks location across production.

Level 2 – Connectivity: Limited tracking in small areas. Object data isn't shared across processes.

Level 3 – Visibility: Objects are tracked across steps. Digital shadow shows real-time status and traceability.

Level 4 – Transparency: Location data links with process data to explain delays or bottlenecks.

Level 5 – Predictive Capacity: Tracking data predicts delays, tool needs, or delivery times.

Level 6 – Adaptability: Real-time tracking enables dynamic routing and auto-adjustments in workflows.

**Efficient communication:** (Focuses on the use of IT for internal communication and collaboration)

- What IT communication and collaboration systems does Everest Textile use to enable communications between employees? And to what extent are these systems integrated with operational processes?

Level 1 – Computerization: Communication is mostly paper or verbal. IT tools like email aren't linked to operations.

Level 2 – Connectivity: Basic tools exist (chat, templates), but info sharing is limited and siloed.

Level 3 – Visibility: Communication tools give some real-time status. Workflow info still needs manual access.

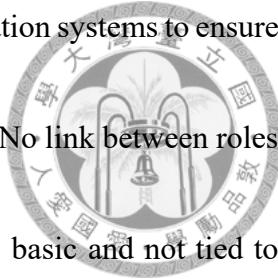
Level 4 – Transparency: Comms link with systems like MES/ERP. Info is contextual, traceable, and insight-driven.

Level 5 – Predictive Capacity: Systems send alerts from predictive data. Teams respond proactively to avoid issues.

Level 6 – Adaptability: Real-time platforms support fast, system-wide decisions. Right info reaches the right people fast.

- What role descriptions or access rights are linked to these communication systems to ensure the right people receive information?

Level 1 – Computerization: Mostly verbal or paper communication. No link between roles and digital info access.



Level 2 – Connectivity: Some digital tools used in parts. Access is basic and not tied to tasks or roles.

Level 3 – Visibility: Basic dashboards show real-time status. Access is general (e.g., by department), not role-specific.

Level 4 – Transparency: Access is linked to broad roles. Insights and approvals are traceable and contextual.

Level 5 – Predictive Capacity: Alerts go to the right roles based on predictive models. Access supports proactive action.

Level 6 – Adaptability: Smart systems deliver the right info to the right person, in context and in real time.

- Is there a digital signature or other means of approval and authorization used in digital workflows? How has this system changed the way decisions are made in terms of speed and transparency?

Level 1 – Computerization: Approvals are manual or by email. No structured digital workflows or signatures.

Level 2 – Connectivity: Basic email replies serve as approvals. No formal, integrated authorization system.

Level 3 – Visibility: Some digital workflows exist. Approval status is limited and not system-wide.

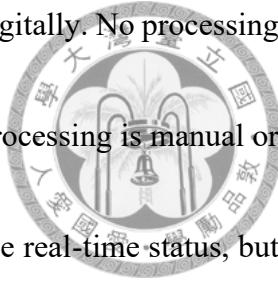
Level 4 – Transparency: Digital signatures are used. Approvals are traceable and faster than manual steps.

Level 5 – Predictive Capacity: Approvals align with predictive alerts. Role-based access supports fast, proactive decisions.

Level 6 – Adaptability: Approvals are dynamic, real-time, and role-aware. Systems boost speed and trust in decisions.

- To what extent is there local or nearby processing for sensor and actuator data before the information is relayed to Central Systems? Why are those processes done and what are the advantages to distributing data processing?

Level 1 – Computerization: Sensor data is isolated or not captured digitally. No processing or central system link.



Level 2 – Connectivity: Some sensor data is connected or shared. Processing is manual or basic, local only.

Level 3 – Visibility: Sensor data is sent to central systems. Users see real-time status, but no local processing.

Level 4 – Transparency: Data is analyzed centrally to find root causes. Some ad hoc pre-processing may occur.

Level 5 – Predictive Capacity: Sensor data feeds central predictive models. Local processing plays a small role.

Level 6 – Adaptability: Decentralized processing enables fast, near-autonomous decisions. Systems react in real time.

**Principle 2: Structured Communication** - Focuses on the exchange of data and information in a structured and purposeful manner between people and machines.

**Efficient communication:** (Covered above, but also relates to structured communication)

- How does Everest Textile create a framework where communication between employees, machines and systems is structured, and serves a specific purpose? Are there protocols or standards in place for data transfer?

Level 1 – Computerization: Communication is manual or via basic email. No structure, no formal data exchange.

Level 2 – Connectivity: Some digital tools connect people or machines, but data sharing is ad hoc and siloed.

Level 3 – Visibility: Dashboards show real-time status. Communication shows “what’s happening” but lacks structure.

Level 4 – Transparency: Systems support analysis of “why.” Communication is structured, documented, and data-driven.

Level 5 – Predictive Capacity: Frameworks send predictive alerts to the right roles. Info flows fast and reliably.

Level 6 – Adaptability: Fully integrated, real-time systems enable autonomous actions and smart communication.

## II. Information Systems

**Principle 1: IT Integration** - Details the extent of connection and sharing of data across the company with our IT systems.



### Systems integration:

- What is the level of integration for the different IT Systems (ERP, MES, PLM, CRM, IoT platforms, etc.) used at Everest Textile? Can you describe the flow of data between the different systems?

Level 1 – Computerization: IT systems are stand-alone. Data is shared manually or via basic file transfer.

Level 2 – Connectivity: Some systems are connected, but many operate in silos. Data flow is partial and scattered.

Level 3 – Visibility: Systems show real-time data in dashboards. Integration is limited, not yet a single source of truth.

Level 4 – Transparency: Integrated systems support root cause analysis. Data starts to flow with purpose and structure.

Level 5 – Predictive Capacity: Data flow supports predictive models. Info reaches the right place for proactive decisions.

Level 6 – Adaptability: Real-time data flows across all systems. Full integration enables fast, coordinated responses.

- Does Everest Textile have a goal of a "single version of the truth" with their data? If yes, what systems would be the primary sources for each type of data (for example, product data, order data, production data)?

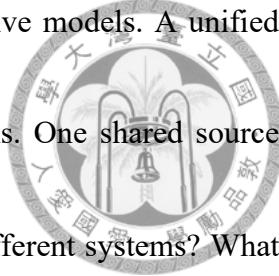
Level 1 – Computerization: Data is siloed in basic systems. Transfers are manual. No goal for a unified view.

Level 2 – Connectivity: Systems are somewhat linked. Data remains siloed. No real move toward one source of truth.

Level 3 – Visibility: Some data is centralized and shown in dashboards. Full integration is still far off.

Level 4 – Transparency: Data is integrated and analyzed. Efforts to build a single source of truth begin.

Level 5 – Predictive Capacity: Data is reliable enough for predictive models. A unified view supports proactive actions.



Level 6 – Adaptability: Data flows in real time across all systems. One shared source supports fast, autonomous decisions.

- Are there standardized interfaces used for data transfer between different systems? What types of standards are used (for example, OPC-UA)?

Level 1 – Computerization: Data sits in isolated systems or spreadsheets. Transfers are manual. No single source of truth.

Level 2 – Connectivity: Systems are linked. Data flows in basic ways, but no unified or prioritized data structure.

Level 3 – Visibility: Data is viewable across systems but not fully integrated. Dashboards don't equal true unification.

Level 4 – Transparency: Systems connect through a shared platform. Data is being consolidated into a single source.

Level 5 – Predictive Capacity: Data is trusted and integrated enough for predictive analytics. Proactive action becomes possible.

Level 6 – Adaptability: One real-time platform serves as the single source of truth. Enables fast, even autonomous decisions.

- How is data generated from shop floor equipment and IoT devices integrated with enterprise-level information systems?

Level 1 – Computerization: Shop floor data is isolated. Capture is manual or minimal. No link to enterprise systems.

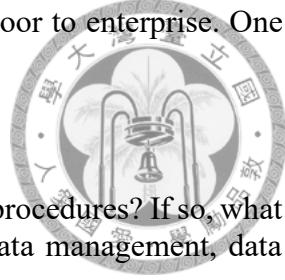
Level 2 – Connectivity: Some equipment connects to MES. Data sharing is limited. Major OT-IT gaps remain.

Level 3 – Visibility: Sensor and IoT data is shown in dashboards, but sources are siloed and not fully unified.

Level 4 – Transparency: Data flows from shop floor to enterprise systems via platforms. Used for analysis and decision-making.

Level 5 – Predictive Capacity: Integrated data supports predictive models. OT and IT data enable forward-looking insights.

Level 6 – Adaptability: Real-time, seamless data flow from shop floor to enterprise. One unified platform drives fast decisions.



### **Data governance:**

- Does Everest Textile have established data governance policies and procedures? If so, what are the policies around (for example, data quality, data storage, data management, data presentation)?

Level 1 – Computerization: No formal data governance. Practices are ad hoc and vary by person or team.

Level 2 – Connectivity: Some informal data sharing exists, but no consistent rules or quality standards apply.

Level 3 – Visibility: Data issues become visible, but there's still no enterprise-wide governance in place.

Level 4 – Transparency: Formal policies start to guide data quality, flow, and presentation across systems.

Level 5 – Predictive Capacity: Strong governance ensures reliable, well-managed data fit for advanced analytics and forecasting.

Level 6 – Adaptability: Governance is fully mature—covering quality, flow, storage, and presentation to support real-time decisions.

- What technical capabilities are in place to ensure data quality (for example, automated data cleansing, master data management)?

Level 1 – Computerization: Data quality is manual, inconsistent, and siloed. No automated checks or cleansing.

Level 2 – Connectivity: Systems are linked, but quality is still managed manually in silos. Inconsistency remains.

Level 3 – Visibility: Data issues are visible, but no formal tools exist to fix them across systems.

Level 4 – Transparency: Automated cleansing and master data tools are introduced to ensure quality in integrated systems.

Level 5 – Predictive Capacity: Strong, automated quality controls support reliable data for accurate forecasting.

Level 6 – Adaptability: Data quality is self-managed, real-time, and system-wide—supporting autonomous decision-making.



### IT security:

- What measures are in place to ensure IT security of networks and manufacturing systems at Everest Textile? Are there unique security standards followed (for example, IEC 62443)?

Level 1 – Computerization: Security is ad hoc or missing. No formal standards or protection for IT/OT systems.

Level 2 – Connectivity: Basic access controls exist. No full security strategy or multi-system protection.

Level 3 – Visibility: Awareness of risks grows. Security is reactive, local, and lacks formal structure.

Level 4 – Transparency: Formal policies emerge. Some standards like IEC 62443 may guide initial protections.

Level 5 – Predictive Capacity: Security is reliable and trusted. Policies cover most systems and anticipate risks.

Level 6 – Adaptability: Security is fully integrated, adaptive, and continuous across the whole value chain.

- How is access control to data and IT systems managed and controlled?

Level 1 – Computerization: Access control is manual or ad hoc. Few policies exist. Security is inconsistent.

Level 2 – Connectivity: Basic access limits may exist at network edges. No cross-system access control strategy.

Level 3 – Visibility: Some monitoring exists. Access is still local, with no formal control across systems.

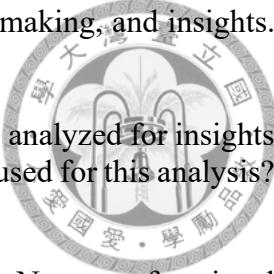
Level 4 – Transparency: Role-based access control begins. Policies and authentication systems are being developed.

Level 5 – Predictive Capacity: Strong access control protects all key systems. Data access aligns with policy and trust needs.

Level 6 – Adaptability: Access control is advanced, real-time, and role-aware, supporting secure, autonomous decisions across systems.

**Principle 2: Data Use** - Is the extent of use of data for analytics, decision-making, and insights. Data analytics:

- What extent is data from production processes and other functions being analyzed for insights into performance, efficiency and quality? What are the tools or methods used for this analysis?



Level 1 – Computerization: Analysis is manual, basic, and siloed. No cross-functional insights.

Level 2 – Connectivity: Some connected data enables basic, mostly manual analysis within limited areas.

Level 3 – Visibility: Real-time data supports descriptive analysis like KPIs. Shows “what is happening,” not “why.”

Level 4 – Transparency: Integrated data enables root cause and diagnostic analysis. Focus shifts to “why it’s happening.”

Level 5 – Predictive Capacity: Advanced tools forecast trends and events. Analysis suggests actions, but response is still manual.

Level 6 – Adaptability: AI-driven, real-time analysis enables autonomous decisions. Insights lead to automatic process changes.

- Are analytical levels for data being implemented to different levels (e.g., machine level, production line level, overall plant level)? What are examples of data informed decisions that are being made at these levels?

Level 1 – Computerization: Analysis is basic, manual, and siloed. No cross-level insights. Decisions are limited and reactive.

Level 2 – Connectivity: Some data moves between systems, but analysis is manual and fragmented. No full-process view.

Level 3 – Visibility: Dashboards show real-time status. Analysis is local and reactive. No cross-level model exists.

Level 4 – Transparency: Integrated data enables root cause analysis. Diagnostic insights guide decisions across levels.

Level 5 – Predictive Capacity: Predictive models forecast issues. Data supports proactive decisions across systems and levels.

Level 6 – Adaptability: AI-driven, real-time analysis supports automated decisions across machine, line, and plant.

- Is there any predictive analytics use to forecast potential future events or issues (e.g., machine breakdowns, deviations in quality)?

Level 1 – Computerization: No predictive analytics. Only basic, manual reports from isolated systems.

Level 2 – Connectivity: No forecasting. Some data is shared, but analysis is still basic and descriptive.

Level 3 – Visibility: Real-time dashboards show current status only. No future prediction.

Level 4 – Transparency: Integrated data supports root cause analysis. Focus is on “why” past issues occurred.

Level 5 – Predictive Capacity: Data forecasts future events. Manual action follows based on predictions.

Level 6 – Adaptability: AI detects issues in real time and triggers automatic, optimized responses.

Decision support systems:

- Are analytics and insights from data analytics integrated for decision-making across the organization? Are there example systems or dashboards for decision support?

Level 1 – Computerization: No real data analysis. Decisions rely on experience or siloed reports. No dashboards or support tools.

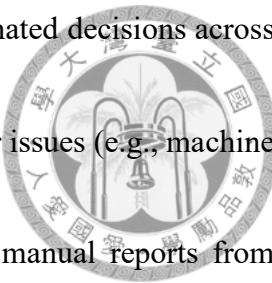
Level 2 – Connectivity: Some data flows, but analysis is still manual. No systems or dashboards guide decisions.

Level 3 – Visibility: Dashboards show current status. Decisions are reactive, based on real-time data, not deep insights.

Level 4 – Transparency: Integrated data supports root cause analysis. Decisions are informed but not yet proactive or predictive.

Level 5 – Predictive Capacity: Forecasts guide decisions. Dashboards support planning based on expected issues or trends.

Level 6 – Adaptability: AI-driven, real-time systems enable autonomous or semi-autonomous decisions across the organization.



- Are real-time data used to inform a change in operations and improve responsiveness?

Level 1 – Computerization: No real-time data use. Decisions rely on reports or gut feeling. No support for quick actions.



Level 2 – Connectivity: Some systems connect, but real-time data isn't used for operational changes.

Level 3 – Visibility: Real-time dashboards show current status. Decisions can be made quickly and reactively.

Level 4 – Transparency: Data explains past issues. Helps with manual decisions but not real-time responsiveness.

Level 5 – Predictive Capacity: Predictions guide proactive planning. Real-time data supports forecasts, but actions are still manual.

Level 6 – Adaptability: Real-time data triggers automated decisions. Systems respond instantly without human input.

### Automated data analytics:

- What extent is analytics automated at Everest Textile? Are there systems that automatically identify patterns, anomalies, or correlation in the data?

Level 1 – Computerization: No automated analysis. Patterns and anomalies are spotted manually or not at all.

Level 2 – Connectivity: Some data sharing exists, but pattern detection and analysis are still manual.

Level 3 – Visibility: Dashboards show current data. Basic alerts exist, but no automated pattern or anomaly detection.

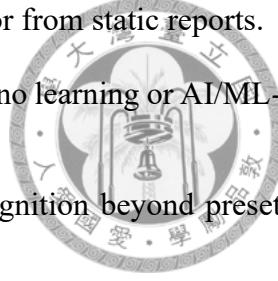
Level 4 – Transparency: Systems analyze data to explain “why.” Patterns and causes are identified using defined rules.

Level 5 – Predictive Capacity: Automated analysis forecasts future events. Predictions exist, but actions remain manual.

Level 6 – Adaptability: AI/ML detects patterns and triggers real-time actions without human input. Learning is continuous.

- Are there any provisions for machine learning or artificial intelligence to perform data analytics and provide new insights?

Level 1 – Computerization: No AI/ML use. All analysis is manual or from static reports.



Level 2 – Connectivity: Systems connect and share data, but there's no learning or AI/ML-driven analysis.

Level 3 – Visibility: Real-time data shows status. No pattern recognition beyond preset rules. No AI/ML used.

Level 4 – Transparency: AI/ML helps analyze known relationships for diagnostics. No discovery or forecasting yet.

Level 5 – Predictive Capacity: AI/ML predicts future events by learning patterns. Used for forecasting and risk detection.

Level 6 – Adaptability: AI/ML detects, learns, and acts autonomously in real time. Systems self-optimize without human input.

### III. Organizational Structure

**Principle 1: Organic Internal Organization** - Focus on the internal configuration flexibility and adaptability.

#### Flexible communities:

- Are there cross-functional teams, or "communities" that are structured within Everest Textiles to manage specific projects or challenges related to digital transformation or operational improvements? How are these communities structured and managed?

Level 1 – Computerization: No structured cross-functional collaboration. Teams are siloed and ad hoc.

Level 2 – Connectivity: Basic communication exists, but no systems support cross-functional teamwork. Silos persist.

Level 3 – Visibility: Live data is visible, but teams aren't formed dynamically based on insights.

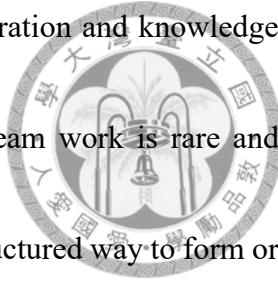
Level 4 – Transparency: Teams are formed to address known issues. Collaboration is structured but reactive.

Level 5 – Predictive Capacity: Future needs are predicted. Teams may be formed, but coordination remains manual.

Level 6 – Adaptability: Cross-functional teams form in real time based on data. Agile, autonomous, and collaborative.

- What is the role of the organizational structure in enabling collaboration and knowledge sharing across different departments and skill areas?

Level 1 – Computerization: Structure is rigid and siloed. Cross-team work is rare and informal. Knowledge sharing is limited.



Level 2 – Connectivity: Some communication tools exist, but no structured way to form or manage cross-functional teams.

Level 3 – Visibility: Data is visible, but doesn't lead to structured collaboration. Teamwork remains voluntary.

Level 4 – Transparency: Teams form to solve known issues. Structure allows projects, but within formal lines and limits.

Level 5 – Predictive Capacity: Predicted issues may trigger planned teams. Setup is manual, guided by reports and managers.

Level 6 – Adaptability: Teams self-form based on real-time needs. Structure is agile, dynamic, and supports instant collaboration.

- Is decision-making becoming more decentralized? How are decision rights governed in a way that enables the benefits of both local autonomy and central control?

Level 1 – Computerization: Decision-making is fully centralized. Local autonomy is not allowed.

Level 2 – Connectivity: Communication improves, but decisions remain top-down. Approval is still controlled centrally.

Level 3 – Visibility: Real-time data is visible, but authority stays centralized. Teams can't act on their own.

Level 4 – Transparency: Local decisions may be allowed for known issues, but only within strict rules.

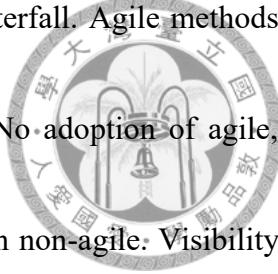
Level 5 – Predictive Capacity: Some local decisions can be made on predicted issues, but boundaries are still centrally set.

Level 6 – Adaptability: Decision rights are dynamic. Teams and systems act autonomously when needed, with strategic alignment.

## Agile management:

- Are agile methods (e.g., Scrum) being used for project management in the context of digital transformation initiatives?

Level 1 – Computerization: No project management or strictly waterfall. Agile methods are not used at all.



Level 2 – Connectivity: Projects are still managed traditionally. No adoption of agile, despite basic connectivity.

Level 3 – Visibility: Real-time tracking exists, but methods remain non-agile. Visibility doesn't support quick changes.

Level 4 – Transparency: Agile ideas are discussed but not used. Projects remain traditional with limited data use.

Level 5 – Predictive Capacity: Agile may be used in pockets (e.g. IT), but not for core digital projects. Still not systemic.

Level 6 – Adaptability: Agile methods are fully adopted. Projects use rapid cycles, feedback, and continuous learning.

- How does the organization move quickly through the process of developing and testing new ideas and prototypes? What feedback mechanisms are in place?

Level 1 – Computerization: Ideas are developed slowly and linearly. No rapid testing or feedback process.

Level 2 – Connectivity: Communication tools exist, but development remains slow. Feedback is rare and not structured.

Level 3 – Visibility: You can track progress, but testing is still traditional. No rapid iteration or fast feedback.

Level 4 – Transparency: Some data informs change. Iterative thinking is discussed but not practiced formally.

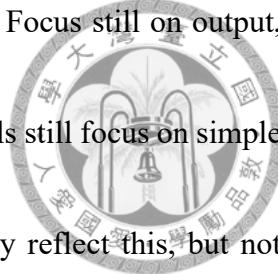
Level 5 – Predictive Capacity: Some agile pilots exist. No full process for fast prototyping and feedback across projects.

Level 6 – Adaptability: Agile methods drive rapid testing, fast feedback, and real-time adjustments. Iteration is built-in.

- How do organizations set and track goals so that the focus is on process efficiency and continuous improvement rather than solely output volumes?

Level 1 – Computerization: Goals focus on output only. Tracking is manual or basic. No link to efficiency or improvement.

Level 2 – Connectivity: Simple digital tools may help share goals. Focus still on output, not process improvement.



Level 3 – Visibility: We can see live data (e.g., throughput), but goals still focus on simple measures, not efficiency.

Level 4 – Transparency: Data helps spot inefficiencies. Goals may reflect this, but not across all areas or in a structured way.

Level 5 – Predictive Capacity: Predictions shape some goals (e.g., avoid downtime), but there's no full system driving improvement.

Level 6 – Adaptability: Goals are multi-dimensional, targeting speed, quality, learning. Agile methods support ongoing improvement.

**Principle 2:** Dynamic Collaboration within the Value Network – Focuses on collaboration with external partners.

#### Cooperation within the network:

- How does Everest Textile work with its suppliers and customers as part of its digital transformation process? Does this include any digital exchange of information about production status, quality, or demand?

Level 1 – Computerization: Communication is manual (calls, fax, mail). Email is used, but only for static files. No real-time data.

Level 2 – Connectivity: Files may be shared digitally (email, portals), but data is not integrated or updated in real-time.

Level 3 – Visibility: Some digital visibility exists (e.g., shipping confirmation), but it's limited, delayed, and one-way.

Level 4 – Transparency: Structured data (e.g., quality, schedules) may be shared, but flows are not real-time or integrated.

Level 5 – Predictive Capacity: Some predictive info (e.g., delays) is shared with partners, but it's not automated or network-wide.

Level 6 – Adaptability: Real-time, automated data exchange with suppliers/customers. All parties adapt quickly using shared info.

- Is there collaboration through any digital platforms or marketplaces to build connections or new collaborations with partners?

Level 1 – Computerization: All partner contact is manual (calls, fax, mail). No digital collaboration or partner platforms.



Level 2 – Connectivity: Basic tools (like email) are used. No integrated systems or digital platforms for external partners.

Level 3 – Visibility: Some static data (e.g., order confirmation) is shared digitally. No active digital collaboration.

Level 4 – Transparency: Structured info (e.g., quality, demand) may be shared digitally. No dynamic digital platforms for collaboration or new partners.

Level 5 – Predictive Capacity: Some predictive data shared with long-term partners. Pilot use of digital collaboration platforms, but not widespread.

Level 6 – Adaptability: Real-time, automated data sharing. Actively uses digital platforms/marketplaces to collaborate and build new partner networks.

- How is competency management dealt with collaboratively in the value network? Are there action-oriented initiatives to bring together different partners' competencies?

Level 1 – Computerization: No structured way to integrate partner expertise. All collaboration is manual or via basic tools.

Level 2 – Connectivity: Some digital communication (e.g. email), but no system to pool or manage partners' competencies.

Level 3 – Visibility: Some info shared digitally, but no efforts to connect or manage partner expertise collaboratively.

Level 4 – Transparency: Structured data shared with known partners. Some informal attempts to use their expertise, but no platform or formal system.

Level 5 – Predictive Capacity: Some pilot projects use partner knowledge with digital tools. No broad platform to manage or combine competencies dynamically.

Level 6 – Adaptability: Real-time digital collaboration with partners. Uses platforms to combine and manage partner expertise. Can reconfigure networks dynamically.

### **Focus on customer benefits:**

- How are customer needs and feedback captured to inform product and process design and development in the digital transformation environment?

Level 1 – Computerization: Customer feedback is manual and disconnected. No digital use for design or production. Response is slow and reactive.



Level 2 – Connectivity: Some digital tools (e.g. email, ERP), but no link between customer feedback and design/production systems.

Level 3 – Visibility: Customer data may be logged or viewed, but it's siloed. No clear analysis or link to design/production processes.

Level 4 – Transparency: CRM/sales data linked to internal systems. Some analysis helps understand “why” issues happen. Adaptation is informed, but still manual.

Level 5 – Predictive Capacity: Customer data is used to forecast future needs. Internal teams may get these insights. Some adaptation happens, but not automated.

Level 6 – Adaptability: Real-time customer data flows into design/production. Systems auto-adapt to changing needs. Value chains can reconfigure dynamically.

- Are there triggered, dynamic changes in production based on real-time indicators of demand or customer preferences?

Level 1 – Computerization: Production is manual and slow to change. No digital capture of real-time demand. All adjustments are delayed and reactive.

Level 2 – Connectivity: Some digital entry (e.g. orders) exists but isn't linked to production. No real-time or automated adaptation.

Level 3 – Visibility: Real-time data (e.g. order or machine status) is visible. Managers can act manually. No automated response to demand.

Level 4 – Transparency: Systems are integrated for analysis (e.g. ERP + MES). Insights explain why things happen. Adjustments are planned, not dynamic.

Level 5 – Predictive Capacity: Data predicts future demand. Production plans adapt in advance, but changes are still manual or semi-automated.

Level 6 – Adaptability: Real-time demand triggers automatic changes. Systems adjust production autonomously. Business is flexible and fully responsive.

## V. Culture

**Principle 1: Willingness to Change** – Focuses on the mindset of employees when it comes to ongoing improvement and new ways of working.

## Openness to innovation:

- What is the level of readiness of employees and the organisation's culture to embrace new digital technologies and paradigms? Is there a way to encourage exploration and awareness of new technologies?



Level 1 – Computerization: Employees use tech only for narrow tasks. No interest in learning new tools. Culture is passive, top-down, and closed to change.

Level 2 – Connectivity: Some systems are linked, but people still work in silos. Digital curiosity is limited. Exploration is isolated and rare.

Level 3 – Visibility: Real-time data is available, but not used to question old ways. Innovation interest exists but lacks structure or support.

Level 4 – Transparency: Data helps explain causes. Learning is based on past events. Exploration is limited to a few roles like R&D or planning.

Level 5 – Predictive Capacity: People use data to plan ahead. Some openness to try tech that boosts efficiency. Culture supports limited innovation, not wide agility.

Level 6 – Adaptability: Employees are proactive, experimental, and open to tech change. Mistakes are learning moments. Teams explore, adapt, and grow together.

- How are the benefits of innovations communicated to employees to pave the way for buy-in and adoption?

Level 1 – Computerization: Tech use is narrow and local. No broad communication on digital benefits. Culture resists change.

Level 2 – Connectivity: Systems connect, but innovation isn't discussed. Employees don't see clear benefits. Openness remains low.

Level 3 – Visibility: Dashboards show "what's happening." Benefits focus on faster info, not strategy. Openness is limited.

Level 4 – Transparency: Data explains "why" issues occur. Communication focuses on analysis and planned fixes. Innovation is accepted but not pursued.

Level 5 – Predictive Capacity: Benefits highlight early warnings and forecasts. Openness grows, but innovation is still tied to prediction use cases.

Level 6 – Adaptability: Innovation is core. Employees explore, co-create, and adapt. Communication drives engagement, learning, and rapid change.

## Data-based learning and decision-making:

- To what extent is decision making at Everest Textile informed by data and fact rather than intuition?

Level 1 – Computerization: Decisions rely mostly on intuition. Standalone systems offer limited data support.



Level 2 – Connectivity: Systems start exchanging data, but analysis is weak. Intuition still drives most decisions.

Level 3 – Visibility: Real-time data (e.g., KPIs) informs decisions. Still focused on “what is happening,” not “why.”

Level 4 – Transparency: Root cause analysis becomes possible. Decisions shift from intuition to data-based understanding.

Level 5 – Predictive Capacity: Data predicts future issues. Decisions are proactive and data-driven, not reactive or gut-based.

Level 6 – Adaptability: Systems make automated decisions. Humans handle only complex cases. Intuition is nearly replaced by analytics.

- How is data disseminated and where is it accessible to make learning and decision-making possible?

Level 1 – Computerization: Data is siloed, disconnected, and hard to access. Only a few people see or use it. No single source of truth.

Level 2 – Connectivity: Some systems are linked. Data flows in parts, but still isolated. Access remains limited across departments.

Level 3 – Visibility: Real-time data is available in dashboards. Sensors capture operations. But access is narrow and data remains fragmented.

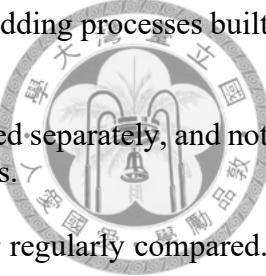
Level 4 – Transparency: Root cause analysis is possible. Data is linked and shared more widely. Employees use data to understand problems.

Level 5 – Predictive Capacity: Past data is used to forecast events. Predictions support early decisions. Data and insights are shared for action.

Level 6 – Adaptability: Data is integrated, reliable, and role-based. It supports autonomous action and continuous learning. Employees trust and use it to improve performance.

- Is there a continuous cycle of monitoring and interrogation of value-adding processes built into the everyday use of captured data to inform judgment?

Level 1 – Computerization: Data is created in isolated processes, stored separately, and not linked to value-adding streams. No continuous monitoring or analysis.



Level 2 – Connectivity: Systems pass data, but it's not integrated or regularly compared. Continuous learning through data is not yet possible.

Level 3 – Visibility: Real-time status data is visible. Dashboards help with decisions. But data is siloed and continuous, broad analysis remains limited.

Level 4 – Transparency: Data is linked and analyzed to understand causes. Root cause analysis begins. Some ongoing monitoring supports better-informed decisions.

Level 5 – Predictive Capacity: Forecasts are built from historical data. Continuous analysis helps anticipate problems. Decisions are proactive and data-reinforced.

Level 6 – Adaptability: Systems self-adjust based on real-time data. Data is fully integrated and supports autonomous decisions. Employees trust and use it for learning and improvement.

### **Continuous professional development:**

- How is the ongoing development of employee's skills and knowledge supported, as it applies to digital technologies?

Level 1 – Computerization: No structured support for digital skills. Training is rare or nonexistent.

Level 2 – Connectivity: Training happens ad hoc. It's not linked to digital transformation goals.

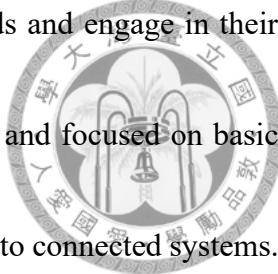
Level 3 – Visibility: Training focuses on using visible systems or tools. No push for continuous or employee-driven learning.

Level 4 – Transparency: Training is structured and supports data use. Employees start recognizing personal learning needs.

Level 5 – Predictive Capacity: Training includes skills for predictive tools and encourages interdisciplinary thinking. Employees help shape their learning paths.

Level 6 – Adaptability: Lifelong learning is part of the culture. Employees co-create training programs and drive their own development to stay ahead in a digital world.

- Are employees encouraged to identify their own development needs and engage in their own training programs?



Level 1 – Computerization: Training is ad hoc, company-initiated, and focused on basic skills. Employees don't identify their own learning needs.

Level 2 – Connectivity: Some structured training exists, mostly tied to connected systems. Employees may suggest needs, but only in limited or informal ways.

Level 3 – Visibility: Training is mainly triggered by observed performance issues or data insights. Employees can propose training, but it's not systematic or common.

Level 4 – Transparency: Programs focus on data use and root cause analysis. Employees are encouraged to identify training needs linked to their work and help shape training with management.

Level 5 – Predictive Capacity: Employees take a proactive role in identifying future skill needs. They help design programs based on anticipated changes and cross-functional demands.

Level 6 – Adaptability: Continuous learning is embedded in culture. Employees lead their own development, shape training programs, and help the company stay agile through shared learning.

### **Shaping change:**

- To what extent do employees feel they are able to broach and implement changes associated with digital transformation, or other process improvement?

Level 1 – Computerization: Employees follow basic IT instructions. They don't suggest or lead changes.

Level 2 – Connectivity: Employees adapt to connected systems but don't shape or initiate change. Input is limited.

Level 3 – Visibility: Employees may suggest small task-level changes based on real-time data. Larger changes come from managers.

Level 4 – Transparency: Employees are encouraged to suggest improvements using data. Input stays mostly local.

Level 5 – Predictive Capacity: Employees are expected to spot future opportunities and propose changes. Cross-functional collaboration grows.

Level 6 – Adaptability: Employees lead, shape, and implement change. Initiative is a core expectation.

- Are there mechanisms for employees to share their knowledge and skills to make tangible contributions towards change?

Level 1 – Computerization: Employees follow top-down instructions. No role in sharing knowledge for change.



Level 2 – Connectivity: Employees may talk across functions, but don't actively share knowledge to drive change.

Level 3 – Visibility: Employees can report problems but lack ways to share deeper knowledge or influence improvements.

Level 4 – Transparency: Employees are encouraged to suggest improvements using data. Their input helps but has limits.

Level 5 – Predictive Capacity: Employees join formal teams to share knowledge and shape planned changes or improvements.

Level 6 – Adaptability: Employees are empowered and expected to share expertise to lead and drive ongoing change.

#### **Acknowledge the benefits of mistakes:**

- What is the organisational culture towards mistakes? Are they viewed as opportunities for improvement?

Level 1 – Computerization: Employees hide mistakes. Admitting errors is avoided. Fixes are quick and quiet.

Level 2 – Connectivity: Employees start documenting mistakes and discussing them within their own teams.

Level 3 – Visibility: Employees openly talk about mistakes across teams and seek to learn from them.

Level 4 – Transparency: Employees value mistakes as learning chances. No blame. Focus is on understanding.

Level 5 – Predictive Capacity: Employees use structured methods to study mistakes and share lessons across the company.

Level 6 – Adaptability: Employees openly reflect on mistakes. They seek shared learning and act quickly to improve reliability.

- Are there processes in place that enable mistakes to be treated as discussion points – exploring root causes and corrective actions, without attribution of blame?

Level 1 – Computerization: No formal error review. Mistakes are hidden or fixed fast. Blame culture discourages open discussion.



Level 2 – Connectivity: Errors may be recorded or discussed within departments, but no cross-functional or blame-free processes exist.

Level 3 – Visibility: Error reporting grows, tied to observable data. Cross-team discussion starts, but root cause and action steps are not yet formal or blame-free.

Level 4 – Transparency: Root cause analysis happens in a safe space. Discussions are respectful, but formal learning systems are still limited.

Level 5 – Predictive Capacity: Structured root cause methods are routine. Lessons and actions are documented and shared. Mistakes are seen as learning tools.

Level 6 – Adaptability: Error learning is embedded. Proactive error spotting, shared analysis, and fast corrective action support continuous improvement.

**Principle 2: Social Collaboration** - Focuses on the effectiveness of collaboration and sharing knowledge occurs within the organization

#### **Democratic leadership style:**

- How would you describe the leadership style at Everest Textile in the context of digital transformation? Is there a focus on valuing employee capabilities, while building collaboration?

Level 1 – Computerization: Leadership is top-down. Employee input isn't valued. Orders are given, not discussed. No collaboration efforts.

Level 2 – Connectivity: Leadership allows basic info flow, but collaboration is functional and limited. Employee capability is still undervalued.

Level 3 – Visibility: Leaders begin listening to employee observations from visible data. Employees can report, but decisions remain top-down.

Level 4 – Transparency: Leaders support open, blame-free discussions. Employees are invited to collaborate in problem-solving but lack real decision power.

Level 5 – Predictive Capacity: Leaders value employee input for predictive tasks and improvement ideas. Collaboration is structured, but strategy stays with leadership.

Level 6 – Adaptability: Leadership is democratic and empowers employees. Collaboration is broad and continuous. Employee input shapes real-time decisions.

- Are employees given more freedom and autonomy to work?

Level 1 – Computerization: Employees have no autonomy. Tasks are rigid. All decisions come from supervisors. No room for flexibility.



Level 2 – Connectivity: Systems are connected, but work is still controlled. Employees follow set processes with little decision-making power.

Level 3 – Visibility: Employees can report data or issues but can't act on them. Autonomy is limited to observations, not decisions.

Level 4 – Transparency: Employees are trusted to explore causes of problems and suggest improvements. Some autonomy exists within defined processes.

Level 5 – Predictive Capability: Employees use structured methods to analyze and respond to issues. Autonomy grows, but major decisions stay with leadership.

Level 6 – Adaptability: Employees act with high autonomy. They make decisions, drive change, and support continuous adaptation in real time.

### **Open communication:**

- How effective is the sharing of both explicit and implicit knowledge among employees from different parts of the organisation and across different levels?

Level 1 – Computerization: Knowledge sharing is manual, informal, and limited to teams or departments. Implicit knowledge rarely spreads due to silos and strict hierarchy.

Level 2 – Connectivity: Basic IT systems support formal sharing of explicit info (e.g., email, shared drives). Implicit knowledge sharing is still blocked by silos and weak collaboration tools.

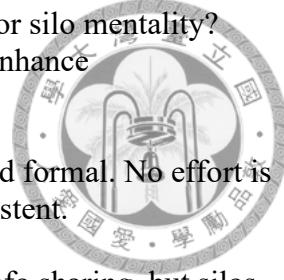
Level 3 – Visibility: Some explicit info (e.g., real-time status) is shared. Implicit knowledge remains hard to access. Hierarchical and departmental barriers still limit open exchange.

Level 4 – Transparency: Data analysis promotes discussion of “why” issues occur. Some formal channels exist for sharing insights. Cultural norms may still limit open exchange of implicit knowledge.

Level 5 – Predictive Capacity: Structured processes support sharing of analyzed data and insights. Explicit knowledge sharing works well in defined teams. Implicit sharing happens but isn't widespread.

Level 6 – Adaptability: Explicit and implicit knowledge flows freely across all levels. Silos are gone. Instant access to shared knowledge enables rapid learning and agile response.

- Are there barriers to open communication such as rigid hierarchies or silo mentality? What is the organisation doing to break down barriers and silos to enhance communication?



Level 1 – Computerization: Communication is top-down, siloed, and formal. No effort is made to break barriers. Implicit knowledge sharing is nearly nonexistent.

Level 2 – Connectivity: Some IT systems support limited explicit info sharing, but silos and hierarchy still block communication across teams. No structured initiatives exist to fix this.

Level 3 – Visibility: Real-time data may be visible in some systems. However, cross-department communication remains limited. Implicit knowledge sharing is rare and not actively supported.

Level 4 – Transparency: Data is analyzed to understand root causes. This leads to more formal sharing of insights. Efforts to improve communication are emerging but still constrained by structure.

Level 5 – Predictive Capacity: Collaborative teams share explicit knowledge for forecasting and problem-solving. Some silos persist, making open, organization-wide knowledge sharing inconsistent.

Level 6 – Adaptability: Silos are dismantled. Communication is open and active across all levels. Both explicit and implicit knowledge flow freely in a culture of learning and collaboration.

### **Confidence in processes and information systems:**

- What level of confidence do employees have regarding the reliability and accuracy of the company's information systems in delivering the data and insight?

Level 1 – Computerization: Employees have little trust in system data. Systems are standalone and used only for basic tasks. Decisions rely on gut feeling, not data.

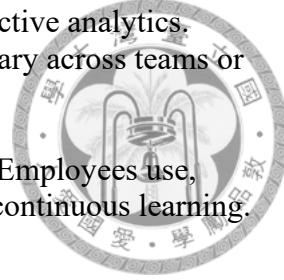
Level 2 – Connectivity: Some systems are connected, but data is fragmented or incomplete. Employees remain skeptical and use data only for simple, low-risk decisions.

Level 3 – Visibility: Real-time data improves trust in visible areas. But confidence is still limited due to silos and lack of integrated data across departments.

Level 4 – Transparency: Trust increases as systems analyze and explain “why” events occur. Structured insights are valued, but full company-wide confidence in system data is still developing.

Level 5 – Predictive Capacity: High trust exists in areas using predictive analytics. Employees rely on system recommendations, but confidence may vary across teams or data types.

Level 6 – Adaptability: Trust in data systems is organization-wide. Employees use, improve, and share insights freely. Data is central to decisions and continuous learning.



- To what extent are employees involved in the design and deployment of new digital systems?

Level 1 – Computerization: Employees have no role in system design or deployment. New systems are implemented without user input.

Level 2 – Connectivity: Involvement is minimal. Employees may give basic feedback after deployment but are not involved in planning or design.

Level 3 – Visibility: Employees provide feedback on tools or data tied to their own tasks. They're not involved in broader system design or cross-functional tools.

Level 4 – Transparency: Some users are engaged to give input on data needs or test new tools. Involvement exists but is not consistent or widespread.

Level 5 – Predictive Capacity: Employees help define system needs, especially for predictive tools. Their feedback is used during development to improve reliability and usefulness.

Level 6 – Adaptability: Employees are deeply involved in every stage—design, testing, deployment, and ongoing improvement. Their input shapes systems, building trust and ownership.

- Is there a way for employees to feedback issues to report or suggest improvements for digital processes and systems?

Level 1 – Computerization: No formal feedback process exists. Employees may informally report critical issues, but improvement suggestions aren't tracked or expected.

Level 2 – Connectivity: Ad hoc feedback may be sent via email or simple forms, mostly to report bugs. There's no structured process to track or respond to suggestions.

Level 3 – Visibility: Feedback exists but is limited to local systems or tools. Employees can raise issues in their area, but input is siloed and not shared across departments.

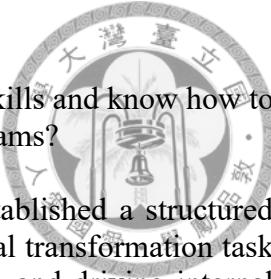
Level 4 – Transparency: Formal channels (e.g. helpdesks, suggestion systems) exist. Feedback is collected and acknowledged, but follow-up, evaluation, and transparency on outcomes may be inconsistent.



Level 5 – Predictive Capability: Structured systems actively collect, review, and respond to feedback on tools supporting prediction and analysis. Employees begin to see visible outcomes tied to their input.

Level 6 – Adaptability: Feedback is embedded in system design and improvement cycles. Employees are routinely engaged, see their input acted on, and feel ownership in shaping digital systems.

## Transcript: RT Tzeng, Assistant Vice President, Digital Service Center



Question: How does Everest ensure that employees have sufficient digital skills and know how to apply Industry 4.0? Are there related training or continuing education programs?

RT: In promoting Industry 4.0 and digital transformation, Everest has established a structured training mechanism and organizational support. A cross-departmental digital transformation task force has been set up, with representatives from each department planning and driving internal digital projects and capability building.

For training, the company uses both external and internal approaches. For example, during the early stage of AI promotion, Everest sent employees to the Taiwan AI Academy to take various levels of courses, including managerial and technical programs. They also invite external lecturers for in-house sessions to ensure practical relevance.

The IT department regularly hosts themed internal training based on project and system rollout progress to align knowledge and skills between teams.

In addition, Everest launched an e-learning platform built by HR, offering a range of courses not only about Industry 4.0 but also general skills, technical improvement, and process optimization. Employees are encouraged to learn independently, and those who earn professional certifications receive subsidies as an incentive.

Question: How does Everest encourage employees to use digital tools and share knowledge or benefits across departments?

RT: We promote both an open culture and a practical focus. Internal collaboration is open, encouraging mutual support and experience-sharing in using digital tools.

To respond to workforce challenges like retirements or staff reductions, Everest conveys that digital tools help improve efficiency and reduce workload. As work increases but manpower remains limited, employees see real value in using digital tools. They are willing to learn and share tips within and across departments.

Support also includes the e-learning platform and subsidies for certifications. The outcomes of learning become part of the company's knowledge base.

Knowledge sharing between departments happens through informal communication and practical collaboration. If one team implements a useful system or process, others naturally follow—more practical than forced rollout, and easier for employees to accept.

Question: Do employees use data for analysis and decision-making?

RT: Yes, departments like production planning, R&D, sales, and finance treat digital tools and dashboards as standard. For instance, production planners and managers use digital dashboards to track progress, output, and issues for real-time decisions.

Once, on a Sunday, when the dashboard system failed, a colleague immediately contacted us saying, “The system isn’t working, I can’t do my job”—which shows how much they rely on it.

Employees also give feedback on system features, which helps IT improve tools. Dashboards are also used for cross-departmental meetings. Executives use integrated reports to guide discussions and decisions.

Question: Are digital tool interfaces designed to make tasks easier?

RT: Yes, Everest optimizes user experience. Systems like SAP and ABS combine information into one interface to avoid switching screens. Drill-down features help users go from summaries to detailed data quickly. Report outputs are tailored to users’ needs, minimizing extra work. User feedback drives ongoing interface improvements.

Question: Do foreign workers also use digital tools?

RT: Yes. Foreign employees use systems to manage work orders and process cards, entering data for real-time updates. They also operate automated equipment. We’ve considered language and usability in system design so frontline staff—including foreign workers—can use the tools easily.

Digital tools are used from the shop floor to upper management, showing that digitalization is fully embedded.

Question: Are sensors and actuators installed in processes like spinning, dyeing, inspection, and packaging? What data is collected?

RT: We don’t automate everything due to cost. Instead, we focus on key equipment. For example, installing sensors across 1,000+ spinning machines would need tens of thousands of devices. So, we prioritize critical machines, collecting data like tension and temperature.

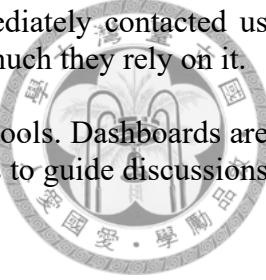
In weaving, all looms have monitoring systems. In dyeing and finishing, sensors are installed on two key machines: dyeing and stenter machines, because they are vital for quality and efficiency.

Question: Is there a system to track items like materials and products on-site?

RT: Yes, we track fabric carts, finished goods, and materials using area-based entry/exit systems and handheld devices that scan QR codes. The system shows item locations in real time, improving logistics and reducing errors.

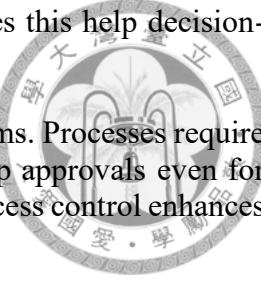
Question: What systems are used for employee communication, and how well are they integrated?

RT: LINE is the main communication tool. It’s familiar and convenient for everyone. We also use LINE APIs to push alerts from internal systems, like stock-in notifications or quality warnings. For meetings and cross-team work, we use Microsoft Teams and Zoom. ERP handles structured data like purchase requests and inventory, ensuring traceable communication.



Question: Does the company use digital signatures for approvals? How does this help decision-making?

RT: Yes. Digital signing is used across business, procurement, and HR systems. Processes require digital signoffs at each level, defining clear responsibilities and speeding up approvals even for people who are abroad. Reminder features push pending tasks. Role-based access control enhances security.



Question: Are sensor/actuator data processed locally before going to central systems? Why?

RT: Yes. Sensor data first goes to edge devices for initial processing. This improves real-time response and filters out noise. Only useful data is sent to the central system, reducing load and helping with decision-making and visual analysis later.

Question: Is there a framework or standard for communication between employees, machines, and systems?

RT: Yes. We have standard operating procedures (SOPs) to guide machine and system use. Training videos are linked to QR codes at workstations. Staff can scan and watch on-demand, improving learning and reducing the need for on-site guidance. This supports standardized knowledge transfer.

Question: How integrated are your IT systems like ERP, MES, PLM, CRM, and IoT platforms?

RT: We've built a "Digital Twin" platform to integrate ERP, MES, and machine data. This unified system supports dashboards and real-time monitoring. We're also building a Data Lake to centralize all data for AI analysis and decision support. The goal is to eliminate data silos.

Question: Do you have a "Single Source of Truth" (SSOT)? Which systems provide the core data?

RT: We're working toward SSOT. In the past, data came from different systems: PLM for products, ERP for orders, MES for production. Now we're integrating them into the Data Lake. Some systems are already connected. Machine data is collected via IoT and uploaded after local processing. We're focusing on key equipment first.

Question: Does Everest have data governance policies?

RT: Yes. Data access is role-based and approved through our BPM system. Staff must apply for access, explaining what and why. Requests go through department, IT, and info security checks. Cross-department requests require extra approval. We also regularly review access and ensure it aligns with company policies.

Question: What methods are used to ensure data quality?

RT: Data is cleaned before being used in BI or AI tools. The IT team filters and checks for quality, even without automated tools. Most data comes from structured systems. IT works closely with

departments to verify and optimize data. Our experienced IT team—many with over 20 years in service—ensures quality through internal collaboration.



Question: What cybersecurity measures are in place?

RT: We take cybersecurity seriously, especially after recent hacks in other firms. We use firewalls, intrusion detection systems (IDS), anomaly monitoring, and AI-based alerts. Network zones are isolated to block external threats. We also have backups and disaster recovery plans. Regular third-party audits and Far Eastern Group support help us stay updated on threats and best practices.

Question: How is system and data access managed?

RT: All access requests go through a strict BPM approval process. Direct managers, IT reviewers, and senior IT leaders all check requests. We've also reduced overlapping IT permissions and follow a “least privilege” rule, where staff only access what's needed for their jobs. External auditors like Deloitte give advice that we follow.

Question: Has Everest adopted AI or machine learning for data analysis?

RT: Not yet, but we're preparing. We currently use BI tools and statistical programs. We understand AI's potential in predictive analytics and root cause analysis. But AI needs clean, structured data, so we're building our Data Lake first. We plan to use AutoML platforms for “low-code/no-code” AI. This way, business users can build models without coding.

Question: Is there a cross-department team or “community” to drive digital transformation?

RT: Yes. We use a “seed staff” model. Each department picks 2–3 digitally savvy staff who bridge the gap between IT and frontline needs. These seed staff help promote and train others. They also translate business needs into technical specs. For larger projects, IT assigns dedicated leads per unit and coordinates across departments when needed.

Question: How do you collect and respond to customer needs?

RT: We design processes around customer expectations—delivery, quality, traceability. We collect feedback through sales teams, data sharing, and project meetings. For custom needs (like traceability platforms), IT adjusts systems accordingly. If a strategic client has specific requests, we prioritize them.

While we haven't fully adopted real-time AI feedback loops, our systems can already handle flexible changes, like order or quality adjustments. We collect feedback from all levels and prioritize common or high-impact issues.

Question: How prepared are employees and the company culture for new digital tools?

RT: We've built a culture that welcomes digital tools. Departments like sales, R&D, and quality rely heavily on them. Even frontline staff can use essential tools when guided. We encourage

learning through outside training, with paid leave and subsidies. Internal small-group training is also offered.

We're building an e-learning platform that will cover technical, managerial, and general skills, with clear learning paths by role.

We involve managers and seed staff early in system rollouts. This builds buy-in and helps the tools succeed.

Question: How does Everest support continuous digital skill growth?

RT: Our current COO promotes an open culture where mistakes are okay and information is transparent. Employees can raise issues freely, and the company provides resources to help solve them.

Each year, top management sets strategy and KPIs, and departments build action plans. This allows top-down guidance and bottom-up initiative. Employees have growing autonomy to implement improvements, showing a shift from command-and-control to an empowered, open culture.

This shift helps employees accept and embrace digital tools, fosters cross-functional teamwork, and builds a shared sense of learning and innovation.

