



# Stages of ERP-Based Digital Transformation to Enhance the Competitiveness of the Batik Industry

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Article Info	Abstract
<p><b>Keywords:</b></p> <p><i>Batik;</i></p> <p><i>Digital Tranformation;</i></p> <p><i>Industry 4.0;</i></p> <p><i>Small Medium Enterprise;</i></p> <p><i>Enterprise Resource Planning;</i></p> <p><i>Sustainability</i></p>	<p>The batik industry, as part of Indonesia's cultural heritage, faces significant challenges in the digital era and Industry 4.0. This study analyzes the stages of ERP-based digital transformation in batik SMEs through a case study at Batik Paradise Yogyakarta, designated by the Ministry of Industry as a pilot project in 2024. Using a qualitative descriptive approach with observations, semi-structured interviews, and documentation, the research identifies four implementation phases: (1) preparation and needs analysis, (2) core module implementation, (3) cross-functional integration, and (4) optimization and evaluation. Findings show that ERP adoption enhances operational efficiency, financial transparency, and data integration while supporting cultural preservation through motif and production documentation. The study contributes an adaptive ERP implementation model for batik SMEs and offers policy recommendations to strengthen digital competitiveness.</p>

## 1. INTRODUCTION

The batik industry is one of the creative economy subsectors with high cultural value and serves as a national identity of Indonesia. As an intangible cultural heritage, batik plays a role not only in the aesthetic dimension but also as an important element in both local and national economies. On the other hand, the digital era and the Fourth Industrial Revolution demand that all business actors, including small and medium-sized batik enterprises (SMEs), enhance their competitiveness through digital transformation that bridges cultural preservation and managerial efficiency (Saputra, 2022).

In the context of sustainability, the batik industry must embody two key dimensions: cultural sustainability and managerial sustainability. Cultural sustainability relates to the preservation of batik motifs, techniques, and philosophies as ancestral heritage. Meanwhile, managerial sustainability emphasizes the importance of adopting digital systems to manage business processes, thereby generating valid data and reliable information for strategic decision-making (Hawa et al., 2025).

At present, many batik SMEs still rely on manual processes in their operations—from financial recording and inventory management to marketing—leading to delays, inaccurate data, and difficulties in making timely decisions. To strengthen managerial sustainability, implementing systems such as Enterprise Resource Planning

(ERP) can be an effective solution. ERP enables the integration of various business functions—production, marketing, finance, human resources, procurement, and logistics—into a single unified system (Pratiwi, 2020).

Recent studies have shown that digitalization, including ERP implementation or other information systems, can enhance the competitiveness and resilience of batik SMEs. For instance, the adoption of IT-based catalog systems has improved customer attraction and marketing efficiency for Banyumasan batik MSMEs (Yusuf et al., 2025). Similarly, digital transformation in financial recording applications for Batik Masaran MSMEs has strengthened financial discipline and business professionalism (Jayanti et al., 2025).

Although digital adoption in batik SMEs has been initiated, studies that integrate the perspectives of cultural and managerial sustainability within an ERP framework remain limited, particularly those based on field research. One example that illustrates ERP's potential is the implementation at Batik Semarang 16 through the Odoo platform, which successfully reengineered supply chain processes and improved operational efficiency (Pratiwi, 2020). Nevertheless, a phased ERP implementation model tailored to the unique characteristics of batik SMEs—such as organizational structure, technological capacity, and local culture—still requires further exploration.

Building on this, the present study takes a case study of Batik Paradise Yogyakarta, representing a batik enterprise with strong cultural potential and distinctive managerial challenges. Batik Paradise has chosen to document its ERP-based digitalization journey in stages—starting with financial, production, and digital marketing modules—as a strategy to improve efficiency while preserving the traditional values of batik.

This study aims to: Describe the stages of ERP-based digital transformation undertaken by Batik Paradise Yogyakarta ; Analyze how these ERP stages support managerial sustainability through stronger data integration and decision-making ; Evaluate the role of ERP in supporting batik cultural sustainability by enhancing operational efficiency and expanding market access without compromising traditional values.

Through this framework, the article seeks not only to contribute conceptually to digital transformation in batik SMEs but also to offer an ERP implementation model that can be replicated by other batik entrepreneurs.

## **2. METHODS**

The batik industry, as an intangible cultural heritage and a vital subsector of Indonesia's creative economy, faces increasing challenges in the digital era and Industry 4.0. Many small and medium-sized batik enterprises (SMEs) still rely on manual processes, which hinder efficiency, data accuracy, and competitiveness. To address these challenges, digital transformation through Enterprise Resource Planning (ERP) offers an integrated solution that enhances managerial sustainability while supporting cultural preservation through the digital documentation of motifs and production processes. However, studies that combine both cultural and managerial sustainability perspectives in ERP implementation remain limited. This research therefore examines the staged ERP-based digital transformation at Batik Paradise Yogyakarta appointed by the Ministry of Industry in 2024 as a pilot project for batik digitalization—aiming to provide insights and a replicable model for strengthening the competitiveness of batik SMEs.

### **2.1 Research Design**

This study employs a qualitative descriptive approach with a case study method. This approach was chosen because it enables an in-depth exploration of phenomena within a real-world context, particularly in the implementation stages of ERP-based digital transformation at Batik Paradise Yogyakarta (Yin, 2018).

### **2.2 Research Location and Subjects**

The study was conducted at Batik Paradise Yogyakarta, a small and medium-sized enterprise (SME) engaged in batik production, distribution, and marketing. The site was selected based on two considerations:

1. Batik Paradise was designated as a pilot project for digital transformation in the batik industry by the Ministry of Industry in 2024 (Kementerian Perindustrian, 2024).
2. ERP implementation at Batik Paradise had been initiated in collaboration with RUN System through core modules such as procurement, inventory, and financial management (Run System, 2024).

### **2.3 Data Collection Techniques**

Data were collected using three techniques:

1. Direct observation of production, marketing, and administrative processes at Batik Paradise.

2. Semi-structured interviews with the owner, manager, and administrative staff regarding their experiences in ERP implementation.
3. Documentation in the form of internal reports, company brochures, publications from the Ministry of Industry, and related literature.

## 2.4 Data Analysis Techniques

Data were analyzed using the Miles et al., 2014 method, which includes:

1. Data reduction – categorizing information related to managerial issues, implemented ERP modules, and digitalization stages.
2. Data display – visualizing business processes before and after ERP implementation through tables and narratives.
3. Conclusion drawing – formulating ERP-based digital transformation stages and their impact on competitiveness.

## 2.5 Data Validity

To ensure data validity, this study employed source triangulation, by comparing interview results, observations, and documentation. In addition, member checking was conducted with Batik Paradise management to confirm that the interpretation of the data accurately reflected the actual conditions.

## 3. RESULT AND DISCUSSION

### 3.1 Profile of Batik Paradise Yogyakarta

Batik Paradise is one of the batik SMEs in Yogyakarta, recognized for combining traditional and modern batik products. The company envisions becoming a batik production center that preserves cultural values while remaining competitive in the global market. Its products are marketed both locally and nationally through physical stores, reseller distribution, and online channels such as marketplaces and social media. Prior to digitalization, Batik Paradise's operations were largely manual, particularly in raw material stock recording, production control, and financial bookkeeping. This condition created several problems, including:

1. Delays in stock information, often resulting in raw material shortages during periods of high demand.
2. Inaccurate financial records, making it difficult to analyze profit-loss and cash flow.
3. Limited data integration across departments, for example, production data not being directly connected to the sales division.

These issues highlight the urgency of adopting a system capable of integrating all business processes comprehensively.

### 3.2 ERP Implementation at Batik Paradise

In 2024, Batik Paradise was appointed by the Ministry of Industry as one of the pilot projects for digital transformation in the batik industry through the implementation of cloud-based ERP. This implementation was facilitated by RUN System, with the initial modules covering procurement, inventory, and financial & accounting management (Run System, 2024; Kementerian Perindustrian, 2024). The ERP system was designed to be implemented gradually, adjusted to the human resource capacity and technological infrastructure readiness of Batik Paradise.

### 3.3 Stages of ERP-Based Digital Transformation

Based on observations and interviews, the ERP implementation at Batik Paradise can be described in four main phases:

**Table 1. The Stages of Digital Transformation of Batik Paradise Based on ERP**

No	Stage	Activity Description	Generated Output	Key Impact
1	Preparation & Needs Analysis	Identification of managerial issues, business process mapping, and selection of priority modules.	ERP needs analysis document.	Increased awareness of the importance of data integration.
2	Core Module Implementation	Implementation of procurement, inventory, and financial management.	Integrated digital recording system.	Improved efficiency in stock and financial management.

No	Stage	Activity Description	Generated Output	Key Impact
3	Cross-Functional Integration	Integration of data across production, marketing, and human resources.	Interconnected cross-module data.	Faster decision-making.
4	Optimization & Evaluation	Use of digital reports for strategic planning, periodic evaluation, and adjustment of additional modules (e.g., digital marketing).	Cloud-based ERP dashboard.	Enhanced competitiveness and stronger export readiness.

### 3.4 Digital Transformation Flowchart

The following diagram illustrates the digital transformation process of Batik Paradise through ERP, showing how the transition from manual systems to ERP-based digitalization creates a new, more efficient, and competitive value chain.



**Figure 1. Flow digital transformation process of Batik Paradise**

To achieve Industry 4.0, full integration between digital technologies and business operations is required. Enterprise Resource Planning (ERP) serves as a critical foundation in supporting this transformation by connecting various business and technology elements. ERP as a Data Lake Provider: ERP manages and consolidates data from all aspects and functions of business processes—including production, inventory, finance, and human resources. In the Industry 4.0 era, ERP is integrated with the Internet of Things (IoT), enabling real-time data collection from physical devices and production processes on the ground.

**Big Data and Predictive Analytics:** Data collected through ERP and IoT is transformed into big data, which is then utilized for predictive analytics. This capability allows companies to forecast demand trends, prevent supply chain disruptions, and improve operational efficiency.

**Machine Learning:** ERP systems integrated with machine learning technologies enable deeper analysis. For instance, analyzed data can help identify consumption patterns or predict machine maintenance (predictive maintenance) before breakdowns occur.

**Artificial Intelligence (AI):** At a more advanced level, predictive analytics and machine learning derived from ERP data drive the development of AI. AI enables automated decision-making, process optimization, and faster, more accurate insights, allowing businesses to quickly adapt to market changes.

### 3.5 ERP Implementation at Batik Paradise Yogyakarta

Based on Table, there are three general approaches to ERP implementation: big bang, modular, and 2RUN (default system). The big bang approach is considered highly risky for SMEs, as all modules must be implemented simultaneously within a short timeframe with high upfront costs. The risk of failure also increases because the system must operate fully at once, while human resource and infrastructure readiness at the SME/SMI level is typically still limited (Taufiq Maulana Firdaus et al., 2024).

In contrast, the modular approach is considered more suitable for the batik industry, as implementation is carried out in stages, lowering risks and allowing more manageable user adaptation. Each module is tested independently, enabling earlier detection and resolution of issues. This model also allows costs to be distributed over a longer period, preventing excessive financial burden on the company (Ramdhani et al., 2025).

In the case of Batik Paradise Yogyakarta, the company did not adopt the big bang method; instead, it chose a combination of modular implementation with the 2RUN baseline default system. This strategy enabled the company to start with the most urgent core modules—procurement, inventory, and financial management—before proceeding to other modules. The advantage of 2RUN is that the modules are already based on standardized baseline systems, reducing the need for initial development. This minimizes costs, shortens implementation time, and reduces technical complexity (Jayanti et al., 2025).

From a change management perspective, the modular-plus-baseline approach also offers smoother adaptation for Batik Paradise employees. Training can be focused on one module at a time, allowing a gentler learning curve and more positive user acceptance of the new system. Testing is conducted in a development environment rather than directly in the production system, minimizing operational disruptions.

Thus, Batik Paradise's strategy demonstrates that the combination of modular and baseline default systems is the most realistic solution for batik SMEs undertaking ERP-based digital transformation. This aligns with literature emphasizing the importance of adaptive and phased approaches in SME digitalization.

**Table 2. ERP Implementation Methods: Big Bang, Modular, and 2RUN**

Aspect	Big Bang	Modular	2RUN (Default System)	Implementation at Batik Paradise
Definition	All ERP modules are implemented simultaneously at one time.	ERP modules are implemented one by one in stages.	ERP modules are implemented either simultaneously or gradually using a default system without initial development.	Batik Paradise chose a staged modular approach with the 2RUN (default) system, starting with procurement, inventory, and finance modules.
Implementation Time	Short (a few months), but intensive.	Longer, depending on the number of modules and complexity.	Faster, since modules are already available in the baseline.	Implementation carried out in stages over a medium timeframe, allowing employees to adapt to each module.
Cost	High upfront, since all modules go live at once.	More distributed, as implementation is gradual.	Lower, as costs focus on training rather than development.	Relatively efficient costs, borne gradually and focused more on HR training.
Risk	High, since all modules must function immediately.	Lower, as each module is tested separately.	Lower, since modules are already tested in the baseline.	Controlled risk, as each module is tested before use, and the RUN System baseline is already stable.
Operational Disruption	High, due to large-scale simultaneous changes.	Smaller, due to gradual changes.	Significant disruptions, but managed in the development environment.	Minimal operational disruption, as testing is conducted in the development environment before production.
Complexity	High, since all aspects must be configured at once.	Simpler, as each module is tested one at a time.	Managed complexity, no major development required.	Controlled complexity, as module implementation is adjusted to SME capacity and needs.
Change Management	Heavy, as the entire system changes at once.	Easier, as changes are gradual.	Large at the beginning, but data remains safe in development.	Lighter change management, as employees are trained per module, making adaptation easier.
Testing	Conducted after the full system goes live.	Conducted per module → issues can be quickly detected.	Conducted on real applications → lower risk.	Step-by-step module testing, issues can be addressed earlier before full integration.
User Readiness	Users must be ready for the full system at once.	Users adapt module by module → smoother learning curve.	Users must be ready more quickly with the default system.	Batik Paradise trained employees per module, enabling smoother adaptation.

Although the batik-making process at Batik Paradise continues to adhere to traditional methods, the company does not overlook the importance of technological innovation to support overall business management. Digital technologies are implemented within the framework of Industry 4.0, particularly to strengthen managerial and operational aspects. Batik Paradise employs technology to manage and monitor the entire supply chain, ranging from raw material procurement and the use of supporting materials to product traceability during the production process. This system ensures that every material entering production can be properly tracked, enabling the company to manage stock and material needs more efficiently.

Furthermore, digitalization has also been applied in inventory management, human resource management, distribution, and the Point of Sales (POS) system to record every sales transaction. Through this technology, Batik Paradise successfully integrates all business functions into a unified system that simplifies documentation and reporting. Financial reporting has also become more accurate and real-time, providing stakeholders with timely insights for faster and more precise strategic decision-making.

### 3.6 The Impact of ERP on Competitiveness

The implementation of ERP at Batik Paradise has delivered tangible impacts on both managerial and cultural sustainability:

- 1. Operational Efficiency. With procurement and inventory modules, the company has reduced the risk of raw material shortages and achieved more accurate production planning.
- 2. Financial Transparency. The finance module generates real-time reports, enabling the owner to evaluate business performance more accurately.
- 3. Cross-Functional Data Integration. Production, sales, and financial data are integrated into a single platform, accelerating strategic decision-making.
- 4. Cultural Sustainability. Digitalization allows Batik Paradise to expand market access through online channels without sacrificing the cultural values of traditional batik. ERP also supports the documentation of motifs and production processes, ensuring the preservation of unique batik patterns even as demand increases.

3.7 Discussion with Previous Studies

These findings are consistent with Ramdhani et al, (2025), who emphasize the importance of SME readiness in ERP adoption. Management commitment and employee training have proven to be key success factors at Batik Paradise, as also highlighted by Akmila et al, (2023) in ERP studies on retail companies. However, unlike Taufiq Maulana Firdaus et al, (2024), who largely underline adoption barriers in developing countries, the case of Batik Paradise demonstrates that government support (through the Ministry of Industry) and collaboration with local ERP vendors can significantly accelerate digital transformation in traditional sectors.

Tabel 3. Comparison of Organizational Aspects Before and After ERP Implementation

Aspect	Before ERP	After ERP	Academic/Practical Impact
Inventory Management	Manual recording, frequent stockouts of raw materials.	Inventory module provides real-time data on raw material and finished product stock.	Improved production efficiency and better supply chain control.
Finance & Accounting	Manual financial reports, prone to errors, slow profit and loss analysis.	Financial management module generates automated reports and dashboards.	Increased financial transparency and accuracy.
Production	Production planning not integrated with sales data.	Sales data automatically feeds into production planning.	Production becomes more adaptive to market demand.
Marketing	Promotion limited to physical stores & resellers.	Sales data supports digital marketing strategies (marketplaces & social media).	Expanded market reach and increased digital penetration.
Decision-Making	Based on intuition and partial data.	Based on integrated ERP dashboards.	Faster and more accurate strategic decision-making.
Batik Culture	Focus on tradition preservation but poorly documented.	ERP supports documentation of production processes and batik motifs.	Cultural sustainability preserved alongside modern efficiency.

4. CONCLUSION

This study concludes that the implementation of cloud-based Enterprise Resource Planning (ERP) at Batik Paradise Yogyakarta has significantly improved operational efficiency, financial transparency, cross-functional integration, and market access, while also supporting the preservation of batik culture through systematic documentation of motifs and production processes. The findings highlight the importance of government support, collaboration with local technology providers, and internal organizational readiness as key success factors, in line with previous studies on ERP adoption in SMEs. To strengthen digital transformation in the batik industry, Batik Paradise is advised to expand ERP into advanced modules such as digital marketing and human resource management, while other SMEs are encouraged to adopt ERP gradually according to their readiness and collaborate with local vendors to optimize costs. Furthermore, the government is recommended to provide subsidies, training, and digital incubation, as well as formulate policies that integrate cultural preservation with technological innovation to ensure the long-term sustainability and competitiveness of the batik industry.

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