

RESEARCH ARTICLE

Enhancing operational efficiency in the metal manufacturing industry through ERP system implementation: A case study

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Abstract – The competitiveness and efficiency of manufacturing companies depend on seamless operations and the adoption of up-to-date technologies. However, reliance on manual tools such as Microsoft Excel spreadsheets often results in errors, delays, and inefficiencies, thereby highlighting the need for more effective systems. Enterprise Resource Planning (ERP) has been widely recognised for its ability to simplify supply chains, reduce costs, and support data-driven decision-making. This study examines current delivery tracking practices and evaluates the impact of ERP implementation using a qualitative case study approach. Data were collected through a face-to-face semi-structured interview with an experienced QA/QC manager and supported by process observations. The findings show that ERP adoption enhances organisational efficiency, strengthens interdepartmental collaboration, improves delivery tracking, and increases customer satisfaction and competitiveness. Overall, the study highlights ERPs as a strategic tool for achieving operational excellence, long-term growth, and sustainability in the manufacturing industry.

Article History

Received : 22 May 2025

Revised : 11 September 2025

Accepted : 29 October 2025

Published : 30 September 2026

Keywords

ERP System

Delivery

Manufacturing

Efficiency

Case study

1. Introduction

Manufacturing involves the process of transforming raw materials into finished goods using machining, assembly, and quality control (Islam et al., 2024). These methods range from basic consumer goods to complex industrial equipment and are essential for producing large quantities of products. The diverse range of products produced by the manufacturing industry demonstrates its variety to ensure quality and accuracy. Beyond its basic product creation, manufacturing drives economic development globally by generating employment and value creation (Ndubisi et al., 2021). Haraguchi et al. (2017) claimed that the manufacturing industry greatly affects national labour market participation and gross domestic product (GDP), therefore promoting economic stability and development of the country and its neighbours. Maintaining future growth necessitates manufacturing companies to create innovations and make positive changes. They can also capitalise on modern technology to improve production line operations, reduce various types of expenses, and increase product quality by mixing different technological components (Ding et al., 2023).

Rapid technological development has brought about significant changes to manufacturing, with more large companies attempting to meet new consumer expectations and expand into new markets (Aheleroff et al., 2021). Successful businesses often understand the value of integrated systems to improve quality, customer satisfaction, performance, and profit (Bukhari et al., 2025). Manufacturing organisations require timely, reliable, and accurate data to operate effectively. This underscores the necessity to implement suitable management information systems. Organisations can achieve this goal by implementing enterprise resource planning (ERP) technologies in practice (Anaya et al., 2023). ERP is a type of business management software that unifies the data and processes of an organisation into a single system. Its software architecture encourages data flow across all business functions (Tuli & Kaluvakuri, 2022). Additionally, ERP facilitates data and information transmission to enable the automation and integration of business procedures and achieve process management best practices. One of the main goals of ERP implementation is linking corporate activities for improving customer satisfaction and reducing production wait times (Ahamed et al., 2020; Ndubisi et al., 2021). Another benefit of ERP is the capacity to view and manage the complete supply chain, consumers, and vendors as a kind of discipline, and a wealth of knowledge about consumer desires and goals (Roy et al., 2024). ERP systems give businesses faster and more precise control over their changes, which is particularly important amid unavoidable conflict and ongoing economic (Ahamed et al., 2020).

A previous case study by Ahamed et al. (2020) found that companies that do not implement the ERP system may not be able to reap the benefits of several intangibles, including reduced time spent preparing monthly and quarterly accounts, the elimination of manual data entry and duplicate work, timely and accurate reporting that increases customer satisfaction and helps retain customers, and a reduction in employee workload and manual paperwork. Additionally, management constantly needs management information reports that include all financial and operational analyses. The ERP system only requires extracting the data into an appropriate format because the integrated application captures all of the data into the same database. This study employed a case study approach focusing on a manufacturing company in Malaysia, where dependency on manual data entry created challenges to the operation. The company is a multinational corporation that specialises in producing pressure equipment and catering to clients in the power, chemical, refinery, and petroleum sectors. An observation done on site revealed that the manufacturing company conducted its data management manually using a Microsoft Excel spreadsheet (see Figure 1). Although initially feasible, the manual process later caused significant issues as the manufacturing company faced operational expansion. A recurring issue is the difficulty in tracking deliveries,

as reliance on ad hoc processes and manual data (e.g., Microsoft Excel spreadsheets) is both time-consuming and error-prone, limiting the accuracy of real-time service information essential for operational continuity and customer satisfaction. Additionally, the manual data management has frequently resulted in problems such as delayed shipments and poor production planning, combined with the presence of errors in manual data input and slow processes. This underscores the urgent need for a more sophisticated system to streamline the operations and boost efficiency. The organisation must develop innovative ways to overcome these challenges to prevent mistakes and avoid wasting time in complex tasks, ultimately resulting in improved quality of work and accuracy of real-time service.

Figure 1

Microsoft Excel spreadsheet data key-in

DA35														
Amalgamated Metal Corporation (M) Sdn. Bhd.														
FROM : QA / QC Dept. (Name of the Department)					TO : Jaid (B) Sdn. Bhd. (Client / Inspection Agency)					NOTE :				
										AP : APPROVED AN : APPROVAL NOTED AND RESUBMIT (FABRICATION MAY PROCEED) RC : RETURNED FOR CORRECTION (FABRICATION SHOULD NOT START) RI : RETURNED FOR INFORMATION ONLY				
										RE : REVIEWED WITHOUT COMMENT S : SCHEDULE A : ACTUAL OUT : IT IS THE DATE AND SUBMITTED TO CLIENT IN : IT IS THE DATE AND RECEIVED FROM CLIENT RES : RESULT				
										ISSUE PURPOSE :				
										FI : FOR INFO FR : FOR REVIEW FA : FOR APPROVAL FT : FOR FINAL				
SL NO.	APAC DOCUMENT NO.	DOCUMENT TITLE	DOC. NO.	SIZE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE
3	C3185/JSB/MDR/005	Manufacturer's Data Report	A4	48	20/03/23	06/10/23	30/03/24	16/3/24	27/05/24	07/05/24	17/05/24	17/05/24	17/05/24	17/05/24
** Refer MDR Requirements **														
10	C3185/JSB/ISPP/006	Surface Preparation & Painting Procedure	A4	48	20/03/23	22/03/24	AN	28/03/24	16/04/24	AP	07/05/24	17/05/24	17/05/24	17/05/24
To update and modification on 03-24 App-L to per email on 06/05/24.														
11	C3185/JSB/ISP/007	Packing, Preservation & Shipping Procedure	A4	7	01/11/23	13/10/23	27/03/23	14/11/23	01/12/23	AP				
12	C3185/JSB/HTP/008	Hydrostatic Test Procedure	A4	15	01/11/23	23/10/23	01/11/23	17/11/23	03/12/24	AP				
13	C3185/JSB/NDE/009	NDE Procedure (RT/MT/PT)	A4	63	23/3/23	16/10/23	17/11/23	24/11/23	23/11/23	AP				
14	C3185/JSB/NOC/010	NDE Operator Certificate	A4	25	23/3/23	16/10/23	17/11/23	28/11/23						
15	C3185/JSB/WP/011	Preliminary Welding Procedure Specification (Support Pad)	A4	22	23/3/23	30/10/23	AN	10/11/23	03/01/24	AP				
16	C3185/JSB/HTP/012	Inspection and Test Plan (DOC)	A4	11	11/12/23	03/01/24	AP							
*** Attached with the Preparation Report by weekly if feasible ***														
PROJECT NAME : LCD2 FAIRLEY EAST PROJECT - BROVNFIELD CD					ITEM NO. / NAME :					** MDR REQUIREMENTS :				
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Based on the problems faced by the case company, this study aims to identify the issues associated with the data management practices and to evaluate the potential of implementing an ERP system as a solution to the limitations of manual-based processes. This study contributes to academia and practice by providing insight into challenges experienced by manufacturing companies that employ manual data management methods. From a practical standpoint, the findings highlight the inefficiencies and challenges associated with manual processes and how ERP systems may be used as a strategic tool to improve integration, efficiency, and decision-making. From a theoretical standpoint, this case study contributes to the growing body of literature on digital transformation in manufacturing, particularly in Malaysia, by demonstrating how ERP adoption addresses real operational issues such as delivery tracking, production planning, and data accuracy. It offers useful implications for managers considering ERP implementation and serves as a foundation for future research on innovation and technological adoption in manufacturing industries. This section describes the context of the research on the manufacturing industry, general information on ERP systems, the problems faced by the case company, and the research objectives. The subsequent section presents a thorough analysis of existing literature on ERP, including its benefits and challenges. It is followed by an explanation of the research methodology, a presentation of the results, and a discussion of the findings.

2. Literature Review

2.1 ERP System in Modern Organisation

Management information systems (MISs) (Malaysian & Multimedia) emerged in industry in the late 1950s and early 1960s through the introduction of the first inventory control and material requirement planning (MRP) systems (Wilson, 2016). The initial generations of MISs were implemented primarily to meet the needs of mass production control and the development of industrial production standards in the United States. These helped to shape the development of subsequent generations of MIS systems. The next generations, CL-MRP (closed-loop MRP) and MRP II (manufacturing resource planning), were mainly responsible for managing inventory and planning resources for both current and future production (Morawiec & Softysik-Piorunkiewicz, 2023). The functionality of these systems was focused on enhancing the manufacturing process and lowering production costs by decreasing waste and optimising resource utilisation through planning (Dubey et al., 2024). ERP stands as an extension of the MRP II concepts in which resource planning is

implemented throughout the organisation, including financial resources, human resources, and management (Morawiec & Sołtysik-Piorunkiewicz, 2023). The framework has been proven effective for organising, defining, and standardising business processes to successfully plan and control a company, allowing the corporation to leverage its internal knowledge to seek an external advantage (Tuli & Kaluvakuri, 2022). ERP can improve an organisation's performance in a variety of ways, including optimised inventory, real-time reporting generation, enhanced customer service, and cost reduction.

2.1.1 Inventory management

The implementation of an ERP system customised to the demands of the manufacturing industry can result in significant benefits, particularly in inventory management (Chopra et al., 2022). Such a system can manage inventory levels, expedite raw material sourcing, and ensure the optimal use of resources. ERP implementation has a beneficial effect on corporate processes by reducing inventory levels, which saves costs while boosting sustainability and environmental responsibility (Vukman et al., 2024). Empirical evidence suggests that ERP systems can increase productivity, improve total supply chain coordination and production planning, and reduce the risk of supply disruption by providing reliable, real-time data on inventories and delivery, along with integrated tracking and real-time insight (Adeosun & Chukwunweike, 2024; Chopra et al., 2022; Vukman et al., 2024). This is particularly important in the manufacturing sector, where supply chains are frequently complex and involve several suppliers, distributors, and end users (Tulli, 2024).

2.1.2 Real-time reporting generation

ERP systems allow businesses to respond to real-time data and connect operations, resulting in a new era in manufacturing (Chopra et al., 2022). In the absence of such systems, manufacturing companies frequently find it difficult to produce and evaluate reports on time, which hinders rapid decision-making (Tulli, 2024). Because all financial, marketing, and sales data are unified into a single platform, managers who invest in ERP may view and export reports based on the most recent business information (Chopra et al., 2022). This supports automated and robotic modern manufacturing processes and guarantees accuracy, consistency, and efficiency (Feng & Ali, 2024). One of the key benefits of ERP is its ability to generate real-time reports across several departments, document process changes, and deliver sales, financial, or customised information to the appropriate stakeholders when needed (Chopra et al., 2022; Feng & Ali, 2024). According to Emma (2024), ERP systems enable real-time access to data. For instance, a project team will be able to obtain current and real-time data and reports, allowing them to monitor performance and make data-driven decisions.

2.1.3 Enhance customer service

ERP systems provide organisations with the ability to better manage their customer relationship through integrated Customer Relationship Management (CRM) (Emma, 2024). It offers sales teams access to centralised consumer data and enables them to provide individualised service and expedite problem-solving, such as contact information, purchase history, and preferences (Aljawarneh & Al-Omari, 2018). The CRM module also helps sales, marketing, and service tasks by automating lead tracking, sales pipeline management, and order processing, allowing sales teams to close deals more efficiently (Aheleroff et al., 2021). It further assists in the design and analysis of marketing campaigns across numerous channels, while also handling questions, support tickets, and service requests to ensure fast responses (Chopra et al., 2022). Organisations that consolidate customer data within the ERP system can respond to customer inquiries faster, give more precise order tracking, and provide a better overall service experience. This integration ultimately increases consumer satisfaction and loyalty (Jo, 2023).

2.1.4 Cost reduction

Cloud-based ERP solutions can help organisations reduce costs by eliminating the need for large expenditures in on-premise hardware and software infrastructure (Emma, 2024; Ndubisi et al., 2021). ERP systems reduce maintenance costs, maximise resource utilisation, and improve overall efficiency by streamlining operations. Task automation eliminates manual intervention, staffing costs, and the possibility of errors that could lead to costly rework (Chopra et al., 2022). Furthermore, ERP systems promote effective resource allocation by ensuring that human, financial, and material resources are efficiently employed (Tulli, 2024). In terms of inventory management and cost control, real-time tracking and automated procurement processes help to prevent overstocking and stockouts, thereby lowering carrying costs and increasing cash flow (Chopra et al., 2022; Vukman et al., 2024).

2.1.5 Enhancing process transparency

Blockchain technology is increasingly being used in ERP systems to improve data security, transparency, and integrity (Emma, 2024; Perera et al., 2023). It facilitates secure and transparent transactions by generating a living document of data transfers, which improves accountability and reduces the risk of fraud, especially in supply chain management and financial reporting (Bhagat, 2025). The decentralised design improves protection against unauthorised changes or data breaches, which is especially important in industries such as finance, healthcare, and manufacturing (Emma, 2024). Furthermore, integrating blockchain with ERP systems upholds supply chain traceability, allowing firms to more accurately track product movement and develop confidence with consumers and partners (Bhagat, 2025; Perera et al., 2023).

2.2 Challenges in Implementing the ERP Systems

Despite the benefits of ERP integration in manufacturing companies, several organisations have failed to reap its full potential. These failures are attributable not only to the software but also to the user company itself, particularly the management's inability to describe their own requirements and the user's inability to implement the specifications (Mahmood et al., 2020). The primary cause of failure is that business managers and IT experts overestimate the complexity of the planning, development, and training required to prepare for a new ERP system that would significantly impact their business processes and information systems. Therefore, manufacturing companies must improve their processes by embracing the skills and knowledge of users (Ranjan et al., 2016). ElFarmawi (2019) postulates that ERP system users lack the necessary knowledge to manage the system, as companies have little time to train them. Hence, ERP system vendors must provide a proper and adequate handbook for system users. In addition, a flowchart can also be supplied to demonstrate the flow of information between departments and how each module functions. Regular training sessions should be held to ensure a thorough understanding of the system, particularly as some users may find the system extremely complex and difficult to use. A proper selection of key users is equally critical since these individuals act as a liaison between the firm and the provider and therefore should be well-versed in both business operations and the system's technical aspects.

2.3 The Case Company

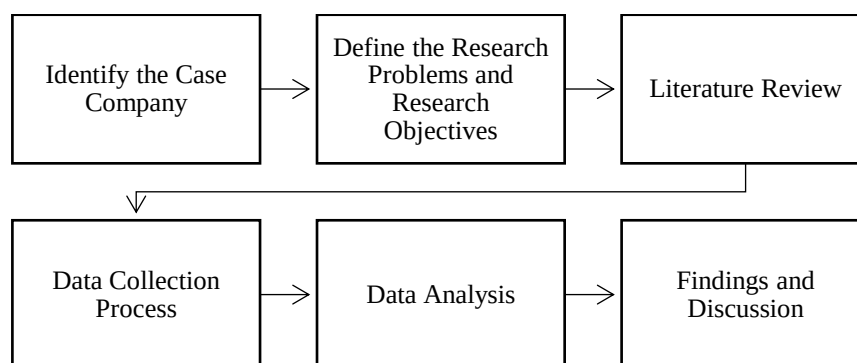
The case company in this research is an international pressure equipment manufacturer located in Malaysia. It was founded in 1982 and has grown over time to offer comprehensive engineering, manufacturing, and construction solutions. The company has obtained internationally recognised certifications such as the ASME U, U2, and S stamps as well as ISO 9001:2000 accreditation, thereby demonstrating its commitment to quality assurance. The product portfolio includes everything from traditional carbon steel equipment to advanced chrome alloys like Incoloy and Inconel, alongside other speciality materials used in industries like petroleum, power, chemicals, and refineries. Its success focuses on a customer orientation that prioritises customers as a basic value. Since its inception, the company has grown into a full-service fabrication and contracting supplier that serves a diverse range of industries.

3. Methodology

This study employed a qualitative research design using a case study approach to answer the research questions. The case company (i.e., Company ABC) was selected using the convenience sampling method due to its simple operation, less time-consuming, and cost-effective (Golzar et al., 2022). The use of a correct sampling method is crucial in research to strengthen the representativeness of the sample and improve the generalisability of the results. The investigation began with a preliminary interview involving a representative from the company to understand the problems related to data management practices faced by the organisation. Next, a thorough literature review was conducted to explore existing best practices on data management. It was followed by the data collection process, which entailed interviewing the Quality Assurance/Quality Control (QA/QC) Manager with more than 20 years of experience in managing quality processes and operational data. The informant also possessed prior experience in supply chain management, which provided valuable insights into the company's challenges and expectations regarding ERP implementation. An observation of the process flow of data entry was also performed to fully comprehend the problem. Finally, data analysis was performed to illustrate the impact of the proposed solution. Figure 2 presents the research flow of this study.

Figure 2

Research process flowchart



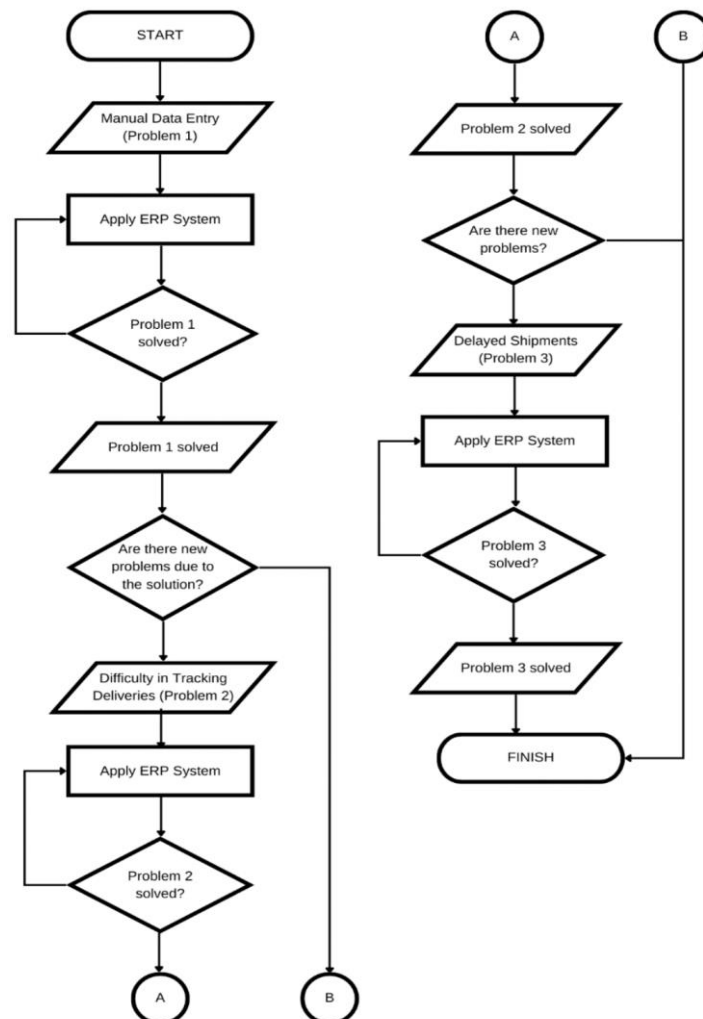
4. Results and Discussion

Findings from the interviews and on-site observations at Company ABC revealed that its reliance on manual data entry using Microsoft Excel spreadsheets led to several operational challenges. While spreadsheets provided a basic method of tracking tasks and information, this strategy proved insufficient as business activities developed. Errors, duplication of work, and delays in updating data were common, resulting in poor job quality and poor production planning. These limitations demonstrate how manual data management halts productivity and accuracy in a modern production environment, thereby emphasising the significance of using an integrated ERP system to address such difficulties. The

proposed ERP implementation will assist Company ABC in data management practices and enhance the efficiency of production processes. As shown in Figure 3, the implementation of the ERP system involves problem identification, application of the ERP solution, result evaluation, monitoring the gaps, and process stabilisation.

Figure 3

Flowchart of ERP implementation at Company ABC



Evidence from the interviews and direct observations indicated that manual data entry via spreadsheets generated duplicate records, keying errors, late updates, and inconsistent spreadsheets across departments. The use of single-source data integrated the shop-floor terminals, purchasing, and sales to automatically generate reports or posts, ultimately reducing data-entry error rate, reconciliation time, and transaction lead time. The next step was identifying other possible problems. Among the issues highlighted during data collection were difficulty in tracking deliveries that caused limited shipment visibility, manual status chasing, and mismatched dates between production, warehouse, and sales. Consequently, ERP activated warehouse and transportation management to integrate order processing, inventory movements, and freight execution. To improve shipment visibility, Advance Ship Notices (ASNs) were sent to consumers and transporters before delivery. Barcode scans were captured at pick, pack, and ship to validate each handling step and update inventory in real time. This published the shipment status to enable tracking. Another issue faced by Company ABC was delayed shipments. The ERP system provided a single, shared schedule for production, purchasing, and logistics, and it defined lead times to improve delivery planning and the production schedule. The results showed fewer delays and more dependable schedules. Performance was measured using plan adherence, schedule stability, supplier on-time rate, backlog age, and expedited cost.

Previously, the manual data entry practice using Microsoft Excel spreadsheets created challenges to the operation. The implementation of the ERP system enabled the company to enhance overall efficiency by properly managing customer service, coordinating supply chains, and managing human resources. Its implementation in a manufacturing environment resulted in enhanced production and efficiency, better decision-making and supply chain integration, and improved customer service. Figure 4 illustrates an example of how a client enters an ERP system (SAP/HANA) to conduct a business transaction, demonstrating one of the valuable features of ERP in organisations.

Figure 4*Client order data entry interface in the SAP/HANA ERP system*

Create Standard Order: Overview

Standard Order: 00 Net Value: 159,90 EUR

Sold-To Party: 12461 Donald Duck GmbH / Hauptstraße 5 / 67105 Entenhausen

Ship-To Party: 12461 Donald Duck GmbH / Hauptstraße 5 / 67105 Entenhausen

Cust. Reference: Intelligent Product Proposal Cust. Ref. Date: Z Base Values

Sales Item Overview Item detail Ordering party Procurement Shipping Configuration Reason for rejection

* Req. Deliv.Date: D Deliver.Plant: Total Weight: 180 KG

Complete Div.: Volume: 18 M3

Delivery Block: Pricing Date:

Billing Block:

Pyt Terms: 0001 Pay immediately w/o deduction

Inco. Version:

Incoterms:

Inco. Location1:

All Items (Active product proposal)

Item	Material	Req. Segment	Sea...	Sea...	Collec...	Theme	P...	Seas...	Order Quantity	Un	S	Item Description
10	IPHONE						0		20	AU	☒	iphone 8
20	SD01						0		10	PC	☒	SD Test Material 01

☒ The quantities from the product proposal have been copied

4.1 Implications of ERP Implementation

ERP streamlines organisational data and integrates operational data into a single system. The centralised data enable managers to access real information regarding orders, inventory, production, and deliveries, thus reducing reporting cycles and supporting consistent decisions. As the reports draw from the same source, the risk of conflicting versions or missing updates is reduced. These improvements resulted in increased daily efficiency for Company ABC, as teams were able to plan tasks and predict bottlenecks immediately via the shared dashboards that displayed delivery deadlines, inventory locations, and production plans. The implementation of ERP also improved cross-functional coordination and transitions by facilitating the understanding of a single schedule and item master shared by the production, purchasing, warehousing, and sales teams. Additionally, data processing was made more controlled, ownership of data was made transparent, and distributed spreadsheets were replaced with a managed system. Significant improvement was also recorded in the communication between suppliers and customers and service reliability, particularly since fewer follow-ups were needed due to more accurate delivery status sharing and updated order dates from ongoing activities. Overall, ERP has been proven effective in strengthening operational control and shortening the time to obtain reliable information. Managers may focus on planning, exception handling, and continuous improvement when they centralise fundamental activities into a single platform.

5. Conclusions

This study reveals that implementing the ERP system significantly improves manufacturing operations, especially in operations where manual data management was previously used. The case study illustrates that the implementation of the ERP system increases the efficiency of delivery tracking, reduces data-entry mistakes, improves collaboration between departments, and enables quicker and more accurate decision-making. These results highlight the critical role of digital transformation for businesses to remain competitive, meet customer needs, and boost organisational performance. In this regard, ERP should be viewed as a strategic investment that promotes long-term growth, flexibility, and sustainability in the manufacturing industry, ultimately supporting sustainability.

This study has several limitations that warrant attention. First, the qualitative data were gathered from an interview with one informant and on-site observation, which might limit the range of viewpoints and the generalisability of the findings. Future research should employ a better data collection technique to ensure that complete data can be acquired and increase the validity of the study. Increasing the number of informants using an appropriate sampling strategy will also improve validity and offer more comprehensive insights. Overall, this study highlights that ERP implementation provides clear operational advantages and enhances customer satisfaction by streamlining processes, reducing errors, and enabling faster decision-making. In addition, the successful implementation of ERP also depends on employee readiness, management commitment, and the ability to align it with evolving business and sustainability goals.

Acknowledgements

This research was conducted as part of the Individual Field Project (IFP) for the Bachelor of Business Engineering programme at Universiti Malaysia Pahang Al-Sultan Abdullah. The authors wish to express their gratitude to the Faculty of Industrial Management for the support and to the case company for their cooperation and valuable insights during the data collection process.

Funding

This study was not supported by any grants from funding bodies in the public, private, or not-for-profit sectors.

Declaration of Competing Interest

The authors declare no conflicts of interest.

CRedit Authorship Contribution Statement

Nur Khadijah Batrisyia Mujeebur Rahman: Conceptualisation; Analysis; Methodology; Writing – original draft

Norhana Mohd Aripin: Conceptualisation; Analysis; Validation; Supervision; Writing- review & revise

Nor Rokiah Hanum Md Haron: Analysis; Methodology; Writing- review & revise

Nazim Hanis Zainal Abidin: Methodology; Analysis; Writing- review & revise

Availability of Data and Materials

The data supporting this study's findings are available on request from the corresponding author.

Ethics Declarations

This study did not involve human or animal participants, nor did it require ethical approval.

Generative Artificial Intelligence Declarations

The authors declare that no generative AI or AI-assisted technologies were used in the writing of this manuscript. All content, including text, figures, and tables, was created by the authors.

References

- Adeosun, M. A., & Chukwunweike, S. O. (2024). *Bridging the gap: Innovations in supply chain technology through ERP integration and intelligent automation*. <https://doi.org/10.7753/IJCATR1310.1001>
- Ahamed, M. Y., Musthafa, M. M., & Marikar, F. (2020). Challenges and benefits of ERP system and non-ERP system integration in a developing country. *Global Journal of Management and Business Research: A Administration and Management*, 20(10), 69–78. <https://journalofbusiness.org/index.php/GJMBR/article/view/3146>
- Aheleroff, S., Mostashiri, N., Xu, X., & Zhong, R. Y. (2021). Mass personalisation as a service in industry 4.0: A resilient response case study. *Advanced Engineering Informatics*, 50, Article 101438. <https://doi.org/10.1016/j.aei.2021.101438>
- Aljawarneh, N., & Al-Omari, Z. (2018). The role of enterprise resource planning systems ERP in improving customer relationship management CRM: An empirical study of Safeway company of Jordan. *International Journal of Business and Management*, 13(8), 86–100. <https://doi.org/10.5539/ijbm.v13n8p86>
- Anaya, L., Flak, L., & Abushakra, A. (2023). Realizing sustainable value from ERP systems implementation. *Sustainability*, 15(7), Article 5783. <https://doi.org/10.3390/su15075783>
- Bhagat, S. K. (2025). ERP in public sector governance: Transforming transparency and accountability. *IJSAT– International Journal on Science and Technology*, 16(1). <https://doi.org/10.71097/IJSAT.v16.i1.2720>
- Bukhari, W. A. A., Bukhari, A. A. A., Troise, C., Hayat, N., & Bresciani, S. (2025). Green and profitable for sustainable development: The strategic advantage of integrated management systems on environmental, economic and financial performance. *Measuring Business Excellence*, 29(3), 635–655. <https://doi.org/10.1108/MBE-12-2024-0198>
- Chopra, R., Sawant, L., Kodi, D., & Terkar, R. (2022). Utilization of ERP systems in manufacturing industry for productivity improvement. *Materials Today: Proceedings*, 62, 1238–1245. <https://doi.org/10.1016/j.matpr.2022.04.529>
- Ding, B., Ferras Hernandez, X., & Agell Jane, N. (2023). Combining lean and agile manufacturing competitive advantages through Industry 4.0 technologies: An integrative approach. *Production Planning & Control*, 34(5), 442–458. <https://doi.org/10.1080/09537287.2021.1934587>
- Dubey, D. K., Agarwal, S., Yadav, A. K., Singh, M. K., & Singh, S. K. (2024). Sustainable manufacturing systems: Optimizing resource efficiency and minimizing environmental impact. *Indian Journal of Science and Research*, 4(2), 93–97.
- ElFarmawi, W. (2019). Challenges affecting the implementation of enterprise resource planning (ERP) system: An analysis. *Journal of Systems Integration*, 10(3), 35–43. <https://doi.org/10.20470/jsi.v10i3.378>
- Emma, L. (2024). *Enterprise resource planning (ERP) systems for streamlining organizational processes* [Unpublished manuscript]. ResearchGate. https://www.researchgate.net/publication/386382658_Enterprise_Resource_Planning_ERP_Systems_for_Streamlining_Organizational_Processes

- Feng, C., & Ali, D. A. (2024). Improving the organizational efficiency of manufacturing enterprises: The role of digital transformation, resource planning (ERP), and business practices. *Journal of Law and Sustainable Development*, 12(3), Article e2439. <https://doi.org/10.55908/sdgs.v12i3.2439>
- Golzar, J., Noor, S., & Tajik, O. (2022). Convenience sampling. *International Journal of Education & Language Studies*, 1(2), 72–77. <https://doi.org/10.22034/ijels.2022.162981>
- Haraguchi, N., Cheng, C. F. C., & Smeets, E. (2017). The importance of manufacturing in economic development: Has this changed? *World Development*, 93, 293–315. <https://doi.org/10.1016/j.worlddev.2016.12.013>
- Islam, M. R., Zamil, M. Z. H., Rayed, M. E., Kabir, M. M., Mridha, M., Nishimura, S., et al. (2024). Deep learning and computer vision techniques for enhanced quality control in manufacturing processes. *IEEE Access*, 12. <https://doi.org/10.1109/ACCESS.2024.3453664>
- Jo, H. (2023). Key factors influencing loyalty and satisfaction toward ERP: Mediating role of flow. *Journal of the Knowledge Economy*, 14(3), 2138–2155. <https://doi.org/10.1007/s13132-022-00981-4>
- Mahmood, F., Khan, A. Z., & Bokhari, R. H. (2020). ERP issues and challenges: A research synthesis. *Kybernetes*, 49(3), 629–659. <https://doi.org/10.1108/K-12-2018-0699>
- Malaysian Communications and Multimedia Commission. (2019). *Consumer satisfaction survey for courier 2019*. <https://www.mcmc.gov.my/skmmgovmy/media/General/pdf/Consumer-Satisfaction-Survey-Courier-2019.pdf>
- Morawiec, P., & Sołtysik-Piorunkiewicz, A. (2023). ERP system development for business agility in Industry 4.0—A literature review based on the TOE framework. *Sustainability*, 15(5), Article 4646. <https://doi.org/10.3390/su15054646>
- Ndubisi, N. O., Zhai, X., & Lai, K.-H. (2021). Small and medium manufacturing enterprises and Asia’s sustainable economic development. *International Journal of Production Economics*, 233, Article 107971. <https://doi.org/10.1016/j.ijpe.2020.107971>
- Perera, R., Nawurunnage, K., Chathuranga, S., Wickramarachchi, R., & Withanarachchi, A. (2023). Role of blockchain technology in ERP systems for a transparent supply chain: A systematic review of literature. In *2023 3rd International Conference on Advanced Research in Computing (ICARC)*. IEEE. <https://doi.org/10.1109/ICARC57651.2023.10145618>
- Ranjan, S., Jha, V. K., & Pal, P. (2016). Literature review on ERP implementation challenges. *International Journal of Business Information Systems*, 21(3), 388–402. <https://doi.org/10.1504/IJBIS.2016.074766>
- Roy, R., Ajith, A., & Vaishnavi, K. (2024). A systematic review on ERP and supply chain management. In *Applications of new technology in operations and supply chain management* (pp. 38–57). <https://doi.org/10.4018/979-8-3693-1578-1.ch003>
- Tuli, F. A., & Kaluvakuri, S. (2022). Implementation of ERP systems in organizational settings: Enhancing operational efficiency and productivity. *Asian Business Review*, 12(3), 89–96. <https://doi.org/10.18034/abr.v12i3.676>
- Tulli, S. K. C. (2024). Leveraging Oracle NetSuite to enhance supply chain optimization in manufacturing. *International Journal of Acta Informatica*, 3(1), 59–75. <https://www.yuktabpublisher.com/index.php/IJAI/article/view/132>
- Vukman, K., Klarić, K., Greger, K., & Perić, I. (2024). Driving efficiency and competitiveness: Trends and innovations in ERP systems for the wood industry. *Forests*, 15(2), Article 230. <https://doi.org/10.3390/f15020230>
- Wilson, J. M. (2016). The origin of material requirements planning in Frederick W. Taylor’s planning office. *International Journal of Production Research*, 54(5), 1535–1553. <https://doi.org/10.1080/00207543.2015.1092616>