IIAI Open Conference Publication Series
IIAI Letters on Business and Decision Science
Vol. 004, LBDS297
DOI: https://doi.org/10.52731/lbds.v004.297

A Case Study on the Internal Process Re-Engineering of Traditional Industry from a Resource-based Perspective

Che-Yu Hung [*], Sheng-Pin Wu [†],
Chien-Chih Wang [*], Tai-Yu Lin [†]

Abstract

Traditional industries face significant operational pressures in increasing global market competition. Many companies are adopting business process reengineering (BPR) to navigate these challenges and enhance operational efficiency and competitiveness. This study examines the application of BPR in a traditional manufacturing company, focusing on its impact on management information systems (MIS), operational costs, and employee morale. Employing a case study approach, the research analyzed the reengineering of the company's internal processes, which included integrating MIS with operational procedures under the ISO 9001:2015 framework. Key steps involved system analysis, personnel interviews, and the implementation of strategic improvements aimed at streamlining operations. The reengineering efforts led to a 30% increase in MIS utilization, a reduction in operational staff by two full-time equivalents, and a decrease in processing time by over 12 working days per year. Furthermore, there was an 80% reduction in average monthly non-performing losses and significant enhancements in employee morale. The findings demonstrate that BPR can significantly improve the efficiency and cost-effectiveness of traditional industries. The standardization of management practices and the transparent operational model were well-received by staff, fostering a culture of continuous improvement. These results suggest that similar strategies could benefit other companies in traditional sectors looking to modernize their operations and improve competitiveness.

Keywords: Business Process Reengineering, Traditional Industries, Management Information Systems, Operational Efficiency, Employee Morale.

1 Introduction

The COVID-19 pandemic has caused significant changes in market competition and industrial operating models. Moreover, there is intense competition between mainland China and Southeast Asian countries. Traditional industries are feeling the heat of this competition and are facing unprecedented operational pressure. They mainly focus on increasing operating profits and reducing procurement costs to achieve their profit goals. With international competition and rising prices, they also focus on process improvement and reengineering to ensure process efficiency and cost control.

To achieve process improvement and reengineering, companies in traditional manufacturing mainly rely on introducing system management and information systems. Their understanding

[*] Department of Industrial Management and Engineering, Ming Chi University of Technology, New Taipei City, Taiwan
[†] Department of Business Administration, National Cheng Kung University, Tainan, Taiwan

of process improvement and reengineering is to institutionalize and digitalize the processes to reduce costs and improve performance.

China's cancellation of ECFA tariffs, international attention to climate change and carbon emissions, and Taiwan's political uncertainty challenge future operations. The government's response to global market trends and policy pace needs to catch up to other countries, making its assistance strategy for traditional industries often passive. Traditional industries are facing significant challenges, such as the wave of intelligent manufacturing and artificial intelligence (AI) applications, massive reductions in manpower, and changes in personnel costs.

To solve these problems, traditional industry operators are reviewing internal systems and processes. They examine the internal and external resources that the company can control, plan, integrate, formulate, manage, and maintain the processes of all business operations. They aim to improve efficiency and reduce costs through process improvement.

Since the 1990s, the ISO 9000 quality management system has become popular in various industries. It mainly implements and supervises the operations of enterprises in a process-based model. This quality management system has been optimized several times with the transformation of enterprise business models. Today, the ISO 9001:2015 quality management system mainly assists the operation of enterprises with a process-oriented and risk management model, and enterprises generally recognize the benefits generated. Figure 1 shows an organizational process depicted by an ISO 9001 quality management system.

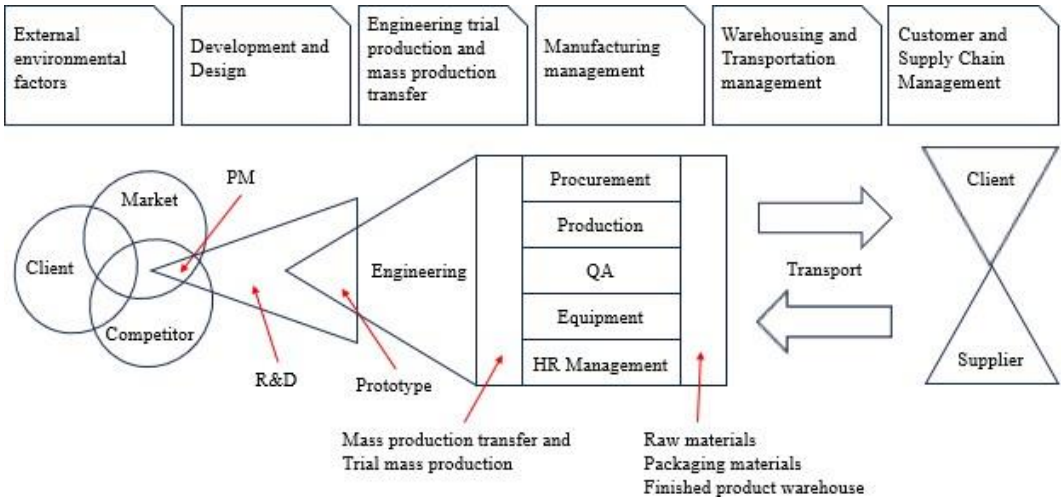

Figure 1: ISO9001 Quality Management System Process

The company's operating process remains the same based on the process-oriented structure of ISO 9001's 2015 quality management system. The company plans to concentrate on corporate process transformation and computerized system construction using the same structure to im- prove corporate health and enhance competitiveness. However, many traditional industrial process improvement and re-engineering projects have failed despite hiring highly paid consulting professionals and investing significant amounts in building information management systems (such as ERP and MES). This is mainly because the operators need more essential knowledge for the reforms. In addition to support, they also need to have the ability to comprehend the company's corporate culture, operating procedures, and system

integration analysis. Moreover, it is crucial to review the existing organizational structure, the critical control points of the sponsoring, and whether the supervisor's professional ability is adequate to take on the responsibility. It is critical to assess whether the professional capabilities of the organizers and supervisors at crucial control points within the existing organizational structure are sufficient. Organizational theory and process reengineering literature show that the organizational structure is usually determined after reengineering. Once supervisors and employees are in place, evaluating their performance and leadership capabilities mainly focuses on their technical and professional skills, with less emphasis on their management and emergency response capabilities. This research article will decisively address this theoretical gap.

2 Methodology

This study uses a case improvement analysis method to identify a particular enterprise's existing process and information management system issues. The operation process of the enterprise will be categorized into functional categories, and Plato and factor analysis diagrams will be utilized to identify the root cause of the problems. After a thorough discussion, feasible solutions will be proposed to promote implementation. The results will be verified, and operating processes will be established to improve sustainability.

Additionally, this study will review the professional capabilities of the enterprise in hosting and supervising essential process control points from a resource-based perspective. Therefore, the objectives of this study are as follows:

a. To conduct process reengineering for the enterprise based on the connotation of ISO 9001:2015 quality management system.

b. To compare the operational performance results before and after the process reengineering.

c. To improve the competitiveness of the enterprise resources.

In recent years, management methods and theories have adapted to meet the environment's and market's rapidly changing needs. To execute these concepts, institutional changes and new implementation techniques must be coordinated and follow written, standardized, and rational planning directions (Chen Shujuan et al., 1997). However, Dr. Deming (1997) believed that for any improvement plan, "variation" is a part of the process, which means that even with detailed planning, deviations from the plan may occur during execution. Therefore, the PDCA management cycle has become the standard procedure for most process reform planning.

Most enterprise process improvements aim for immediate results to solve current issues while focusing on long-term success to reinforce the enterprise's constitution and improve competitiveness. This requires various methods to interact with each other cooperatively and successfully. Hammer (1990) proposed that process reengineering in most enterprises mainly involves changes in organizing operations, such as changes in equipment and construction methods. Even spending considerable money on introducing information technology only strengthens the old operating procedures and is only a beneficial tool for the already flawed processes. Thus, "reengineering" is proposed as the basis for enterprise innovation and change.

This study follows Furey's (1993) enterprise process reengineering model, which involves the following steps:

1. Identify customer needs and process goals.
2. Analyze existing processes.
3. Modify existing processes or create new ones.
4. Use the best process as a benchmark.
5. Optimize processes to meet actual needs.
6. Implement the new process, including training, quality control, supervision, and measurement.

This study is based on the PDCA model and involves several steps to improve the organizational processes. Firstly, the organizational structure, roles, and responsibilities are confirmed, and a process reengineering team is established. Then, the operational processes, including the existing information management system and ISO quality management system, are assessed. The implementation status is evaluated, and goals for improvement are set based on the current situation and needs. Next, a questionnaire is used to understand the current work status and the sources of each employee's problems before conducting individual interviews. The results are analyzed to identify the root cause of the problem using Plato and Invitation Analysis Charts. The company's resources are confirmed, and the responsible person is discussed before promoting the implementation and following each control point. The results are then discussed, and each operation process and requirement are standardized before being fed back into each operation process. The study also examines the core capabilities of personnel management using the resource-based view theory. Assessments are conducted based on functional expertise, emergency response, communication and coordination, and leadership to identify problems, analyze the real causes, and propose countermeasures

3 Case Study and Discussions

3.1 Background of the Case Company

This case concerns a furniture and wood products manufacturing company that has operated for 40 years. It has 75 employees and mainly serves domestic public enterprises and academic research institutions. Initially, the company focused on producing table boards, decorations, and cabinets for OA office furniture but realized that these products' future development and profitability needed to be improved due to changes in market demands. Therefore, in 1994, they started developing new products and introduced a production and quality monitoring management system. 2019, the company implemented the ISO-9001 quality management system to enhance product quality further.

To accommodate product diversification and improve operational control, the Metal Industry Center was appointed in 2014 to plan and build the MIS system. The center took two years to construct the entire information management system, enabling seamless software and hardware integration. The company is confident about future market development and operation with fully

prepared physical equipment.

However, after the company introduced the ISO quality management system, the operating procedures required by the internal system were implemented. Still, the information management system was not initially integrated with the ISO operating procedures. This resulted in difficulty operating the current information management system aligned with the ISO operating system. There is duplication and waste of operations as various data must be created once in the ISO system and then again when transferred to the information management system.
The MIS system has various functions and features that include:

a. This system has complete functions, including order, manufacturing control, shipping, accounts receivable, purchasing, and other systems.

b. The data for the current month has not been carried forward, and the data for the next month cannot be entered (except for the order system).

c. The order system cannot output operating statistics and analysis tables.

d. The production management system only makes arrangements for making orders and cannot control the situation of each station.

e. There are discrepancies between the statement and the shipping order in the shipping system.

f. Statistical data often need to be corrected or executed in the procurement system.

g. The systems currently in use, except for the order, production management, and shipping systems, are all used individually without links.

h. The system will only create new data if any monthly settlement process has been completed.

3.2 The implemented method

This study created interview questions based on the case company's issues, work characteristics, and content. The questions were divided into three main categories:

a. Current Operation Process Questionnaire Interview: This questionnaire includes questions about the operation process of the information management system, the ISO quality management system operation process and its usage form, the problems and difficulties operators face, and the execution time.

b. Interviews were conducted to confirm the professional capabilities of key management and control point hosts and supervisors.

c. Personal work content and personal work cognition were also discussed in interviews.

The content of the interviews at each stage was analyzed using Plato and factor analysis diagrams. The results are found in Table 1.

Table 1: MIS and ISO quality management process problem list

Category	Problem
System Planning Problem(P)	1. There was a failure to consider integration when planning the MIS system. 2. The MIS/ISO forms are different. 3. The MIS forms are not applied to general operations. 4. The need for statistical data was not incorporated when planning the MIS system. 5. The accounting system cannot produce profit-loss and management reports.
System setup issues(S)	6. The work dispatch order cannot control the situation of each workstation. 7. Cannot execute other operations if there are unfinished procedures. 8. Shipments sometimes do not match the statement. 9. Procurement does not match the accounts payable digits.
Management system issues(M)	10. No dedicated computer personnel to maintain and consult with. 11. There is no effective system to coordinate management. 12. The data flow is disordered, and no one is willing to take responsibility.
Personnel Issues (E)	13. I don't know that the ISO form can be modified. 14. Being afraid of computers because of lack of knowledge. 15. Programmers have difficulty communicating. 16. No real needs are raised. 17. Not testing each function. 18. Basic information has not been created yet. 19. Not effectively communicating with the designer about the error and solving the problem. 20. The supervisor did not perform daily management tasks. 21. The attitude of the workers is not favorable. 22. Workers have no sense of responsibility. 23. Supervisors feel powerless in management. 24. All staff have low computer knowledge. 25. Poor internal coordination. 26. Failure to fill in the purchase requisition form for engineering and business delays in purchasing. 27. Efficiency cannot be improved if the assignment content is not discussed in depth. 28. The critical personnel in the process are family members of the company with poor cooperation. 29. The critical personnel in the process are family members of the company with poor coordination. 30. Business personnel can change the requisition date at will.

Once the above five problem categories were sorted out, the problems were classified into four improved subjects. After identifying the main problems in this study, improvement

measures were proposed. The improvement characteristics were quantified and summarized in Table 2 to propose effective solutions.

Table 2: Problem classification and improvement countermeasures

Problem #	Improved subject	Countermeasures
1-3, 16	System and program improvements	● Modify totally 21 forms for MIS and ISO.
4-5, 15, 19		● Modify five types of statistical data, including sales amount, production volume, defective quantity, order amount, and suppliers.
6-9		● Modify five requirements related to the operating system program.
10-11	Improvement of systems and management	● Establish organizational and responsibilities rules.
12, 20-23, 25-26, 28-30		● Establish rules for rewards and punishments.
13-14, 24	Education Training	● Enhance knowledge and use of computers.
17-18	Improvement of work requirements	● Complete the basic information of the system.
27		● Seven figures must be entered continuously for at least three working days or more, including material input, material picking, material return, shipment, warehousing, and inventory outsourcing.

The classification and targeted countermeasures listed in Table 2 reflect a strategic approach to business process reengineering. By addressing systemic flaws and enhancing workforce capabilities, the company is poised to achieve significant gains in operational efficiency and employee satisfaction. These improvements are pivotal for cost reduction and are crucial in boosting the company's competitiveness in a challenging market. This study created tables with audit and assessment functions for each specific target, such as work and meetings, to help the company monitor the implementation progress effectively.

Table 3: Summary of Improvement Countermeasures

Table name	Execution timing	Supervisor	Manager	Director
Orders, materials and shipment	Daily	◎	◎	
Orders, materials and shipment	Monthly	◎	◎	
Production- Marketing Coordination	Monthly	◎	◎	
QC meeting	Monthly	◎	◎	◎
Performance meeting	Monthly	◎	◎	
Work schedule	Weekly		◎	◎

According to the regulations, supervisors at all levels are required to assess the execution, timing of confirmation, and authority of each table. During monthly performance

management meetings, various performance evaluations and improvements are conducted, and any unqualified conditions and losses are confirmed. Table 3 summarizes the audit and assessment permission of various tables.

3.3 Results

The improvement results of this study are briefly described below.

a. After completing education and training, modifying the system program, and creating primary data, the information management system's usage rate has increased by approximately 30%.

b. The allocation of work rights and responsibilities has resulted in a positive outcome, reducing the manpower needed for business, production management, and shipping by one person.

c. All process personnel and supervisors adhere to the work list and approval authority.

d. The monthly settlement date for the information management system has been significantly improved. It now takes only five working days instead of more than three weeks.

e. Through various improvements and goal setting, the amount of nonconformity losses incurred by business, production management, shipping, and accounting every month has been reduced from an average of 130,000 yuan to an average of 25,000 yuan per month, saving about 80% every month—amount lost due to nonconformity.

f. Clear delineation of rights and responsibilities, goal-oriented work, and fair, just, and transparent rewards and punishments have significantly improved work performance.

4 Conclusions

This study successfully applied systematic analysis, Plato analysis diagrams, and factor analysis charts to re-engineer processes in traditional industries, supported by the PDCA cycle, to ensure effective interventions. A critical focus was on accommodating employee cognition, corporate culture, and time constraints, which is essential for maintaining confidence and facilitating acceptance of new processes.

Our findings align with Avanesova et al. (2018), who demonstrated that business process reengineering (BPR) can prevent bankruptcy and aid in transitioning to new developmental stages by integrating new information technologies and enhancing investment attractiveness. Similarly, Hnylianska (2022) emphasized the role of BPR in radically changing management approaches to improve operational efficiencies and competitive positioning in challenging market conditions.

Significant improvements in management and operational models were evident, characterized by:

- Enhanced System Introduction: Our reengineering efforts led to optimized business

processes and increased economic efficiency by shedding redundant and outdated methods.

- Management Support: As supported by the literature, management's backing is pivotal for the success of reengineering projects. Our interventions resulted in an 80% reduction in average monthly non-performing losses, underscoring management's crucial role.
- Institutionalized Management and Cost Quantification: These efforts were fundamental in streamlining operations, evidenced by reduced internal working time and improved financial accountability, which are critical for sustaining long-term improvements.
- Systematic Planning and Improvement: Reflecting the case study by Ravalison et al. (2008), our approach demonstrated that comprehensive system improvements could yield quick wins in delivery speed, quality, flexibility, and dependability, enhancing overall market competitiveness.

These findings support the empirical effectiveness of BPR in traditional industries and demonstrate its potential for transforming business operations into more efficient, competitive, and sustainable systems. Our study contributes to the existing literature by showcasing the practical application of BPR principles, aligning with international quality standards, and supporting the ongoing transformation towards digitalization and smart operations in traditional industries.

References

[1] Hammer, M., & Champy, J. (1990). Introduction to business process reengineering. Industry week, 1.

[2] Johansson, H.J., McHugh, P., Pendlebury, A.J., Wheeler III, W.A., Business Process Reengineering. Singapore: John Wiley & Sons, 1993

[3] Grover, V., Jeong, S. R., Kettinger, W. J., & Teng, J. T. (1995). The implementation of business process reengineering. Journal of Management Information Systems, 12(1), 109-144.

[4] Grant, D., & Yeo, B. (2022). A business process reengineering method. Issues in Information Systems, 23(1).

[5] Harika, A., Sunil Kumar, M., Anantha Natarajan, V., & Kallam, S. (2021). Business process reengineering: issues and challenges. In Proceedings of Second International Conference on Smart Energy and Communication: ICSEC 2020 (pp. 363-382). Springer Singapore.

[6] Avanesova, N. E., VALKOVSKA, G., & Beketsky, R. M. (2018). Management of a modern industrial enterprise: initiation of business processes reengineering. Economic innovations, 20(4 (69)), 23-31.

[7] Hnylianska, O. "Rethinking the business process through reengineering." Bulletin of VN Karazin Kharkiv National University Economic Series 103 (2022): 84-90.

[8] Ravalison, F., Rajaonary, P., Raveloson, E., Rakotomaria, E., Gazerian, J., Loubet, C., & Ruiz, J. M. (2008, July). How does reengineering sustain economy? The case of a paper industry in a developing country. In PICMET'08-2008 Portland International Conference on Management of Engineering & Technology (pp. 210-219). IEEE.