



Redesigning the Oxygen Gas Distribution Business Process for Process Time Efficiency from Department to Shipping

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Abstract

Inefficiencies often occur in company operations due to mismatches between business processes implemented in Enterprise Resource Planning (ERP) systems and operational practices. This study aims to improve the business processes of an industrial gas manufacturer that experiences delays in meeting customer needs due to inconsistencies within its ERP system. Business Process Reengineering (BPR) is applied through fundamental rethinking and radical redesign to improve process efficiency. The fundamental rethink stage begins with developing a Business Process Model and Notation (BPMN) model to map the current business process (As-Is), followed by 5W+1H analysis, Root Cause Analysis (RCA), and time study. The radical redesign stage involves developing a proposed business process (To-Be) based on the problems. The results indicate that the main problems are concentrated in the distribution unit, particularly manual communication, duplicate data entry, and limited integration between work units. The time study shows that the initial business process requires an average of 4 hours, 41 minutes, and 39 seconds. The proposed business process reduces the processing time to 3 hours, 37 minutes, and 25 seconds. These results demonstrate that the redesigned process improves operational efficiency by 22.8% and provides an integrated, efficient, and responsive business process.

Keywords: BPMN, Business Process Reengineering, Root Cause Analysis, Time Study, 5W+1H Analysis

1. INTRODUCTION

Increasingly dynamic industrial competition demands that companies operate business processes efficiently, effectively, and responsively to customer needs to maintain their competitiveness in today's era of business digitalization [1]. Poorly integrated business processes can lead to service delays, duplicate activities, and poor operational decision-making [2]. In the context of business process management, organizations need to conduct a comprehensive evaluation of work processes to ensure that each activity adds value to both the company and its customers [3]. Business Process Reengineering (BPR) is a widely used approach to fundamentally change business processes to achieve significant performance improvements. The BPR approach emphasizes not only improving work activities but also fundamentally rethinking the goals and structure of the organization's business processes. Companies need to thoroughly understand the root causes of their business processes before undertaking a complete redesign [4].

Industrial gas production companies, such as gas distribution and filling companies, have complex operations, particularly in selling and distributing gas products to customers. Timeliness of customer demand fulfillment is one of several key indicators of a company's operational performance, as it is directly related to the quality of service provided to customers [5]. Based on the company's operational conditions, delays in fulfilling customer demand were found, resulting in some demand targets not being met on time. The discrepancy between demand targets and sales realization indicates problems in information flow and in the implementation of the company's operational activities [6]. The Percentage of unfulfilled requests can be shown in Table 1.

These problems indicate that the company's ongoing business processes do not fully support its operational efficiency and effectiveness [7]. This condition is important to analyse further using a Business Process Reengineering approach to identify the root causes of business process problems systematically. Based on observations of Epicor's Enterprise Resource Planning (ERP) operations at a company, it was

discovered that the gas sales business process involves a sales counter unit, a driver unit, a filling station unit, and a billing unit. The delivery procedure begins with customer prospecting, order handling, and the goods preparation stage by the sales counter unit, followed by the bottle/Portable Gas Supply (PGS) delivery stage by the Filling Station driver unit. Next, the empty bottle/PGS is received at the filling station unit, then forwarded to the bottle/PGS delivery stage by the Filling Station driver unit. Finally, the billing unit generates an invoice.

Table 1. Percentage of Unfulfilled Requests

Period	Percentage of Unfulfilled Requests (%)
Period 1	9,22
Period 2	7,55
Period 3	19,02
Period 4	6,81
Period 5	-1,44
Period 6	16,14
Period 7	4,67
Period 8	-2,01
Period 9	16,55
Period 10	-0,18
Period 11	11,62
Period 12	8,76
Average	11,15

There are differences between the actual gas sales procedures at the factory and those established in the company's business processes. In reality, the gas sales procedure at the factory involves the filling station, sales counter, distribution, drivers, and billing. The actual sales procedure begins with the input of stock data by the filling station, which is then forwarded to the sales counter. Delays in the delivery of stock data to the sales counter often affect the speed of the distribution department in processing customer order shipments and preparing the required delivery documents for delivery personnel. These delays also extend to the billing department, where invoices are processed late due to late stock data being sent to the sales counter. The information-sharing discrepancy required an average of four hours to resolve the issue and reconcile the data. This discrepancy in the actual information sharing process at the factory resulted in delays in deliveries by drivers, thus hindering the optimal operation of the business process.

Business Process Reengineering (BPR) is a business process improvement approach that aims to achieve significant performance improvements through fundamental rethinking and redesigning of business processes. According to Hammer and Champy, BPR consists of two main stages: Fundamental Rethink and Radical Redesign. The Fundamental Rethink stage is conducted to identify and evaluate current business processes by questioning the goals, needs, and added value of each activity performed by the organization. This stage aims to identify the root causes of problems, non-value-added activities, and obstacles that contribute to low business process performance. Once the root causes are identified, the next stage is Radical Redesign, which involves fundamentally redesigning business processes by eliminating inefficient activities, simplifying information flow, integrating information technology, and creating new, more effective work procedures. Unlike the continuous improvement approach, Radical Redesign emphasizes transformational change to generate significant performance improvements in terms of time, cost, quality, and service. [8]. Previous research has shown that the success of BPR implementation is significantly influenced by an organisation's ability to comprehensively understand the actual conditions of its business processes [9]. Therefore, the implementation of these two stages allows organizations not only to understand the root causes of problems, but also to produce new business process designs that can improve overall operational efficiency and effectiveness [10].

In BPR implementation, business process modelling is a crucial method for systematically and easily understanding the actual conditions of a company's operational processes. Business Process Model and Notation (BPMN) is widely used as a business process modelling standard because it can describe activity relationships, information flows, and actor involvement in a business process in detail [11]. BPMN also supports the analysis of non-value-added activities, thereby simplifying the evaluation of a company's operations [12]. The use of BPMN in business process analysis allows companies to obtain a comprehensive visualisation of ongoing work processes. Business process modelling can help organisations identify bottlenecks and activities that could delay operational processes [13]. Thus, BPMN plays a relevant role as a tool to support the fundamental rethink stage in this study.

In addition to business process modeling, identifying root causes is also an important part of the fundamental rethinking stage. 5W+1H analysis and Root Cause Analysis (RCA) is used to systematically and structuredly identify the main factors causing operational problems. The 5W+1H analysis method is a

systematic approach used to identify problems comprehensively through six main questions: What, Why, Who, Where, When, and How [14]. The RCA approach helps organizations understand the cause-and-effect relationships of a problem, enabling more targeted solutions [15]. In the context of business process improvement, the 5W+1H analysis and RCA is often used to identify the causes of process delays, misinformation, and inefficient work activities [16]. Previous research has shown that combining business process analysis, the 5W+1H analysis and RCA can increase the effectiveness of identifying operational problems in companies [17]. The use of the 5W+1H analysis and RCA in this study is expected to support the fundamental rethinking process more comprehensively.

Research on Business Process Reengineering has been widely conducted across various industrial sectors to improve the efficiency and effectiveness of company operational processes. Research by Amalia et al. [18] shows that business process redesign can improve the effectiveness of operational activities in direct selling companies by simplifying workflows. Another study by Gustaji et al. [19] found that implementing BPR in the procurement processes of oil and gas companies can reduce activities that do not add value to business processes. Hamdani et al. [20] also stated that BPR in a website-based travel booking system can improve service efficiency and accelerate the flow of operational information within the company. Several studies have shown that BPR significantly improves operational performance across various industrial sectors.

Although extensive research on BPR has been conducted, most previous studies have focused on the redesign or implementation of new business processes rather than the fundamental rethink stage, the initial stage of business process analysis. However, the fundamental rethink stage plays a crucial role in determining the success of implementing overall business process improvements. Previous research generally focused directly on designing to-be processes without conducting an in-depth exploration of the root causes of a company's operational problems. Research addressing the application of fundamental rethink to industrial gas sales and distribution processes is considered quite limited, thus creating an opportunity for further study in this sector. This study seeks to fill this research gap by focusing solely on the fundamental rethink stage within the BPR approach. This study focuses on identifying business process activities, analyzing root causes, evaluating business process inefficiencies in an industrial gas distribution company, and proposing a business process redesign.

This study also considers the importance of aligning business processes with company information systems to support operational effectiveness. Poorly integrated information systems can delay information flow and increase the risk of errors in a company's operational processes [21]. Aligning business processes with information systems is a crucial factor in supporting sustainable organisational performance improvement. Previous research has shown that integrating business processes with ERP systems can improve the accuracy of information and the efficiency of a company's operational processes [22]. Business process modelling using BPMN can also support ERP implementation by depicting more structured work processes. The fundamental rethink stage in this research also considers the relationship between business processes and the company's operational information flow.

This study was conducted to deeply understand the causes of delays in fulfilling customer requests at an industrial gas-producing company, using a fundamental rethink approach to Business Process Reengineering. The analysis was conducted by mapping the actual business processes using BPMN and identifying the underlying causes of the problems using 5W+1H Analysis and Root Cause Analysis. The study focused on a complete redesign of the business process. This approach is expected to contribute to a more comprehensive understanding of the actual state of the company's business processes before undergoing redesign in subsequent research. The findings of this study are expected to serve as a foundation for companies in setting business process improvement priorities more effectively. Thus, this study makes both theoretical and practical contributions to the development of Business Process Reengineering studies.

Based on the background and literature review described above, this study aims to analyze the gas sales business process in an industrial gas producing company using a Business Process Reengineering (BPR) approach. 5W+1H analysis is used to systematically identify and define problems based on the aspects of what, why, where, when, who, and how to obtain a comprehensive understanding of the actual condition of the oxygen gas distribution process. The results of this identification are then further analyzed using Root Cause Analysis (RCA) to find the main root cause of the problem through the cause-effect relationship that occurs. Thus, 5W+1H focuses on problem identification, while RCA focuses on tracing the root cause as a basis for preparing proposals for business process improvements. This study uses BPMN as a tool to describe business processes, both initial and proposed business processes. Time Study is used as a time measurement method to determine the process time of the business process. This study also aims to evaluate the relationship between business processes and the company's operational information flow in supporting customer service effectiveness. The research questions formulated in this study are: what is the current condition of the gas sales business process in the company, what factors cause delays in fulfilling customer requests, and how the proposed business process redesign can provide better process time efficiency. The

answers to these questions are expected to contribute to the development of Business Process Engineering research, particularly in the industrial gas distribution sector.

2. MATERIALS AND METHOD

This study applies an applied research approach with a qualitative descriptive method to analyse the gas sales business process at an industrial gas producing company through the fundamental rethink stage of Business Process Reengineering (BPR) [23]. The research focused on identifying business process activities that cause delays in fulfilling customer requests without undergoing a comprehensive business process redesign. The research data included primary and secondary data collected through direct observation, interviews, company documentation, and operational gas sales data during the research period [23]. Data collection was conducted on operational activities involving sales, administration, warehouses, filling stations, and distribution to obtain a comprehensive overview of the company's business process flow. Observation techniques were used to observe the sequence of actual business process activities, work process times, document flow, and interactions between the company's operational departments.

Primary data were obtained through direct observation and interviews with five respondents (n = 5) representing units involved in the oxygen gas distribution process at an industrial gas company: the Sales Counter, Filling Stage, Distribution, Billing, and Drivers. Observations were conducted during the research period, from September to December 2024, to identify actual workflows, process bottlenecks, and inter-unit coordination patterns that contributed to delivery delays. To increase data validity, information obtained from observations was compared with interview results and company operational documents so that the resulting business process model could represent actual operational conditions. Furthermore, the results of the business process modeling and root cause identification were reconfirmed with respondents (member checking) to ensure alignment between the analysis results and the company's actual conditions. Next, the actual business process was modelled using Business Process Model and Notation (BPMN) with Bizagi Modeller version 4.2.0.003 to visually represent relationships among activities, actors, and the flow of information within the company's business processes.

The analysis stage of the research was conducted using a fundamental rethink approach by evaluating business process activities that did not add value to the company's operations. BPMN modelling is used to identify bottlenecks, process delays, and information flow discrepancies that occur in the company's gas sales business process. Next, Root Cause Analysis (RCA) is applied to identify the main factors contributing to delays in fulfilling customer requests using a systematic cause-and-effect approach. Root cause analysis is conducted using a fishbone diagram that considers human factors, work methods, information systems, materials, and the company's work environment. Validation of the analysis results is conducted through discussions and direct confirmation with the company to ensure that the actual business process identification results align with operational conditions in the field. Through these stages, this research is expected to produce a fundamental identification of the company's business process problems, which will serve as the basis for developing Business Process Reengineering research in the next redesign stage. The following explains each stage of the fundamental rethink [24].

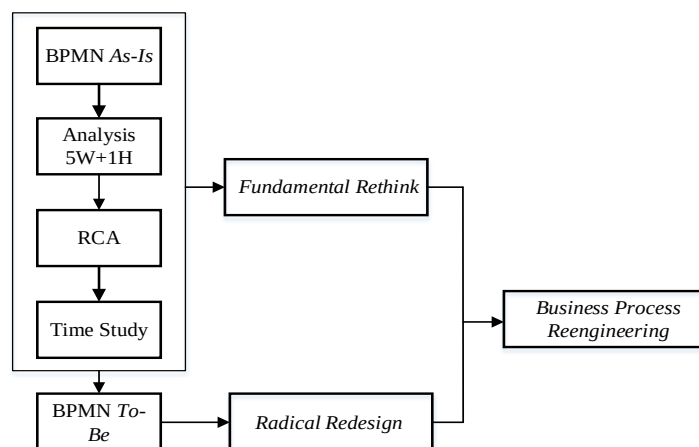


Figure 1. Research Methodology

2.1. BPMN Preparation Stage

Business Process Model and Notation (BPMN) is a business process modelling standard used to visually and systematically describe the flow of activities, the relationships between processes, and the involvement of each actor in a business system. BPMN helps organisations understand the actual conditions of business processes, making it easier to identify activities that do not provide added value and potential

operational bottlenecks. BPMN can improve communication effectiveness between organisational units because the business process model can be understood technically and non-technically. In this study, BPMN was used to map the gas sales business process within the company, enabling the comprehensive analysis of information flows and operational activities [25], [26]. The following is an image of BPMN notation, can view Figure 2.

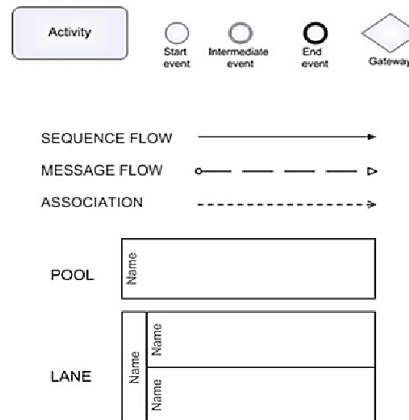


Figure 2. BPMN Notation

2.2. Analysis 5W + 1H Stage

The 5W + 1H analysis is a problem identification method used to gain a comprehensive understanding of a problem through six main questions: what, why, where, when, who, and how. This approach helps researchers identify the actual condition of the business process, the cause of the problem, the parties involved, the location of the incident, the time the problem occurred, and the ongoing process mechanisms. The use of the 5W + 1H analysis enables systematic problem identification, facilitating the determination of the root cause of the company's operational problems. In this study, the 5W + 1H method was used to support the fundamental rethink stage in Business Process Reengineering in analyzing the problem of delays in fulfilling the company's customer requests [27].

2.3. Root Cause Analysis Stage

Root Cause Analysis (RCA) is an analytical method used to systematically identify the main causes of a problem, enabling a more targeted solution. RCA focuses on finding the cause-and-effect relationship of an operational problem by identifying factors that influence the occurrence of business process non-conformities. One of the tools commonly used in RCA is the fishbone diagram, which groups causes of problems into human factors, work methods, machines, materials, the environment, and information systems. In this study, RCA was used to identify the main factors causing delays in the gas sales process, enabling the company to understand the source of operational problems in greater depth [28], [29], [30].

2.4. Time Study Measurement Stage

Time study is a work measurement technique used to determine the time required for operators to complete a work activity under normal working conditions. This method involves directly observing and recording the completion times of work activities to obtain a standard work time for evaluating the productivity and efficiency of operational processes. Time studies help companies identify activities that cause process delays and identify opportunities for improvement in operational workflows. In this study, a time study was used to analyse the effectiveness of the gas sales business process time under actual company conditions [31], [32].

2.4.1 Observed Time

Observed time is the time resulting from direct observation of an operator's work activities during the operational process. Observed time measurements are performed using a stopwatch or other time-recording device, with multiple observations to obtain representative work-time data. The observed time value represents the actual time required to complete a work activity, without accounting for the operator's performance level or work flexibility factors. In this study, observed time is used as the basis for calculating normal and standard times for the company's business process activities [31], [32].

2.4.2 Performance Rating

A performance rating is an assessment of an operator's speed and work ability relative to normal work standards. This assessment is conducted to adjust observed time results to reflect the normal working

conditions that an operator should achieve in completing a specific work activity. Performance rating is influenced by skill factors, work consistency, work effort, and operational conditions during the observation. In this study, performance ratings are used to calculate normal time, thereby making work-time measurements more objective and aligned with the company's operational conditions [31], [32].

2.4.3 Allowance

Allowance is additional time provided to operators to accommodate personal needs, work fatigue, and unavoidable obstacles during operational activities. The purpose of providing an allowance is to make the resulting standard time more realistic and applicable to the company's actual working conditions. The amount of the allowance is influenced by the type of work, the working environment, the operator's level of fatigue, and the complexity of the operational activities. In this study, the allowance is used to calculate standard time, so that the time measurement results more accurately reflect the company's operational conditions [31], [32].

2.4.4 Normal Time

Normal time is the working time obtained by adjusting the observed time with the operator's performance rating. Normal time calculations are performed to estimate the completion time of work activities under normal working conditions, without accounting for flexibility factors. The normal time value indicates the level of operator work efficiency based on predetermined standard work capabilities. In this study, normal time is used as the initial stage in determining standard time in the company's gas sales business process activities. The following is the Normal Time formula [31], [32]. This is mathematically shown in Equation 1.

$$NT = OT \times \frac{PR}{100} \quad (1)$$

Description: NT (Normal Time) = Normal working time is the result of adjusting the observation time to the worker's performance; OT (Observed Time) = Average time of direct observation of work activities; and PR (Performance Rating) = Employee performance assessment factors in percentage (%).

2.4.5 Standard Time

Standard time is the standard time required to complete a work activity, taking into account the operator's performance rating and work allowance. Standard time is calculated by adding the allowance to normal time to obtain a realistic work-time estimate applicable to the company's operational conditions. Standard time is used as a reference in productivity evaluation, operational planning, and identifying activities that cause delays in business processes. In this study, standard time was used to evaluate the effectiveness of the gas sales business process under the company's actual conditions. The following is the Standard Time formula [31], [32]:

$$ST = NT \times (1 + \text{Allowance}) \quad (2)$$

Description: ST (Standard Time) = Standard working hours after adding allowance; NT (Normal Time) = Normal working hours as a result of performance adjustments; Allowance = Allowance factor for personal needs, fatigue, and work obstacles (expressed in decimals).

2.4.6 Determining The Number Of Observations

Determining the Number of observations in a time study is done to ensure that the work time data obtained has an adequate level of accuracy and reliability. The Number of observations is influenced by the level of variation in work time, the desired level of accuracy, and the level of confidence in the measurements used in the study. Repeated observations help reduce measurement errors and produce work time data that is more representative of the company's operational conditions. In this study, determining the Number of observations is done to ensure that the results of business process time measurements can serve as a basis for an objective, accurate analysis of the company's operational efficiency. The following is the formula for determining the Number of observations [31], [32].

$$N = \left(\frac{Z \times SD}{e \times \bar{X}} \right)^2 \quad (3)$$

Description: N = Number of observations required; Z = Normal distribution values according to the confidence level (usually 95% $\rightarrow$ 1.96); SD = Standard deviation; e = Relative accuracy limit (usually 5–10%); and $\bar{X}$ = Average OT.

In this study, the required number of observations was determined using a 95% confidence level ($Z = 1.96$) and a relative accuracy level (e) of 5%, following work measurement guidelines. Calculations were performed to ensure that the observed time data were statistically representative and reliable. Furthermore, a standard tolerance of 15% was applied to account for personal needs, fatigue, and unavoidable delays. These parameters were selected based on generally accepted industrial engineering practices and were applied consistently throughout the time study analysis.

3. RESULTS AND DISCUSSION

The results of the gas sales business process mapping at an industrial gas-producing company indicate that the operational process involves several work units: customers, sales, administration, warehouses, filling stations, and company distribution. Based on the Business Process Model and Notation (BPMN) results, the business process begins with the receipt of customer orders. It continues through several administrative and operational stages [33]. Observations indicate that certain activities delay fulfillment of customer requests, particularly in administrative validation, gas-filling coordination, and product distribution. Mismatches in information flow between operational units were identified, resulting in waiting times across several business process activities [33]. The 5W+1H analysis also revealed activities that do not add value to the operational process, thereby impacting the company's service to customers [34]. Based on the 5W+1H analysis results, the main problem in the company's business process centers on the distribution unit, which contributes to delays in O₂ gas delivery. This problem is caused by process inefficiencies and a lack of system integration, requiring further analysis to identify the root causes in depth.

Based on the Root Cause Analysis (RCA), the factors contributing to delays in fulfilling customer requests include human factors, work methods, information systems, and operational coordination within the company. Regarding the human factor, delays in communication and coordination between units were observed, which slowed the company's operational processes. In the work method factor, the analysis shows that several operational activities are still performed repeatedly and have not been optimally integrated, thereby increasing the company's work process time. In the information system factor, it was found that the flow of operational information has not been fully integrated properly, causing delays in the company's operational decision-making process. The results of the fundamental rethink analysis also show that several business process activities do not directly contribute to customer service value, potentially reducing the efficiency of the company's business processes [35]. Based on these results, this study shows that the fundamental identification of business process activities and the root causes of operational problems is an important stage in supporting further research on Business Process Reengineering [35]. The following are the results of fundamental rethink and radical redesign.

3.1. Business Process Model and Notation As-Is

The first stage of business process reengineering is to create business processes using the Business Process Model and Notation (BPMN) standard. The following is the BPMN As-Is (current business process), as shown in Figure 3.

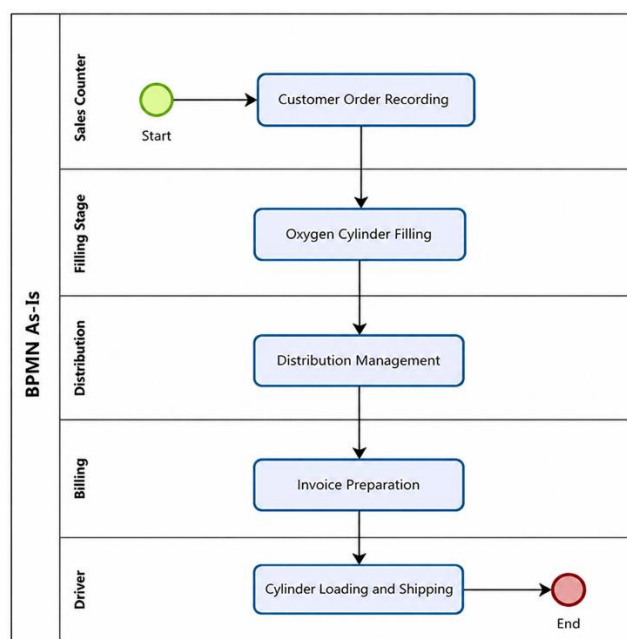


Figure 3. BPMN As-Is

3.2. Analysis 5W + 1H

In the second stage of business process reengineering, we analyse known problems using the 5W+1H analysis. The following are the results of the 5W + 1H analysis of the current business process:

Table 2. Analysis 5W + 1H

Aspect	Identification Results
What	There was a delay in the delivery of O ₂ gas to customers.
Why	The distribution process is inefficient and not yet integrated with the ERP system.
Who	Distribution unit, sales admin, and warehouse section.
Where	In the product distribution and delivery process.
When	During the transition process from administration to distribution.
How	Occurs due to manual communication, duplicate input, and un-integrated workflows.

3.3. Root Cause Analysis

The third stage of business process reengineering involves conducting a more in-depth analysis to identify the root cause of the problem, using the 5W + 1H analysis and fishbone root cause analysis. The following is the result of a fishbone analysis of the current business process, as shown in Figure 4.

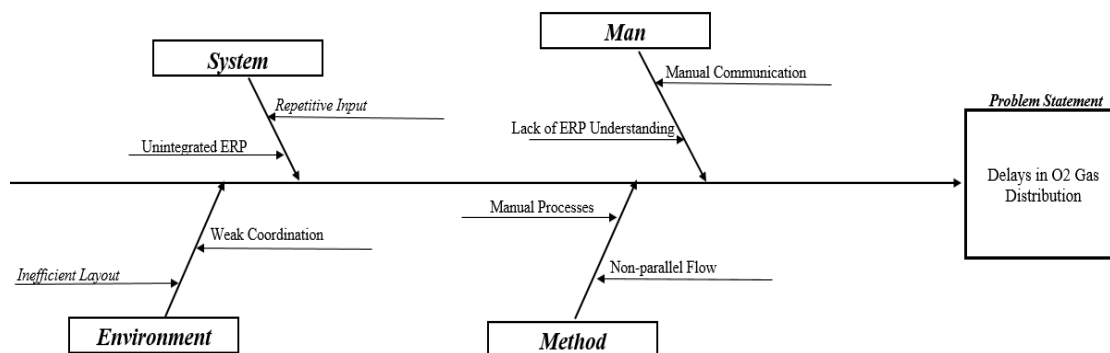


Figure 4. Fishbone Delays in O₂ Gas Distribution

3.4. Time Study As-Is

The fourth stage of business process reengineering involves conducting a time study to determine the current time for the business process. The following are the results of the time study for the current business process, as shown in Table 3.

Table 3. Result Time Study As-Is

No	Unit / Activity	Observed Time (OT)	Normal Time (NT)	Standard Time (ST)
1	Sales Counter	29,6 Minutes	29,6 Minutes	34,82 Minutes
2	Filling Stage	75 Minutes	75 Minutes	88,24 Minutes
3	Distribution	60 Minutes	60 Minutes	70,59 Minutes
4	Billing	29,8 Minutes	29,8 Minutes	35,06 Minutes
5	Driver	45 Minutes	45 Minutes	52,94 Minutes
Total Standard Time As-Is		—	—	281,65 Minutes

Based on the results of the fundamental rethinking phase, further research is recommended to develop the radical redesign and dramatic improvement phases using a comprehensive Business Process Reengineering approach to deliver more optimal, measurable business process recommendations. The following conclusions are summarised in several points:

1. The gas sales business process at an industrial gas-producing company continues to experience operational delays due to inefficiencies in its business processes and information flows.
2. BPMN modelling results indicate the presence of activities that do not add value, thus impacting the effectiveness of customer service.
3. The main factors causing business process delays include human factors, work methods, information systems, and operational coordination.
4. The fundamental rethinking approach can help companies systematically identify the root causes of operational problems before undertaking business process redesign.
5. This research can serve as a basis for subsequent Business Process Reengineering to improve the efficiency and effectiveness of the company's business processes.

3.5. Business Process Model and Notation To-Be

The fifth stage of business process reengineering is Business Process Model and Notation (BPMN) To-Be. Based on the results of the Fundamental Rethink stage, it was found that delays in the oxygen gas distribution process were caused by repetitive administrative activities, delays in information exchange between departments, and suboptimal utilization of the Enterprise Resource Planning (ERP) system to support operational coordination. Therefore, the Radical Redesign stage was carried out to fundamentally redesign the business process by eliminating non-value-added activities (events), simplifying workflows, improving information integration, and optimizing ERP use. This stage aims to produce a proposed business process design (To-Be Process) that is more effective and efficient than the existing conditions, thereby supporting a significant improvement in distribution process performance. The Following are the BPMN To-Be results for the proposed business process, can view Figure 5.

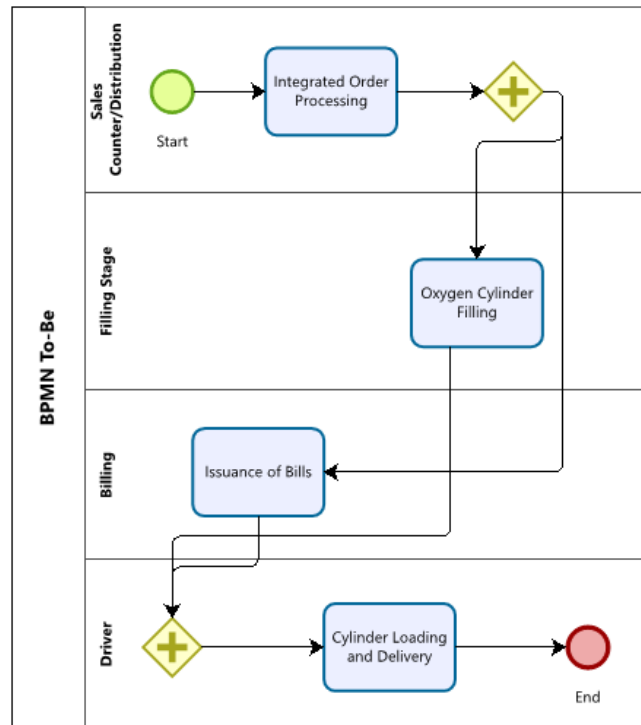


Figure 5. BPMN To-Be

To evaluate the impact of the proposed business process redesign, a Time Study was conducted on each activity in the To-Be business process model. This measurement aims to determine the standard time required after the implementation of the proposed improvements, so that it can be compared with the existing conditions (As-Is Process). The results of the Time Study on the proposed process are shown in Table X, which presents the observed time, normal time, and standard time for each activity involved in the oxygen gas distribution process.

Table 4. Result Time Study As-Is

No	Unit / Activity	Observed Time (OT)	Normal Time (NT)	Standard Time (ST)
1	Sales Counter (Join Distribution)	44,8 Minutes	44,8 Minutes	52,71 Minutes
2	Filling Stage	75 Minutes	75 Minutes	88,24 Minutes
3	Billing	20 Minutes	20 Minutes	23,53 Minutes
4	Driver	45 Minutes	45 Minutes	52,94 Minutes
Total Standard Time As-Is		—	—	217,42 Minutes

The table above shows that the time study results showed a decrease in the To-Be process. Overall, the process time savings in the To-Be model stem from:

1. Eliminating repetitive manual checking activities.
2. Integrating workflows between departments through consistent use of ERP.
3. Changing sequential activities to parallel activities.
4. Reducing the wait time before documents are produced.

With this strategy, the total operational time of the distribution process was significantly reduced compared to the As-Is process, thereby increasing the company's operational efficiency.

4. CONCLUSION

This study applies Business Process Reengineering (BPR) through the Fundamental Rethink and Radical Redesign stages to improve the oxygen gas distribution process at an industrial gas company. The Fundamental Rethink stage, Business Process Model and Notation (BPMN) As-Is modeling, 5W+1H analysis, Root Cause Analysis (RCA), and Time Study revealed that distribution delays were caused by serial activities, reliance on manual document confirmation, delays in updating stock data in the Enterprise Resource Planning (ERP) system, and a lack of integration of information flow between the Sales Counter, Distribution, and Billing. The analysis also revealed bottlenecks in the stock verification and distribution administration processes, resulting in long wait times before shipping and billing documents could be processed.

Based on these findings, the Radical Redesign stage was implemented through streamlining the process flow, eliminating non-value-added activities, integrating information flow through the ERP, merging the Sales Counter and Distribution functions, and converting several activities from serial to parallel processes. The redesign results showed that the total standard time of the distribution process was reduced from 281.65 minutes in the As-Is condition to 217.42 minutes in the To-Be condition, a reduction of 64.23 minutes (22.8%). This reduction in time was mainly achieved through reduced repetitive administrative activities, shorter wait times between departments, and improved coordination and real-time information availability through the ERP system. Thus, the implementation of the Fundamental Rethink and Radical Redesign stages has been shown to increase the efficiency of the distribution process and reduce the potential for delivery delays in industrial gas companies. Future research is recommended to expand the stages of dramatic improvement and evaluate the performance of the proposed business processes to obtain more optimal, measurable, and implementable recommendations for business process improvements for companies.

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