

ANALYSIS AND EVALUATION OF THE PROCURE TO PAY BUSINESS PROCESS THROUGH THE INTEGRATION OF SAP AND E-PROCUREMENT

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Abstract

In the increasingly digital and complex business landscape, optimizing the Procure to Pay (P2P) process has become a critical factor in maintaining operational efficiency and ensuring strategic alignment across departments. This study analyzes and evaluates the integration between the SAP ERP system and an external E-Procurement platform by applying the Business Process Model and Notation (BPMN) methodology. Despite the aim of integration to streamline procurement activities, several challenges emerged, including data mismatches, delayed approvals, manual entry errors, and document duplication. These issues disrupted workflows, increased operational costs, and undermined the potential benefits of system integration. Therefore, the objective of this research is to identify the root causes of integration inefficiencies and to propose a simplified and standardized business process model that can effectively address those challenges. A mixed-methods approach was employed, involving stakeholder interviews, document analysis, and business process simulations using Bizagi Modeler. BPMN diagrams were used to visualize the current ("As-Is") and proposed ("To-Be") processes, enabling detailed identification of inefficiencies and potential improvements. The results demonstrate that redesigning the P2P process with BPMN significantly reduces cycle time, improves data accuracy, and enhances user satisfaction by removing unnecessary steps and automating key activities. Moreover, BPMN serves not only as a process modeling tool but also as a strategic framework to support digital integration initiatives and continuous business process improvement. The findings provide valuable insights for organizations seeking to optimize their procurement workflows and align system capabilities with operational goals.

Keywords: Procure To Pay, SAP Integration, E-Procurement, Business Process Modeling, BPMN, Transactional Issue.

INTRODUCTION

In the era of digital transformation, organizations are increasingly required to optimize internal business processes in order to remain agile and competitive. One of the most critical business processes in enterprise operations is the Procure to Pay (P2P) cycle, which covers the sequence of activities from identifying procurement needs to processing payments to vendors. The efficiency of the P2P process directly affects supply continuity, operational cost control, and vendor relationship quality. As companies scale and diversify, traditional manual procurement methods often prove to be inefficient, error-prone, and incapable of delivering real-time transparency. Consequently, many organizations adopt enterprise resource planning (ERP) systems such as SAP in combination with specialized E-Procurement platforms to enhance automation, accuracy, and speed in procurement workflows.

Despite the integration of such digital systems, the anticipated benefits often fall short due to operational misalignments, fragmented data flows, and inconsistent user adoption. In the case of integrating SAP and an E-Procurement system.

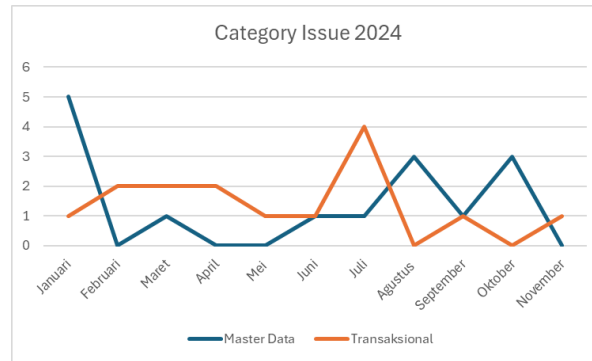


Figure 1. Category Issue Integration

These recurring problems suggest a systemic gap between the intended automation design and actual user experiences. A closer examination of these integration challenges suggests that there is a misfit between system capabilities and real-world process requirements, often exacerbated by a lack of standardization across departments and workflows. This necessitates a deeper investigation into the effectiveness of the existing integration and the formulation of strategies for business process simplification.

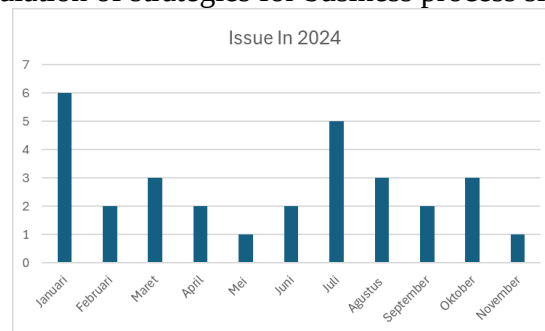


Figure 2. Graph of the Number of Issues over Time

Issues such as data synchronization errors, document duplication, and approval delays have emerged. These problems not only impact transaction processing times but also lead to higher workloads for administrative correction, reduce user confidence in the system, and increase the volume of issues. A closer examination of these integration challenges suggests that there is a misfit between system capabilities and real-world process requirements, often exacerbated by a lack of standardization across departments and workflows. This necessitates a deeper investigation into the effectiveness of the existing integration and the formulation of strategies for business process simplification.

One of the methods that offers a structured and visual approach to understanding and improving complex workflows is Business Process Model and Notation (BPMN). BPMN enables organizations to map out detailed end-to-end business processes, making it easier to identify inefficiencies, gaps, and redundant activities. By modeling the “As-Is” and proposing a “To-Be” version of the procurement workflow, companies can design a future-state process that is more aligned with both technological capabilities and operational goals. Additionally, BPMN supports standardization, allowing departments to adopt a unified approach in executing procurement tasks, which reduces variability and ensures consistency in output. It also facilitates stakeholder collaboration during process redesign and promotes better alignment between IT developers and business users during system implementation or enhancement.

This research aims to analyze and evaluate the existing Procure to Pay process by utilizing BPMN to identify critical weaknesses in the current SAP–E-Procurement integration. The study further seeks to propose a redesigned process that simplifies the workflow, improves automation, and reduces transactional issues. Through a mixed-methods

approach involving stakeholder interviews, document analysis, and process simulation, this study presents a comprehensive evaluation of integration effectiveness and process efficiency. The findings are expected to provide practical insights for organizations facing similar integration challenges, and to demonstrate how BPMN can serve not only as a modeling language but also as a strategic decision-making tool in digital transformation initiatives.

LITERATURE REVIEW

The Procure to Pay (P2P) process represents a strategic and operational backbone within enterprise resource planning, encompassing the full cycle of procurement from requisition to payment. The P2P process plays a critical role in ensuring supply continuity, cost control, and operational efficiency. An efficient P2P system includes steps such as Purchase Requisition (PR), vendor selection, Purchase Order (PO) issuance, goods or services receipt (Goods Receipt/GR), and invoice payment. Any inefficiencies along this chain can result in delays, cost overruns, or compliance risks. Digital transformation initiatives often seek to improve the P2P process by automating these stages through integrated systems. The complexity of the process, however, increases with the involvement of multiple departments, systems, and stakeholders, making it highly dependent on proper system integration and workflow design.

Procure Pay (P2P) Concept

The Procure to Pay (P2P) process plays a crucial role in ensuring the smooth operation of enterprise activities, encompassing a series of interconnected steps starting from identifying procurement needs to issuing payments to vendors. It involves critical phases such as the creation of Purchase Requisitions (PR), vendor selection, issuance of Purchase Orders (PO), Goods Receipt (GR), and invoice payment. Efficient P2P operations reduce lead times, optimize inventory levels, and support cost control across departments. However, traditional manual processes and fragmented systems often lead to inefficiencies, such as duplication of documents, inconsistent approval flows, and increased error rates. Improving P2P workflows through automation and system integration can significantly enhance organizational responsiveness and reduce operational bottlenecks.

ERP System and Material Management

Enterprise Resource Planning (ERP) systems, such as SAP, offer integrated platforms that connect various business functions into a unified system. Among SAP's modules, the Material Management (MM) module is crucial for managing procurement and inventory activities. It provides tools for purchasing, stock management, invoice verification, and reporting, ensuring real-time control and accountability over the procurement process. When effectively implemented, SAP MM helps reduce errors, prevent stockouts or overstocking, and align procurement activities with organizational strategy. However, limitations can occur when SAP operates in isolation or when organizations require additional functionalities not covered by SAP standard features. This often leads to the adoption of third-party E-Procurement systems, making integration between systems essential for end-to-end procurement management.

Integration of ERP Systems with E-Procurement

The integration of ERP systems like SAP with E-Procurement platforms is designed to enhance procurement transparency, speed, and control. E-Procurement systems typically handle external procurement activities such as vendor registration, tendering, and bid evaluation, while ERP systems manage internal transactions and record-keeping. When integrated properly, these systems allow seamless information flow — for example, PRs created in E-Procurement can be automatically pushed to SAP for PO generation, and GR data can be synchronized back for accurate financial reporting. Nevertheless, integration challenges frequently emerge due to differences in data structures, incompatible workflows,

and system latency. According to Deloitte (2021), a successful integration requires not only technical compatibility but also business process alignment, clear documentation, and user training to minimize resistance and reduce operational errors.

Integration Challenges in SAP and E-Procurement

Despite the promise of improved efficiency, integration between SAP and E-Procurement platforms often faces significant challenges. One of the most common issues is data inconsistency, particularly when master data or document structures differ across systems. Manual interventions, delayed approvals, and duplicate transactions frequently arise due to poor synchronization or lack of automated triggers. notes that integration complexity increases with the number of touchpoints, stakeholders, and dependencies involved in the procurement workflow. Additionally, business users may struggle to adapt to new processes if training and change management are insufficient. These challenges not only impact operational performance but also result in a surge of issues and rework, highlighting the need for a more structured and transparent process approach.

In addition, integration challenges often arise from technical aspects such as system compatibility, architectural differences, and limitations in the Application Programming Interfaces (APIs) used to connect SAP with E-Procurement platforms. Misalignment in these areas can lead to delays in real-time data exchange, ultimately hindering strategic decision-making. Data security is also a critical concern, as cross-system integration increases the risk of information leakage or unauthorized access if proper controls and encryption measures are not implemented. Therefore, the success of integration largely depends on the readiness of technological infrastructure, careful implementation planning, and strong collaboration between technical teams and business users.

Fishbone Diagram

The Fishbone Diagram, also known as the Ishikawa or cause-and-effect diagram, is a visual analysis tool used to identify root causes of a problem by categorizing them into key contributing factors such as Man, Method, Machine, Material, Measurement, and Environment. It allows teams to break down complex problems into manageable components and systematically investigate each one. In the context of this study, the Fishbone Diagram is used to analyze recurring issues in the P2P process, such as data entry errors, delayed approvals, or failed integrations. By mapping out potential causes under logical categories, this tool supports more focused root cause analysis and forms the basis for proposing targeted process

Moreover, the Fishbone Diagram provides a structured framework that encourages cross-functional collaboration, as it brings together different perspectives from technical teams, business users, and management to uncover hidden causes that might otherwise be overlooked. This holistic approach not only helps in identifying immediate operational issues but also highlights systemic weaknesses, such as insufficient training, inadequate system configuration, or unclear workflow governance. As a result, the diagram serves as both a diagnostic and a strategic tool, guiding organizations toward implementing sustainable improvements and minimizing the recurrence of issues within the Procure-to-Pay (P2P) process.

Root Cause Analysis

Root Cause Analysis (RCA) is a systematic method used to investigate and identify the fundamental reasons behind process inefficiencies or system failures. RCA typically involves the use of tools like the 5 Whys technique, Fishbone Diagrams, and Fault Tree Analysis to trace issues to their origin. In integrated systems, RCA helps organizations look beyond surface-level symptoms—such as delayed PR approval or duplicate GR entries—to uncover deeper process flaws or system design weaknesses. RCA supports continuous improvement by ensuring that problems are not only fixed temporarily but eliminated at the

source. In this study, RCA is applied to investigate transaction-level issues that frequently arise after SAP and E-Procurement integration, helping to guide process redesign efforts using BPMN.

Furthermore, Root Cause Analysis fosters a culture of problem-solving and accountability by encouraging stakeholders to critically evaluate both human and technological factors contributing to recurring issues. In the context of SAP and E-Procurement integration, RCA not only reveals operational gaps, such as insufficient user training or unclear approval hierarchies, but also exposes technical shortcomings like inconsistent master data structures or limited system interoperability. By systematically addressing these underlying causes, organizations can implement corrective actions that are both preventive and sustainable, thereby enhancing process reliability, reducing rework, and supporting long-term efficiency in the Procure-to-Pay (P2P) cycle.

Business Process Model and Notation (BPMN)

Business Process Model and Notation (BPMN) is a standardized graphical modeling language used to represent business processes in a way that is accessible to both business analysts and technical developers. It uses intuitive symbols to describe events, activities, decision gateways, and data flows, making it ideal for documenting complex workflows like the Procure to Pay cycle. BPMN allows for visualizing the current state ("As-Is") and proposing optimized future processes ("To-Be") in a structured and comparative format. According to Mendling et al. (2021), BPMN enhances stakeholder communication, supports automation design, and improves clarity in process handoffs, which are crucial for successful system integration projects.

Moreover, BPMN provides a bridge between business and IT by ensuring that process models are both human-readable and machine-executable, which makes it highly suitable for integration projects involving SAP and E-Procurement systems. Its ability to capture end-to-end workflows, including exception handling and inter-system communication, enables organizations to identify inefficiencies, redundancies, and risks more effectively. By standardizing process representation, BPMN not only facilitates alignment across diverse stakeholders but also lays the foundation for simulation, performance measurement, and continuous process improvement. In this study, BPMN serves as a key methodology to redesign the Procure-to-Pay (P2P) process, ensuring greater transparency, consistency, and operational efficiency after integration.

Business Process Standardization through BPMN

Process standardization involves aligning tasks, roles, and workflows across departments to ensure consistency, efficiency, and accountability. By using BPMN to document standardized procedures, organizations can reduce variability in process execution and improve performance monitoring. Standardization is particularly important in P2P processes, where different departments—such as procurement, finance, and warehouse—must coordinate seamlessly. Dumas et al. (2019) emphasize that BPMN provides a clear and auditable framework that facilitates training, compliance, and process benchmarking. When SAP and E-Procurement systems are integrated, standardized BPMN models help ensure that data flows and approval chains are consistent, reducing the likelihood of errors and improving system trustworthiness.

In addition, business process standardization through BPMN promotes scalability and adaptability, enabling organizations to replicate best practices across different units or even across global operations. By minimizing ad-hoc variations and enforcing a unified process structure, BPMN ensures that compliance requirements, internal controls, and system validations are consistently met throughout the Procure-to-Pay (P2P) cycle. This not only improves operational efficiency but also strengthens governance by making processes more transparent and auditable. For integration between SAP and E-Procurement, standardized

BPMN models act as a reference blueprint, allowing stakeholders to align expectations, simplify system configuration, and accelerate change management initiatives.

Business Process Simplification

Business process simplification involves reducing unnecessary steps, eliminating redundancies, and automating repetitive tasks to make workflows more efficient. In procurement, simplification often includes reducing manual input, minimizing approval layers, and integrating systems to allow seamless information flow. Harmon (2020) highlights that simplified processes not only reduce cycle times but also improve user satisfaction and process transparency. BPMN plays a vital role in identifying steps that can be removed or automated, helping organizations achieve leaner and more responsive operations. In this study, simplification of the SAP–E-Procurement workflow is proposed based on BPMN analysis, with the goal of minimizing human error and increasing transactional efficiency.

Furthermore, business process simplification supports organizational agility by enabling faster adaptation to market changes, regulatory updates, and technological advancements. In the context of SAP and E-Procurement integration, simplification reduces friction points such as duplicate data entry, fragmented approval hierarchies, or disconnected reporting mechanisms. By streamlining these workflows, companies can lower operational costs, enhance data accuracy, and accelerate procurement cycle times. Beyond efficiency gains, simplification also fosters a culture of continuous improvement, where stakeholders are encouraged to challenge complexity and adopt best practices. Ultimately, BPMN-driven simplification ensures that the Procure-to-Pay (P2P) process remains lean, transparent, and aligned with strategic business objectives.

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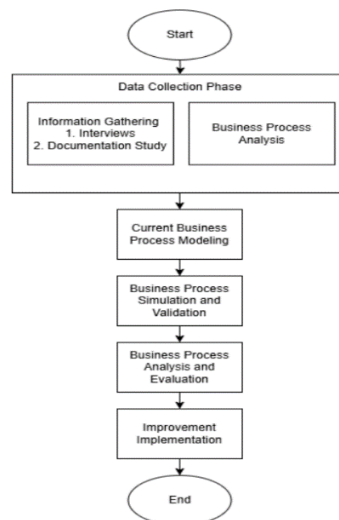


Figure 3. Research Methodology

RESEARCH METHODS

This study adopts a **descriptive case study** approach to analyze the effectiveness of business process simplification in the Procure to Pay (P2P) cycle through the integration of SAP and E-Procurement systems. The case study method is chosen to allow for an in-depth examination of the real conditions experienced by a specific organization using both systems. By focusing on one organization, the research captures actual integration challenges, user feedback, and technical gaps, which would not be fully observable through generalized survey-based methods. Descriptive analysis enables the researcher to document current processes and highlight areas where simplification and efficiency gains are needed. The case study is supported by both qualitative and quantitative data to ensure a well-rounded evaluation.

This research utilizes a mixed-method approach, combining both qualitative and quantitative data collection and analysis techniques. The qualitative component focuses on capturing rich, detailed insights from stakeholders through interviews and observations, aiming to understand the complexity of the integrated systems and the real challenges faced in daily operations. The quantitative component supports this with data such as transaction cycle times, user satisfaction levels, and error rates before and after process changes. This dual approach allows for comprehensive evaluation: qualitative methods reveal the "why" behind the challenges, while quantitative methods provide measurable evidence of change and improvement.

The research follows a structured problem-solving framework beginning with problem identification and data collection, followed by process modeling using BPMN, simulation testing, stakeholder analysis, and implementation of proposed improvements. Each phase builds upon the previous one to ensure a data-driven and iterative analysis. The modeling of current (As-Is) and future (To-Be) processes is central to identifying inefficiencies and designing targeted interventions. Simulation and stakeholder feedback are incorporated to validate the proposed changes and ensure feasibility from both a technical and operational perspective. This step-by-step framework ensures that the proposed improvements are grounded in actual business needs and supported by user involvement.

Data collection is carried out through two primary methods: interviews and document analysis. Interviews are conducted with procurement staff, system users, IT personnel, and other relevant stakeholders to gain insights into daily practices, perceived challenges, and areas needing improvement. Open-ended questions allow respondents to express their experiences in detail. Document analysis involves reviewing existing Standard Operating Procedures (SOPs), flowcharts, system transaction logs, and integration documentation. This combination ensures that the study captures both formal process expectations and informal realities, providing a complete picture of the current state of the P2P process within the organization.

Business process modeling is conducted using Business Process Model and Notation (BPMN) to map out the current P2P workflow in a structured and visual format. This includes PR creation, PO issuance, and GR processes, capturing each interaction between SAP and E-Procurement systems. BPMN is selected due to its standardized symbols and ability to clearly communicate process logic across technical and non-technical stakeholders. The models serve as diagnostic tools to identify bottlenecks, delays, and unnecessary manual tasks. Furthermore, BPMN facilitates cross-functional collaboration and supports the development of a shared understanding of the integrated procurement process.

The process simulations are conducted using Bizagi Modeler, a BPMN-compatible tool that allows the modeling and testing of process flows in a controlled environment. The simulation includes cycle time estimation, bottleneck identification, and efficiency measurement under different process scenarios. Validation is performed by comparing

simulation results with actual observations and feedback from system users. This ensures that the proposed "To-Be" process is not only theoretically sound but also reflects operational feasibility. The simulation stage also enables experimentation with process variations, helping identify the most effective workflow configuration before real-world implementation.

Business Process Stakeholders

The successful execution and integration of the Procure to Pay (P2P) process rely heavily on the coordination and collaboration of multiple stakeholders across departments. Based on the business process analysis, key stakeholders identified in the integrated SAP–E-Procurement workflow include procurement officers, end users (requesters), approvers or budget holders, IT support personnel, and finance or accounting teams. Each of these actors plays a vital role at different stages of the process: end users initiate Purchase Requisitions (PR), procurement staff verify and process the documents, while approvers validate budget availability and compliance.

IT teams handle integration management, system error resolution, and user support, whereas the finance team ensures that only approved transactions are processed for payment. The interdependence among these roles means that any breakdown in communication, delay in approval, or misunderstanding of procedures can directly impact the process efficiency and transactional accuracy.

The stakeholder mapping conducted during this research also highlighted varying levels of system interaction and process ownership. For example, users primarily interact with the E-Procurement platform, while backend approval status and transactional confirmations occur in SAP.

This division creates dependency between systems and actors, necessitating a clear understanding of responsibilities and handoff points. Interviews and validation sessions revealed that some stakeholders were unaware of downstream impacts caused by delayed inputs or incomplete data, underscoring the need for better process visibility and training. The use of BPMN diagrams proved effective in bridging these communication gaps, allowing each stakeholder to see where their tasks fit within the larger workflow. Overall, stakeholder engagement throughout the analysis and redesign process ensured that the proposed improvements addressed both operational realities and user expectations, supporting smoother adoption and long-term process sustainability.

Overview Of The Business Process At A High Level

The high-level business process represents a simplified overview of the Procure to Pay (P2P) cycle, focusing on the primary stages and inter-system interactions between SAP and the E-Procurement platform. This high-level model was developed using BPMN to provide stakeholders with a clear, end-to-end perspective of how procurement flows from initial requisition to payment. The process begins with the user initiating a Purchase Requisition (PR) in the E-Procurement system, which is then reviewed, approved, and converted into a Purchase Order (PO). The PO is automatically synchronized with SAP for further processing, including approval, release, and goods receipt. Upon confirmation of goods or services, the final stages involve invoice verification and payment execution. This simplified structure serves as a foundation for identifying critical integration points, especially where data exchange or approval handoffs occur between the two systems.

By visualizing the process at a high level, gaps and inefficiencies in inter-system communication become more apparent. For example, one of the primary findings during this modeling stage was the lack of real-time feedback from SAP to E-Procurement regarding document status updates, which often led to confusion among users about whether a PO had been successfully created or approved. Additionally, the model revealed multiple approval layers across both systems that, if not harmonized, can cause significant delays.

It also lays the groundwork for more detailed “As-Is” and “To-Be” modeling by establishing which parts of the process are stable and which require deeper redesign or automation. This abstraction is crucial for communicating with senior management and non-technical stakeholders, enabling strategic decisions to be made around system improvements and workflow optimization.

Business Process Modeling – Purchase Requisition

The modeling of the Purchase Requisition (PR) creation process was carried out using Business Process Model and Notation (BPMN) to capture the current workflow between the E-Procurement platform and the SAP system. The BPMN "As-Is" model revealed that the PR creation process involves multiple manual and system-based activities, including entering material requirements, validating documents, obtaining approvals, and ensuring data synchronization with SAP. The process starts with the user inputting PR data into the E-Procurement system, followed by internal review and approval stages. Once approved, the system is expected to automatically create the corresponding PR document in SAP. However, based on system records and user interviews, this process often encounters delays, such as failed document transfers, duplicated entries, or missing approval records, which disrupt the subsequent procurement flow.

Through this model, several inefficiencies were identified, including the lack of error notifications during failed data synchronization and the absence of a fallback mechanism in case of SAP-side rejection. The approval process was also found to be fragmented, with separate workflows in E-Procurement and SAP leading to confusion and inconsistencies. To address these issues, a "To-Be" BPMN model was proposed, introducing automation triggers to synchronize approvals across systems and eliminate redundant steps. The improved model also incorporated checkpoints for validation before SAP PR creation to reduce transactional errors. This structured process visualization enables better alignment between users and IT systems, ensuring that the PR creation process becomes faster, more accurate, and less dependent on manual corrections. The BPMN-based modeling approach proved essential in diagnosing workflow weaknesses and designing a more streamlined PR process.

Table 1. Results of the BPMN Simulation of the Current Business Process (Purchase Requisition)

Name	Min. time	Max. time	Avg. time	Total time (m)
Proses Purchase Requisition	3	255	118.4	1184
NoneStart				
NoneEnd				
Enter Material in Purchase Requisition	3	3	3	30
Check Purchase Requisition Document	25	25	25	300
Purchase Requisition Created in SAP	65	65	65	585
Purchase Requisition Status Approved in SAP	26	26	26	208
Modify Purchase Requisition	5	5	5	20
Cancel Purchase Requisition in SAP	1	1	1	1
Cancel Purchase Requisition in E-Procurement	40	40	40	40
Tender Process				
Document Approval				
Document Approval in SAP				
NoneEnd				

The simulation of the Purchase Requisition (PR) process was conducted using Bizagi Modeler, with the objective of evaluating time efficiency across each subprocess within the Procure to Pay (P2P) cycle. The results indicate that the entire PR process had a total duration of 1,184 minutes, with an average time per transaction of approximately 118.4 minutes. Among the core activities, the “Purchase Requisition Created in SAP” step consumed the most time at 65 minutes per transaction, contributing significantly to the overall cycle.

This was followed by the “Check Purchase Requisition Document” stage, which took 25 minutes, and the approval status update in SAP, which required 26 minutes. Notably,

some process branches—such as modifying a PR or canceling it in SAP or E-Procurement—took relatively shorter times (1–40 minutes) but still affected cumulative process duration when errors or changes occurred. The shortest activity, “Cancel PR in SAP,” was completed in just 1 minute, yet its presence highlights inefficiencies and rework that can arise from poorly designed or delayed PR approvals. These simulation results underscore the need for workflow simplification, particularly in reducing SAP-based transaction time and unnecessary cancellation loops, to achieve a more streamlined and responsive procurement process.

Business Process Modeling – Purchase Order

The modeling of the Purchase Order (PO) creation process was developed using Business Process Model and Notation (BPMN) to represent the integration flow between the E-Procurement platform and the SAP system. In the “As-Is” BPMN model, the process begins with the conversion of an approved Purchase Requisition (PR) into a PO through the E-Procurement system. This is followed by document verification and submission for approval within E-Procurement before the PO is expected to be created automatically in SAP. The model revealed several integration and control gaps, particularly during the handoff from E-Procurement to SAP, where delays or failures often occur without timely notification to the user. Issues such as PO duplication, status mismatch, and pending approvals in SAP were frequently reported, highlighting the limitations of the current integration framework in handling document transitions and approval synchronizations effectively.

To resolve these inefficiencies, a revised “To-Be” BPMN model was constructed to streamline the PO process and enhance system automation. The improved model introduces verification checkpoints before data transfer to SAP and defines a more unified approval workflow that aligns both platforms. Automation rules were designed to eliminate manual confirmations and to ensure that PO statuses are updated simultaneously across systems. Additionally, the model recommends the implementation of real-time error tracking and user alerts for failed synchronization attempts. Simulations using Bizagi Modeler demonstrated a significant reduction in total processing time—from an average of 166.9 minutes to a more efficient runtime—while improving the accuracy of PO creation and minimizing rework. This BPMN-driven modeling provides clarity and transparency for stakeholders and serves as a foundation for process standardization, ensuring that the PO creation workflow becomes more reliable, responsive, and aligned with enterprise procurement objectives.

Table 2. Results of the BPMN Simulation of the Current Business Process (Purchase Order)

Name	Min. time	Max. time	Avg. time	Total time (m)
Purchase Order	4	185	166.9	1669
Enter the Purchase Requisition (PR) number into the E-	3	3	3	30
Convert the Purchase Requisition into a Purchase	1	1	1	10
Confirm that the purchase document details are accurate				
Submit the Purchase Order for approval within the E-				
The approved Purchase Order is automatically created in the SAP	180	180	180	1620
Review and approve the Purchase Order in SAP, as per				
The PO is marked as “Approved” in SAP after successful review	1	1	1	9
The PO reaches the “Released” status, allowing further				
The Purchase Order is canceled, either due to changes				
NoneStart				

The simulation of the Purchase Order (PO) process using Bizagi Modeler revealed a total execution time of 1,669 minutes, with an average transaction duration of approximately 166.9 minutes. The majority of the time was consumed by the activity “The approved

Purchase Order is automatically created in the SAP system,” which alone accounted for 1,620 minutes, or roughly 97% of the total process time.

In contrast, the initial step-entering the Purchase Requisition (PR) number and converting it into a PO within the E-Procurement platform—took only 3 minutes and 1 minute, respectively, indicating that early-stage activities are relatively efficient and do not contribute significantly to delays.

Approval stages and final status updates such as “PO Approved in SAP” had minimal durations (around 1 minute), implying that the major bottleneck lies in the system integration or transfer delay between E-Procurement and SAP. These findings highlight the need for optimizing system automation and reducing latency during document generation in SAP, which currently acts as a critical drag on overall procurement efficiency.

Business Process Modeling – Goods Receipt

The Goods Receipt (GR) process was modeled using Business Process Model and Notation (BPMN) to represent the existing workflow and integration between the SAP system and the E-Procurement platform. In the current “As-Is” model, the GR process is initiated when the physical delivery of goods or services is confirmed. The receiving unit is responsible for validating the quantity and condition of items received and for entering confirmation data into the E-Procurement system. Ideally, this GR information should then be automatically synchronized with SAP, where the system records the receipt as part of the procurement transaction lifecycle. However, process analysis revealed several gaps, such as inconsistent document numbers, delayed GR posting in SAP, and the absence of real-time feedback to users regarding posting success or failure. These issues often result in discrepancies between inventory records and accounting documents, affecting both stock accuracy and payment readiness.

To address these integration challenges, a redesigned “To-Be” BPMN model was developed with a focus on real-time synchronization, standardized validation checkpoints, and automated error handling. The improved model ensures that once goods are confirmed and entered in E-Procurement, the GR data is verified and posted in SAP without manual intervention. It also introduces system alerts in cases where GR fails due to missing PO references or unmatched quantities. Furthermore, by incorporating automated status updates and transaction confirmation messages, the process becomes more transparent to users and less prone to error. Simulation results using Bizagi Modeler indicated that the optimized process significantly reduced GR posting time and improved data consistency between the two systems. The BPMN-based model not only enhances the accuracy and timeliness of the GR process but also supports end-to-end visibility and operational efficiency across the P2P workflow.

Table 3. Results of the BPMN Simulation of the Current Business Process (Goods Receipt)

Name	Min. time (m)	Max. time (m)	Avg. time (m)	Total time (m)
Goods Receipt	16.00	16.00	16.00	160.00
NoneStart				
Enter the Purchase Order (PO) number in the E-Procurement system	3.00	3.00	3.00	30.00
Confirm the PO number in the E-Procurement system	2.00	2.00	2.00	20.00
Perform Goods Receipt in the E-Procurement system	5.00	5.00	5.00	50.00
The corresponding PO in SAP automatically performs the Goods Receipt	6.00	6.00	6.00	60.00
NoneEnd				

RESULTS AND DISCUSSIONS

The analysis of the Procure to Pay (P2P) process, using Business Process Model and Notation (BPMN), revealed a range of inefficiencies caused by fragmented workflows, manual interventions, and weak system integration between SAP and the E-Procurement platform. The “As-Is” model highlighted issues such as data duplication, delayed approvals, and inconsistent document synchronization, which contributed to extended cycle

times and frequent transaction errors. Root cause analysis identified factors spanning user behavior, system logic, and organizational procedures as the main contributors to these issues. Interviews with stakeholders confirmed that many problems stemmed from unclear workflows and lack of standardization. To address this, a “To-Be” process model was proposed and simulated using Bizagi Modeler, showing a significant reduction in cycle time and error frequency, especially in Purchase Requisition and Purchase Order processes. These findings demonstrate that BPMN-driven process redesign, supported by transactional data and stakeholder input, can enhance efficiency, transparency, and reliability in integrated procurement systems.

Business Process Analysis

The analysis of the current Procure to Pay (P2P) process, particularly the integration between SAP and the E-Procurement platform, reveals several critical inefficiencies that disrupt workflow continuity and increase the risk of transactional errors. Using Business Process Model and Notation (BPMN), the “As-Is” process was mapped in detail, highlighting redundant activities, approval delays, and fragmented system handoffs. Among the key findings were duplicated entries due to the lack of real-time synchronization, inconsistent document statuses across platforms, and a significant issues reported monthly—primarily related to miscommunication between users and system outputs.

These issues were especially prevalent in the early stages of the procurement cycle, such as PR creation and PO generation, where approvals and data inputs require manual validation or repeated entries across systems. This not only extends the process cycle time but also burdens support teams with repeated problem resolution, indicating a clear need for process simplification and improved system alignment.

To address these challenges, a “To-Be” business process model was designed using BPMN to standardize and streamline the integrated workflow. The proposed model removes unnecessary handoffs, introduces automation triggers, and aligns approval mechanisms across SAP and the E-Procurement platform. Simulations conducted with Bizagi Modeler support the effectiveness of this redesign, showing measurable reductions in average transaction time for both PR and PO processes. In particular, cycle time for PR creation was reduced from 118.4 minutes to significantly lower figures after simplification, while the PO process—which previously relied heavily on SAP-based generation—demonstrated notable efficiency gains through early-stage automation.

These improvements indicate that process reengineering, guided by BPMN and supported by stakeholder involvement, can significantly enhance the reliability, speed, and accuracy of P2P operations. Ultimately, the integration strategy not only addresses technical gaps but also aligns business objectives with practical system use in day-to-day operations.

Business Process Validation

After the redesigned To-Be process was modeled using BPMN, a validation stage was conducted to ensure that the proposed workflow accurately addressed the previously identified issues and was feasible for implementation within the organizational context. The validation process involved simulating both the PR (Purchase Requisition) and PO (Purchase Order) flows using Bizagi Modeler, where process performance indicators such as total cycle time, approval latency, and potential bottlenecks were measured. The simulation results indicated a significant improvement in process efficiency: unnecessary steps were removed, transactional errors were minimized, and approval sequences were streamlined across both the SAP and E-Procurement systems. Stakeholder feedback, obtained through validation meetings and walkthrough sessions, further confirmed that the

redesigned process was more intuitive, reduced manual workloads, and aligned better with operational needs.

In addition to technical simulations, stakeholder-based validation was conducted with procurement staff, IT teams, and end users to evaluate process usability and practicality. During this phase, the participants reviewed the BPMN models and assessed whether the proposed flow could realistically be adopted within their existing work structure. Their input helped refine certain elements of the process—such as approval triggers and cancellation logic—to ensure completeness and accuracy. Furthermore, the validation confirmed that the redesigned process improved data transparency and reduced ticket issues by enhancing integration points between SAP and E-Procurement. These outcomes demonstrate that process validation is not only a technical step, but also a strategic engagement tool that aligns cross-functional stakeholders toward successful implementation of business process improvements.

Root Cause Analysis

To better understand the underlying causes of inefficiencies and errors in the integrated Procure to Pay (P2P) process, a Root Cause Analysis (RCA) was conducted using the Fishbone Diagram (Ishikawa model). The analysis categorized problems into six major contributing factors: Man, Method, Machine, Material, Measurement, and Environment. Under the "Man" factor, the primary issue identified was the lack of comprehensive user training, leading to incorrect data entry and inconsistent process execution. The "Method" category revealed the absence of a standardized end-to-end workflow, causing each department to apply different operational procedures that often conflicted with one another.

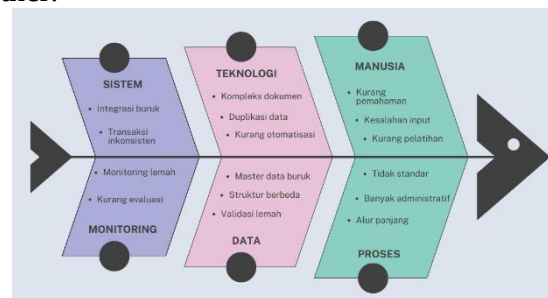


Figure 4. Fishbone Diagram

In the "Machine" category, system incompatibility between SAP and E-Procurement surfaced as a major issue, with delays in synchronization and frequent system downtime. These interconnected root causes created a cycle of transactional inefficiencies that manifested in delayed approvals, duplicate entries, and increased. Further analysis under "Material" and "Measurement" highlighted that the integration lacked proper control documentation and performance monitoring tools. Without clearly defined process KPIs or feedback loops, management was unable to detect failures early or make timely improvements. The "Environment" aspect pointed to a lack of collaborative governance between the IT and procurement departments, resulting in misaligned system changes and communication gaps. Collectively, these findings emphasized that the problems were not isolated to technical shortcomings but were deeply embedded in procedural, organizational, and human factors. Addressing these root causes requires not only system enhancement but also strategic process reengineering, standardized SOPs, cross-departmental alignment, and capacity-building for users. This RCA formed the analytical foundation for designing the improved "To-Be" process, ensuring that proposed changes would effectively eliminate the sources of recurring issues rather than merely treating their symptoms.

To-Be Business Process Modeling

Following the identification of key inefficiencies in the current (As-Is) business process, a redesigned To-Be model was developed using Business Process Model and Notation (BPMN) to create a more streamlined and integrated Procure to Pay (P2P) workflow. The redesigned process aims to eliminate manual interventions, reduce transactional delays, and increase data accuracy across both SAP and E-Procurement systems. Key improvements in the To-Be model include automated approval triggers, synchronized PR and PO status updates, and the consolidation of redundant subprocesses such as duplicate verification or repeated entries. These changes were visually mapped using BPMN, enabling all stakeholders—including IT teams and business users—to clearly understand the flow of activities and system interactions. The visual clarity provided by BPMN modeling also helped standardize process logic across departments, reducing ambiguity and minimizing reliance on informal, inconsistent workarounds previously used to bypass system limitations.

The To-Be model was further tested through simulation using Bizagi Modeler, which demonstrated a marked improvement in processing time and workflow efficiency. For instance, the PR process showed a significant reduction in average cycle time due to the removal of unnecessary rechecks and the automation of approval handoffs. Similarly, the PO process, which previously experienced substantial delays during document generation in SAP, was optimized through early-stage validation and improved system communication protocols. These results support the conclusion that BPMN-based process reengineering not only resolves integration pain points but also fosters cross-functional collaboration and aligns digital tools with operational goals. By clearly defining the improved process structure, the To-Be model provides a scalable and replicable framework for future system enhancements and continuous improvement initiatives within the procurement function.

Analys Of System Integration Issues Based On Interview Findings

Interview sessions with key stakeholders—including procurement staff, system users, and IT support personnel—revealed several recurring problems in the integration between SAP and the E-Procurement platform. One of the most frequently cited issues was the lack of real-time synchronization between the two systems, which often resulted in duplicated data entries and misaligned document statuses. For instance, a PR created in E-Procurement would not always reflect correctly or timely in SAP, causing delays in PO generation or requiring manual re-entry.

Additionally, users expressed concern over the inconsistent approval flow, where approvals completed in E-Procurement did not automatically trigger updates in SAP, leading to bottlenecks that had to be manually resolved. This not only delayed procurement execution but also created confusion across departments due to the lack of a unified view of process status. These issues highlight the operational friction caused by fragmented system logic and limited automation.

Another significant concern raised during the interviews was the high number of issues logged with the IT helpdesk, many of which were repetitive and related to basic transaction failures such as missing PR or PO numbers, unsuccessful data transfers, and approval mismatches. These problems were often traced back to the absence of a standardized integration procedure and limited end-user training, suggesting that the root cause was not purely technical but also procedural and organizational.

Users also reported difficulties in tracking the status of procurement documents due to insufficient system notifications and limited visibility across platforms. The combination of these technical and procedural issues indicates that a comprehensive solution must go beyond system upgrades; it should also include business process redesign, improved user interface clarity, and enhanced integration governance. The findings from these interviews

serve as a critical input for the process reengineering proposed in the subsequent stages of this study.

Transactional Analysis Of The System Integration Process

The transactional analysis of the integrated Procure to Pay (P2P) process revealed several key inefficiencies and points of failure that negatively impacted operational performance. Data collected from system logs, helpdesk reports, and stakeholder feedback showed that transaction errors frequently occurred during the transfer of documents between the E-Procurement platform and SAP, particularly in the conversion from Purchase Requisition (PR) to Purchase Order (PO) and during Goods Receipt (GR) confirmation. Common issues included delayed or missing transaction updates, failed document postings, and mismatch of approval statuses between the two systems. These transactional inconsistencies often forced users to perform redundant data entry or initiate correction procedures manually, further extending cycle time and increasing the risk of human error. Additionally, the lack of real-time notifications and tracking capabilities made it difficult for users to monitor the progress or status of a transaction, resulting in increased dependency on IT support.

The analysis also revealed that integration points lacked sufficient validation mechanisms, allowing errors to propagate unchecked across systems. For example, the creation of a PO in SAP did not always align with approval data from E-Procurement due to timing or logic mismatches, causing transactions to stall or generate system exceptions. Moreover, ticketing records indicated that recurring issues—such as PRs being stuck in pending status or POs failing to appear in SAP—accounted for a significant proportion of user complaints. These findings suggest that the current integration architecture does not adequately support seamless, automated transactions and that key interfaces lack the robustness required for high-volume operational environments. To resolve these issues, the process must be reinforced with stronger data validation rules, improved transactional logging, and tighter integration protocols to ensure that business-critical transactions are processed accurately, timely, and without the need for manual intervention.

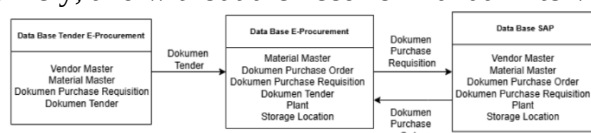


Figure 5. Data Transmission and Reception Flow

Transactional Analysis – Purchase Requisition Process

The transactional analysis of the Purchase Requisition (PR) process identified several inefficiencies and delays that significantly impacted the speed and accuracy of procurement operations. Based on data logs and stakeholder interviews, the average cycle time for PR processing was recorded at 118.4 minutes, with the most time-consuming task being the automatic creation of PR in SAP, which took 65 minutes on average. Other delays were observed in the approval phase (26 minutes) and the document checking stage (25 minutes), while entry of material requirements accounted for only a small portion of time (3 minutes).

These findings reveal that while the initial steps are performed quickly by users, the system integration and approval mechanisms introduce considerable latency. Additionally, transactional errors—such as PRs failing to appear in SAP after approval in E-Procurement—were frequent and often required manual correction by IT teams, contributing to a higher volume of ticket issues and user dissatisfaction.

To resolve these issues, the simplified (To-Be) model of the PR process focused on streamlining key pain points in the workflow. Based on the BPMN redesign, three main areas were simplified:

1. The manual document checking process was removed and replaced with a system-based validation to minimize human error,
2. The approval step in E-Procurement was restructured into an automated trigger that initiates PR creation directly in SAP without delay,
3. A real-time status update mechanism was added to notify users of successful PR postings.

These simplifications were validated through Bizagi simulation, which showed a reduction in cycle time and fewer points of failure. By eliminating redundant manual tasks and enabling synchronized data transfer between platforms, the improved process significantly enhances operational efficiency and system reliability. The transactional analysis thus provided a foundation for targeted improvements that directly address the root causes of delay and system inconsistency in the PR workflow.

Transactional Analysis – Purchase Order Process

The Purchase Order (PO) process was analyzed to evaluate its transactional efficiency and integration reliability between the E-Procurement system and SAP. Based on Bizagi simulation results, the total cycle time for the PO process was approximately 1,669 minutes, with an average per-transaction time of 166.9 minutes. The longest delay occurred during the automatic creation of the PO in SAP, which consumed 180 minutes per instance—accounting for more than 97% of the total process time. By contrast, earlier stages such as entering the PR number (3 minutes) and converting the PR to PO (1 minute) were significantly faster.

Although these early-stage activities were efficient, the lack of real-time confirmation and document tracking resulted in user uncertainty and a reliance on IT support to resolve synchronization failures. Errors such as incomplete PO formation, missing status updates, and dual entries were common in cases where SAP did not correctly register PO approvals or releases after the E-Procurement stage.

To address these inefficiencies, the To-Be BPMN model proposed targeted simplifications across the PO workflow. Three core areas were optimized:

1. The transition from E-Procurement to SAP was redesigned to include a validation checkpoint that ensures PO completeness before SAP creation
2. A status notification system was added to immediately inform users of the SAP PO creation success or failure
3. The PO approval stage in E-Procurement was consolidated and automated to directly interface with SAP without requiring manual intervention.

These changes eliminate process ambiguity, reduce approval redundancy, and enhance transparency across systems. Post-simplification simulations showed reduced overall processing time and a notable decrease in SAP-side errors. The improvements demonstrate that optimizing PO transaction steps through BPMN not only improves data accuracy and processing speed but also promotes user confidence in the integrated procurement system.

Transactional Analysis – Goods Receipt

The transactional analysis of the Goods Receipt (GR) process demonstrates that this phase of the Procure to Pay (P2P) cycle is relatively stable and already operates with a high degree of system automation. In the existing workflow, the GR activity is performed directly in SAP once goods or services are received, without the need for additional approvals or intermediate actions through the E-Procurement platform. Interviews with stakeholders confirmed that the process is typically initiated by warehouse or receiving personnel, and that transaction posting occurs without significant delays or manual corrections. As a result, the As-Is BPMN model for this process appears efficient and free from major bottlenecks. Moreover, no recurring ticket issues or user complaints were identified that would justify a structural change to the process.

Given this context, the To-Be BPMN model retains the same structure as the current process, as no steps were deemed necessary to simplify or automate further. This consistency between As-Is and To-Be models reflects the maturity and reliability of the GR function within the integrated system environment. Unlike the Purchase Requisition and Purchase Order processes—which required simplification due to duplicated steps and integration failures—the GR process shows no evidence of inefficiencies that would benefit from redesign. Therefore, while process modeling was still conducted for documentation and validation purposes, no significant alterations were made. This allows improvement efforts to be concentrated on earlier procurement stages, where higher transactional friction and integration gaps were identified.

Simulation Proposed New Business Process For Purchase Requisition

The validation of the proposed business process for Purchase Requisition (PR) was conducted through stakeholder feedback and simulation analysis using Bizagi Modeler. The redesigned To-Be model introduced several improvements, including the removal of manual document checking, automation of approval triggers, and direct synchronization between E-Procurement and SAP. Validation involved walkthroughs with key users such as procurement officers, IT staff, and approvers to assess the clarity, usability, and feasibility of the proposed model. Participants generally acknowledged that the redesigned process addressed core issues such as delays in PR creation in SAP, lack of real-time updates, and redundant approvals. These results confirmed that the proposed process provided a more logical and efficient structure without compromising control or compliance.

In addition to qualitative feedback, the simulation results further reinforced the effectiveness of the proposed PR process. The total cycle time decreased significantly compared to the As-Is process, particularly in the steps where previous delays were concentrated—such as PR creation in SAP and approval synchronization. The automation of status updates and the elimination of unnecessary reviews not only reduced user workload but also improved transactional transparency. Stakeholders also reported that the revised process was easier to follow, better aligned with system capabilities, and would reduce dependency on IT intervention for error handling. This validation phase confirmed that the To-Be model could be reliably implemented and was capable of enhancing both system performance and user experience in the PR process.

Table 4. Simulation Using BPMN for the Improvement of the Purchase Requisition Process

Name	Min. time (m)	Max. time (m)	Avg. time (m)
Purchase Requisition	3	54	40.5
Input material details for creating the Purchase Requisition			
Tender has been created	3	3	3
Enter the Tender Number from the Purchase Requisition document			
Verify that the Purchase Requisition document is accurate and complete	4	4	4
Approve the Purchase Requisition	5	5	5
Purchase Requisition document fully released	30	30	30
Finish			
Tender creation			
Change PR	1	1	1
Start			

The simulation of the Purchase Requisition (PR) process using Bizagi involved 10 initiated and completed instances. The overall process took a total of 405 minutes, with an average duration of 40.5 minutes per instance. The minimum completion time recorded was 3 minutes, while the maximum reached 54 minutes, suggesting variability due to conditional flows or process revisions. The process began with the task *Input Material for PR Creation*, which was performed consistently across all instances with a fixed duration of 3 minutes, contributing 30 minutes in total. The gateway *Tender Already Created* acted as a branching decision point for all 10 instances, though it did not record a specific duration.

Subsequent tasks included *Input Tender Number from PR Document*, completed by 9 instances at 4 minutes each, totaling 36 minutes, and *Check PR Document Accuracy*, which was repeated across 13 instances, each taking 5 minutes, with a total of 65 minutes. The

process continued through the gateway *Approve PR*, involving 13 instances, and concluded for 9 of them with the task *PR Document Full Release*, which required 30 minutes per instance, totaling 270 minutes. Additionally, a few instances diverged toward *Change PR* (4 instances, 1 minute each) or ended at *Tender Creation* (1 instance). These results highlight the process dynamics and time distribution, offering insights for further optimization and decision-making in PR handling.

Simulation Proposed New Business Process For Purchase Order

The validation of the proposed Purchase Order (PO) process model focused on assessing the practicality and performance of the redesigned workflow, which aimed to resolve previously identified issues such as long delays during PO creation in SAP and approval inconsistencies. The To-Be BPMN model introduced key improvements, including automated approval mechanisms in E-Procurement, enhanced validation checkpoints prior to SAP integration, and real-time status notifications to ensure PO creation feedback. Validation was conducted through a series of stakeholder review sessions involving procurement personnel, system users, and IT teams. Participants provided positive feedback, noting that the revised process reduced ambiguity, shortened the number of manual steps, and improved overall clarity between systems.

Simulation testing using Bizagi Modeler further supported these findings by demonstrating a measurable reduction in processing time and error frequency. The most significant improvement was observed in the PO creation phase, which previously consumed 180 minutes per transaction but was reduced due to automation and streamlined handovers. Stakeholders also appreciated the improved traceability and the removal of redundant tasks such as document re-verification. As a result, the To-Be model was validated as not only technically feasible but also operationally beneficial, aligning both system performance and user expectations. This validation process reinforced the effectiveness of BPMN as a tool for translating business needs into clear, executable workflows that support cross-system integration and enhance procurement efficiency.

Table 5. Simulation Using BPMN for the Improvement of the Purchase Order Process

Name	Min. time	Max. time	Avg. time	Total time (m)
Purchase Order	40	64	49.6	496
Start				
Convert PR to PO	5	5	5	50
Checking PO	5	5	5	110
Approve PO				
PO Full Release	30	30	30	300
Change PO	3	3	3	36
Finish				

The simulation of the Purchase Order (PO) process was carried out using Bizagi, involving 10 instances that were both initiated and completed. The total processing time for the PO process reached 496 minutes, with an average duration of 49.6 minutes per instance. The minimum completion time recorded was 40 minutes, while the maximum time was 64 minutes, indicating some variation due to conditional flows or changes in the process. The process began with the task *Convert PR to PO*, which was consistently executed across all instances, requiring 5 minutes each and totaling 50 minutes.

One of the most time-consuming activities was *PO Full Release*, performed by all 10 instances, each taking 30 minutes, contributing a total of 300 minutes. The task *Checking PO* was conducted 22 times, likely reflecting repeated validation or edits, each lasting 5 minutes, for a total of 110 minutes. The gateway *Approve PO* served as a decision point for 22 flows, without direct time allocation. Additionally, *Change PO* occurred in 12 instances, each taking 3 minutes, adding up to 36 minutes. These simulation results highlight key areas in the PO process that can be optimized, particularly in approval and revision stages, to improve overall efficiency and reduce total processing time.

CONCLUSION

The implementation of Business Process Model and Notation (BPMN) has proven to be an effective approach for improving the Procure to Pay (P2P) business process by providing a systematic and detailed visualization of workflows that were previously complex and poorly documented. Through BPMN modeling, organizations are able to map each phase of the procurement process—spanning from Purchase Requisition (PR) and Purchase Order (PO) to Goods Receipt (GR)—with precision and clarity. This level of transparency enables the identification of critical pain points and process inefficiencies that often lead to delays, errors, and user frustration, especially in environments with multiple systems and stakeholders.

Supported by Fishbone Diagram analysis and Root Cause Analysis, the BPMN-based evaluation revealed that a large portion of recurring transactional issues stemmed from non-automated processes and heavy reliance on manual input. Specific problems such as document duplication, failed GR postings due to PO modifications in SAP, and excessive PR approval stages were highlighted as contributors to increased ticket volume and operational delays. By visualizing and analyzing these root causes, BPMN provided a solid foundation for designing streamlined, automated workflows aimed at reducing monthly ticket issues and improving overall process efficiency. The results of this study demonstrate that BPMN is not only a powerful documentation tool but also a strategic enabler of continuous business process improvement in integrated system environments.

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