An AI-Driven Framework for Optimizing Business Intelligence across Organizational Hierarchies

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ABSTRACT

In today's global trade landscape, Artificial Intelligence (AI) significantly enhances productivity and transforms business processes across sectors. This research investigates the role of business intelligence in improving service delivery within corporate entities. By applying Deming's methodology, strategies to optimize decision-making processes are identified, and hidden insights are revealed through advanced data analysis techniques. A Data Flow Diagram (DFD) illustrates the development stages and system implementation, offering practical guidance for general managers. The findings provide actionable insights that enhance efficiency and decision-making in organizational contexts.

Keywords-algorithm engineering; key performance indicators; business intelligence; data flow diagram; Deming's methodology; agile methodology; software as a service; online

I. INTRODUCTION

The significance of Software as a Service (SaaS) has increased markedly within innovative enterprises and various economic sectors. For these organizations, the timeliness and relevance of the services provided are paramount. It is essential to comprehend and identify specific aspects and timing for enhancements in Information Technology (IT) services. To address this necessity, the concept of Continuous Service Improvement (CSI) is frequently used, focusing on continuous enhancement of services [1].

Within the CSI framework, significant emphasis is placed on analyzing the organization of IT services. This analysis can be conducted effectively using Business Intelligence (BI) technology. The primary objective of BI in this context is to identify and implement necessary improvements in existing IT service organizations. Essentially, BI enables product managers to uncover insights that may not be immediately apparent based on the data processed. However, current approaches to CSI often overlook the unique characteristics of SaaS solutions. Addressing these specificities can help avoid numerous errors during the analysis of the effectiveness of current IT service organizations, ultimately leading to enhanced service quality. Thus, developing a method for continuous improvement of SaaS services is particularly pertinent given the lack of theoretical and practical advances in this area.

The scientific development of continuous improvement methods for IT services has been extensive. The active application of these methods across various domains of modern life has spurred their evolution within IT. These methods integrate principles and practices related to quality management, change management, and capability enhancement. Globally, the challenges of managing IT service quality have been addressed by numerous scholars, including [2-7], who have made significant contributions to change management theory. However, while these works address service improvement, the aspect of continuity is often neglected, a gap largely filled by international research. Although these contributions are of substantial theoretical and practical interest, they do not specifically address the application of continuous improvement methods to SaaS.

This study aims to elucidate the utilization of business intelligence tools to enhance and elevate service levels within companies by employing various business intelligence tools, including Agile and Scrum methods.

II. LITERATURE REVIEW

In [5], a comparative analysis of the Al-Bashir Hospital and the Islamic Hospital was carried out. This study aimed to assess the presence of Total Quality Management (TQM) elements, such as leadership, customer focus, employee integration, continuous improvement, supplier relationships, and performance measures. Involving 490 employees and 340 patients, the findings showed that TQM practices were implemented more effectively in the Islamic Hospital. In contrast, Al-Bashir Hospital showed a lack of interest or awareness in TQM applications, adversely affecting service quality. In [6], the feasibility of implementing TQM in higher education was explored, specifically at Al-Ahliyya Amman University. This exploratory research collected opinions from deans and 600 undergraduate students from the 1996-1997 academic year to gauge satisfaction with educational services.

The results showed high satisfaction with university facilities but lower satisfaction with academic staff, internal regulations, study plans, and university services, suggesting only partial implementation of TQM. In a similar vein, the study in [7] outlined essential steps for educational institutions to adopt TQM. Key recommendations included raising awareness of TQM among students, administration, and faculty through educational programs, developing comprehensive performance evaluation standards, and conducting actual performance assessments based on these standards.

In [4], the importance of strategic planning teams in defining quality requirements and monitoring environmental changes was emphasized to identify risks and opportunities. This study highlighted that TQM in higher education should promote motivation, assessment, delegation, mentoring, documentation, and curriculum development for both students and management. In [3], the impact of organizational commitment on productivity, performance, and effectiveness was investigated, particularly during nighttime operations. By examining various organizations, the research revealed a clear relationship between organizational structure and employee behavior, identifying a negative correlation between organizational structure and job performance, along with an increased desire among employees to leave their jobs. This suggests that a well-defined organizational structure is essential to maintain a competitive advantage. Consistent with this, the study in [2] analyzed traditional administrative methods and the potential application of TQM in nonprofit organizations. Conducted in the United States, this study employed various analytical methods, including means, standard deviations, and ANOVA. The findings suggested that implementing TQM is crucial to improving productivity and maintaining performance, especially for organizations facing funding challenges, while also stressing the importance of leadership in securing the necessary funding. In [8], the impact of the TQM principles on employee satisfaction and loyalty was examined in manufacturing companies in Australia. This study highlighted that applying TQM principles significantly enhances job satisfaction and organizational commitment, emphasizing the need for cooperation, training, employee development, and a supportive work environment to achieve organizational success.

III. A FRAMEWORK FOR CONTINUOUS SERVICE IMPROVEMENT METHODOLOGIES

As previously discussed, SaaS has several distinctive features that differentiate it from traditional software models:

- Optimized for Remote Access: SaaS applications are designed to be accessed over the internet, ensuring that users can work from anywhere with a reliable connection.
- Multi-User Accessibility: Multiple users can utilize a single instance of the application.
- Timely Updates and Modernizations: Updates are executed promptly and customized based on client needs.
- Subscription Payment Structure: Payments are typically organized as subscriptions or recurring fees.
- Modular Composition: SaaS often consists of several smaller, manageable modules.
- Standardized Updates and Upgrades: Regular updates and upgrades are a common practice.
- Expandable Functionality: End users can independently expand the application's functionality as needed.

Given that traditional methods of continuous improvement for IT services often overlook the unique attributes of SaaS, the following outline a tailored approach to continuous service improvement, incorporating the critical features of SaaS.

1. Current State Analysis and Bottleneck Identification: This initial phase involves comprehensive analytical monitoring of the entire IT service. Based on the collected data, experts identify issues that hinder the efficient operation of the service. These issues can be technical, pricing-related, design-oriented, or other, each affecting the service's performance differently. High-quality analytics are essential for an objective assessment of the IT service's state.
2. Root Cause Analysis: This phase, which is the most subjective, is also the most critical. There can be numerous potential causes for service issues and bottlenecks, and it is not always possible to definitively determine the exact cause.
3. Requirement Formation for Service Improvement: Before addressing identified problems, it is necessary to define both functional and non-functional requirements. These requirements should be documented and communicated to the development team. The method employs user stories and use case formats for requirement descriptions, without imposing additional conditions on the form of use case descriptions.
4. Development and Problem Resolution: Continuous service improvement aligns with the Deming cycle, necessitating the adoption of an Agile methodology during development, such as Scrum or its derivatives. A new working version of the SaaS product, incorporating the resolved issue, should be delivered every 1-4 weeks. These timelines should be established before development. The quality of the requirements described in the previous step significantly influences the quality of the released product version [9].
5. Result Analysis of Implemented Changes: This phase should be conducted concurrently with other steps in the method. In SaaS, the effectiveness of changes can only be assessed on a large sample. This involves analytical monitoring to gauge end-user reactions to the implemented changes. The methods used for this analysis may be similar to those employed in the initial stage of the continuous improvement method.
6. Identification of New Bottlenecks: Following the release of a new version of the IT service, and concurrently with the analysis of the results post-problem resolution, it is essential to re-examine the system to identify any new issues. It is important to exclude the recently implemented components from this analysis, as their effectiveness cannot be accurately assessed with such a limited sample size. This

process establishes a continuous cycle of service improvement. At this stage, the principle of ongoing improvement has been solidified [1].

IV. ASSESSMENT OF CURRENT IT SERVICE DEFICIENCIES

The growing relevance of SaaS in today's market is particularly noteworthy, reflecting a transformative shift in how businesses access and utilize software solutions. The demand for these scalable and flexible systems has surged, driven by organizations' need for cost-effective and efficient IT resources that facilitate rapid adaptation to changing market dynamics. Additionally, the role of analytical systems has become increasingly significant in the IT sector, fundamentally enhancing the quality of decision-making processes. As highlighted in [1], effective business models integrated with robust analytical capabilities can yield substantial competitive advantages in a data-driven environment.

Among these analytical systems, Business Intelligence (BI) technologies are paramount. They empower employees across the organization to make informed, data-driven decisions and generate insightful reports through multidimensional data analysis (Online Analytical Processing - OLAP). This analytical capability allows for the interactive exploration of large datasets through specialized models known as OLAP cubes, thereby enabling users not only to conduct complex queries but also to visualize data in both tabular and graphical formats. Such dynamic reporting tools are essential for comprehending patterns and trends hidden within extensive data, further emphasizing the strategic value of BI in organizations [1, 10].

Leveraging available data is critical for identifying systemic bottlenecks within SaaS applications. By thoroughly analyzing performance metrics and user interactions, organizations can uncover inefficiencies and establish the requisite requirements for their resolution. This proactive approach not only enhances operational efficiency but also elevates user experiences, ensuring that service offerings remain competitive.

To address bottlenecks and improve services, it is crucial to integrate BI into the enterprise architecture. This integration should align BI with organizational goals and processes, promoting a culture of data-informed decision-making. Figure 1 uses a Data Flow Diagram (DFD) notation to illustrate how this integration facilitates information flow and system interactions, underscoring the role of BI in enhancing SaaS performance and achieving business excellence. Various file formats can serve as data sources, including text, xls, or XML files, relational databases (e.g., MS SQL, DB2, MySQL), non-relational databases (e.g., MongoDB, eXist, CouchDB), and various metrics (e.g., Yandex.Metrika, Google Analytics). The supported data sources are contingent on the ETL tool selected by the enterprise. Figure 1 illustrates a comprehensive scheme for building BI systems. It is important to note that if an enterprise has already established BI, the entire process of analyzing the current state of the service and identifying bottlenecks involves building an OLAP cube and performing data analysis (analytical monitoring).

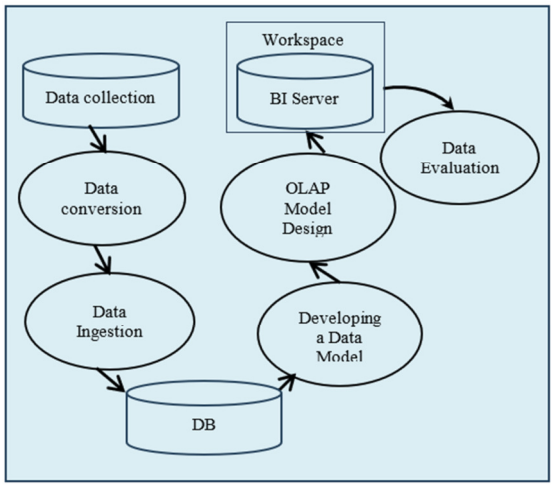

Fig. 1. Framework for implementing BI in an enterprise.

During the analytical monitoring phase, issues within the IT service are identified. This involves presenting a series of indicators to determine whether the service or its components (modules) meet the specified requirements. Key Performance Indicators (KPIs) to assess user engagement and satisfaction may encompass the following:

- Page Exit Rate: The proportion of users who navigate away from the page, providing insights into content relevance and user experience.
- Negative User Reviews Percentage: The incidence of unfavorable reviews, which can highlight areas necessitating improvement and enhance understanding of user sentiment.
- User Base Size: The total number of active users is an essential metric for gauging platform reach and viability.
- Average Pages Viewed Per Session: This metric evaluates user engagement by measuring the mean number of pages accessed during a single session, reflecting user interest and navigation efficiency.
- Action Completion Rate: The total number of interactions required to achieve a specific user objective, which can illuminate potential barriers in the user experience and inform optimization strategies.

These indicators depend on the subject area of the SaaS application and its structure, necessitating unique performance indicators for each SaaS. Additionally, data mining can be employed for analytical monitoring. The application of advanced data mining techniques enables more precise problem identification and can yield unexpected insights. Prominent systems offering data mining capabilities include SPSS Modeler, RapidMiner, SAS, and Dedicator Studio. However, practical experience indicates that not all enterprises are prepared to adopt data mining, often relying solely on OLAP [1].

Utilizing BI to analyze the current state of a service and identify bottlenecks can facilitate both the complete redesign of

a service (or a specific module) and its improvement. The advantages of using BI to assess the current state of a SaaS service and identify bottlenecks include:

- Enhancing the efficiency and quality of decision-making based on available data [10].
- The potential to obtain unexpected results that can help reorganize current processes.
- Increasing data availability.

Despite the clear benefits of using BI, there are challenges and drawbacks:

- Errors in data interpretation are directly related to the competence of the participants involved in building BI.
- Not all enterprises are willing to invest in BI for service quality analysis and bottleneck identification. Despite the growing popularity of BI, many enterprises are hesitant to implement BI systems without a clear understanding of their benefits.

It is essential to recognize that employing BI as a method for identifying bottlenecks within a SaaS service organization does not necessitate the use of any specific BI product or ETL tool. However, the selection of an appropriate BI system remains a critical component of this methodology. Given the rapid evolution of the software market, a thorough analysis of available BI systems is imperative. The following criteria are recommended for comparing BI systems: the capabilities of the information system (analytical tools), the range of analytical tasks that the system can address, and the categories of system users. Additionally, when selecting a suitable BI system, it is crucial to consider the product's cost and the qualifications of its users. Prominent BI systems include SAS, IBM Cognos BI, Tableau, QlikView, SAP BO, Oracle BI, and the Russian Prognoz system [11]. Leading ETL tools include IBM DataStage, Pentaho Data Integration, and Oracle Data Integration [1].

In the context of continuous service improvement, the term "problems" encompasses any issues that diminish the effectiveness of an IT service. Bottlenecks, defined as operations and communications that reduce process efficiency by increasing complexity and cost, are a subset of these problems. Common bottlenecks include redundant operations, excessive delays, information loops, and overloads of specific elements. IT service issues may also stem from technical implementation flaws and the quality of the information system. Furthermore, problems may arise if the service is underutilized compared to the SaaS vendor's expectations. Thus, a problem is any factor that prevents both the end user and the SaaS vendor from achieving full satisfaction with the service. The multitude of potential problems and bottlenecks necessitates a highly objective and responsible approach to their identification. The process often relies on the expertise and competence of individuals such as data analysts, system analysts, product owners, or project managers [5-10, 12-15].

The most favorable scenario occurs when the causes of the problems can be substantiated through precise calculations. Specialists involved in identifying these causes may employ various formulas for justification. If numerical justification is not feasible, the process relies on the specialist's experience. For instance, if data indicate that a tool is unprofitable, numerous factors could be responsible, including design flaws, pricing issues, functional complexity, or inadequate reference materials. The specialist must discern the exact cause, which may involve a combination of factors. This stage is critical since incorrect problem identification can lead to erroneous requirement formation. If weeks are spent addressing a misidentified problem, the development effort and associated costs are wasted [11].

V. SYSTEM COMPONENT DEVELOPMENT AND TROUBLESHOOTING

Given that the entire process of continuous service improvement aligns with the Deming cycle, it is prudent to adopt flexible development methodologies, such as Agile. Agile methods have gained significant traction due to their emphasis on adaptive planning, evolutionary development, early delivery, and continual improvement, with notable examples including Scrum, Extreme Programming (XP), Lean, Agile Unified Process (AUP), and Kanban.

The selection of an appropriate method depends on several factors, including business priorities, preferred communication and team interaction methods, the number of significant risks, the frequency of requirement changes, and the relative importance of speed versus quality. Understanding these factors is essential, as they can greatly influence the effectiveness of the chosen method in meeting organizational goals and enhancing project outcomes. Figure 2 illustrates the choice of the method. Since the method involves continuous improvement, Scrum and other Scrum-like methodologies (e.g., Scrumban, which combines elements of Scrum and Kanban, or a blend of Scrum with XP) are often recommended. These methods allow teams to implement iterative cycles, enabling rapid adjustments based on real-time feedback and performance metrics. Figure 3 depicts the entire Scrum process, highlighting key ceremonies such as Sprint Planning, Daily Standups, Sprint Reviews, and Retrospectives that drive collaboration and accountability within teams.

Regarding requirement formation, Agile and Scrum methods utilize short user stories and use cases as formats for describing requirements. User stories succinctly outline the functionality needed for a specific stakeholder to derive benefit from the software product [16]. The user story format emphasizes clarity and user-centricity, ensuring that the development process aligns closely with user needs. The most common format for user stories includes three components:

- User Role: Identifies the user (Who?).
- Necessary Behavior: Describes the function or action (What does the user do?).
- Benefit/Value: Explains the purpose or value (Why? For what?).

This can be schematically represented as: "As a <role>, I want <behavior> for <value>.

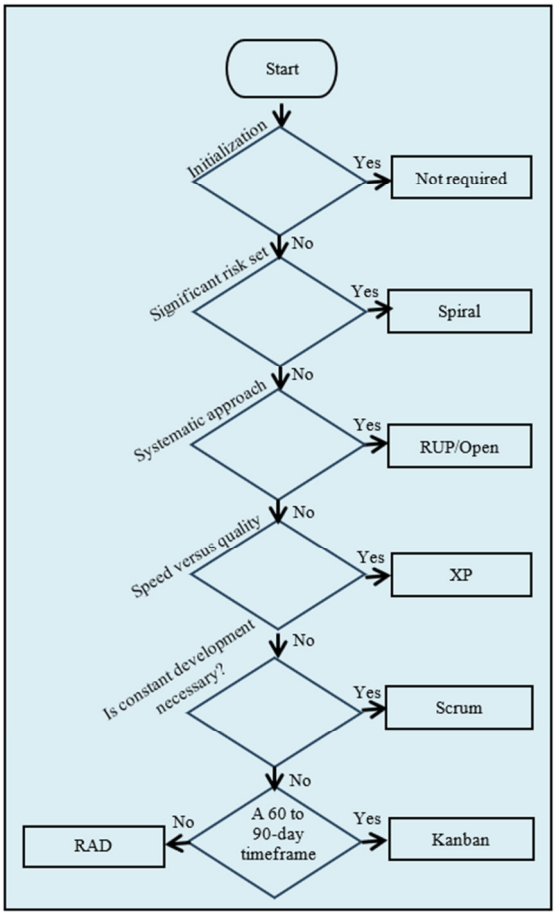

Fig. 2. Framework for identifying the most appropriate Agile method.

This simple yet effective structure encapsulates the essence of the desired functionality while keeping stakeholders focused on delivering value. Additionally, user stories can be further enriched with acceptance criteria, which provide specific conditions under which a story is considered complete, thus ensuring quality and reducing ambiguity.

In summary, the integration of the Deming cycle with Agile methods, particularly through tools such as Scrum and user stories, facilitates a culture of continuous improvement and responsiveness. By regularly reviewing and refining requirements, teams can align their output more closely with stakeholder expectations and adapt to evolving market dynamics. This iterative approach not only enhances product quality but also promotes a more agile mindset across the organization, empowering teams to drive sustained success in their development efforts.

Once user histories are generated, they are often elaborated into user scenarios as needed. Typically, this elaboration is necessary. These scenarios integrate seamlessly with previously prepared user stories, providing comprehensive coverage. The development of scenarios is a collaborative effort with the designer, detailing the anticipated system behavior that must be conveyed to the designer. There are various methods for generating requirements and describing user scenarios, with the most popular being:

- A numbered list of stages, arranged in a table format
- Wirfs-Brock two-column table
- Free-form description
- Tabular presentation
- Full Cockburn format
- Activity diagrams, state transition diagrams, use case diagrams
- Sequence diagrams [17].

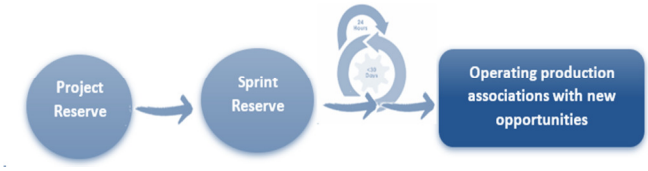

Fig. 3. Overview of scrum processes.

The selection of a requirements format is influenced by several factors, including the enterprise's size, the scale and significance of the project, historical practices, and the preferences of the development team. Importantly, the continuous improvement approach for SaaS through BI does not prescribe a specific format for requirements documentation.

Once the product owner articulates the requirements to resolve issues identified during the analysis of the current state and potential problem causes, these requirements, along with the sprint and project backlogs, are handed over to the development team. Upon completion of the sprint, the changes are then integrated into the system [18, 19].

In the context of continuous service improvement using the Scrum method, the development team exhibits characteristics such as:

- Self-organization: The team autonomously determines how to convert the Product Backlog into increments of working functionality, without directives from the Scrum master.
- Cross-functionality: The team possesses all the necessary skills to develop a product increment.
- Role uniformity: Scrum recognizes only the role of the developer within the development team, irrespective of the specific tasks performed.
- Unified team structure: The development team does not include sub-teams for distinct functions such as testing or business analysis.
- Collective responsibility: While individual members may have specialized knowledge, the entire development team shares responsibility for the work.
- Optimal team size: Ideally, the team comprises 3-9 members. Teams smaller than three may lack sufficient interaction and skills, reducing productivity. Conversely, teams larger than nine face coordination challenges,

complicating the empirical process management. The roles of the product owner and Scrum master are excluded from the development team size unless they contribute to the sprint backlog [19].

The team is tasked with product development through iterative cycles known as sprints. They independently determine sprint duration, team capacity, focus factor (coherence coefficient), the complexity of requirements to be implemented, task sequencing, and other relevant factors. Scrum's application is particularly beneficial for SaaS development, both in the initial stages, where minimal functionality can be launched, and in later stages, where incremental improvements can be made without overhauling the entire project. A sprint comprises four key processes:

1. Planning: The backlog is reviewed to identify tasks that can be completed during the sprint, and the development team for the current sprint is determined.
2. Implementation: Code for the required functionality is written. Ideally, multiple processes occur in parallel, such as developers writing code while testers simultaneously test the application.
3. Release: The implemented functionality is deployed, making it visible to the end user. To enhance release quality, a release management process is recommended, which includes maintaining a reference software library and a stock of accessories and documentation for quick hardware issue resolution. Implementing release management allows for:
    - Making changes to the IT environment without compromising service quality.
    - Reducing incidents caused by the incompatibility of new systems with existing hardware and software.
    - Thoroughly testing new IT solutions to identify and prevent potential user issues.
    - Reducing the number of uncontrolled software versions in the IT environment, thereby mitigating risks associated with unlicensed software.
    - Preventing the loss of original software files [17].
4. Retrospective: The team reviews the sprint and addresses encountered issues, focusing on improving performance in the next sprint.

In summary, the continuous improvement method using BI for SaaS applications does not impose specific technical support requirements. It is not tied to any programming language, server-side application requirements, or Database Management System (DBMS) [14].

VI. ANALYSIS OF THE RESULTS OF THE IMPLEMENTED CHANGES

The analysis of results following the implementation of changes is a critical phase that commences after a designated period, allowing for a comprehensive evaluation of whether the issues have been effectively addressed and whether service efficiency has improved. This phase is designed to operate independently and in parallel with other stages of the CSI framework. Determining the optimal timing for this analytical process rests with the project manager, who must consider variables such as the application's domain, the magnitude and scope of the changes, and the number of users affected.

In the context of SaaS, this phased approach is particularly vital, as it enables a rigorous assessment of change effectiveness through a sufficiently representative sample for analysis. This necessity underscores the importance of continuous analytical monitoring of user responses and behavior post-implementation. The methods employed to analyze post-implementation results often mirror those originally applied during the initial evaluation of the service organization [19]. Specifically, the same performance indicators identified during the baseline analysis are retained, complemented by data from the post-change sample. Should the analysis reveal an improvement in the relevant metrics, a comprehensive service analysis is conducted, similar to the initial phase. Conversely, if the system's efficiency remains unchanged, it can be concluded that the issue has been satisfactorily resolved. However, if challenges persist, further investigative measures must be deployed to address the underlying problems. While the goal is to consistently enhance IT service efficiency, it is essential to acknowledge that certain constraints, often arising from specific module characteristics, may inhibit achieving this objective.

From a technical perspective, the analysis phase typically begins with the construction of an Online Analytical Processing (OLAP) cube. In instances where developers have modified the database, including data previously encompassed within the OLAP cube, an Extract, Transform, and Load (ETL) tool becomes essential. This tool facilitates the transformation of the data into its current state before the re-establishment of the OLAP cube and subsequent analytical monitoring efforts. Notably, at this juncture, the CSI cycle re-engages with its foundational assessment processes. This stage of analysis is particularly salient following the release of a new iteration of the IT service. As the results are analyzed, it is crucial to reassess the overall system and identify emerging problems that may have surfaced during the release cycle. However, newly implemented features should be excluded from this review, as their relatively small sample size may not yield conclusive insight.

This iterative process epitomizes the continuous improvement cycle, in which each new product version necessitates a diligent reassessment of the current service state, allowing the identification of any persisting issues, specifically excluding those linked to the most recent functionalities. Such a structured approach is vital in fostering a culture of continual service enhancement within the IT sector [20]. In essence, the systematic analysis of outcomes from implemented changes not only reinforces service improvement initiatives but also enhances overall user satisfaction and operational efficiency. By adhering to these principles, organizations can cultivate an environment conducive to continuous growth and refinement [21-23]. The pseudocode below demonstrates the enhancement of organizational services using BI tools.

```
BEGIN EnhancementProcess
1:  Start Enhancement Process
    InitiateEnhancementProcess()
2:  Analyze Current State
    data=GatherDataOnServicesAndMetrics()
    assessData(data)
    FocusOnKeyPerformanceIndicators(data)
3:  Identify Root Causes of Issues
    causes = IdentifyRootCauses(data)
    ApplyAnalysisMethods(causes)
4:  Formulate Requirements Based on Causes
    and Needs
    requirements =
    DefineRequirements(causes,
    organizationalNeeds)
5:  Elaborate on Execution Processes
    ClarifyExecutionProcesses(
    previousSteps)
    OutlineStakeholder_
    _RolesAndResponsibilities()
    IncorporateFeedbackLoops()
6:  Develop System Components
    components =
    DesignAndCreateComponents(requirements)
7:  Implement Changes to the System
    ImplementChanges(components)
    DocumentProcess()
    CommunicateModificationsToStakeholders()
8:  Capture and Troubleshoot Issues
    feedback =
    aptureUserIssuesPostImplementation()
    TroubleshootIssues(feedback)
9:  Evaluate the Outcomes of Changes
    effectiveness =
    EvaluateChanges(successCriteria,
    evaluationTools)
10: Define or Update Success Criteria
    UpdateOrRedefineSuccessCriteria(
    effectiveness)
    AddressLessonsLearned()
11: Establish Continuous Data
    Collection
    SetupContinuousDataCollectionSystem()
12: Iterate Enhancement Process
    for Continuous Improvement
      IterateEnhancementProcess()
13: Conclude the Process and Explore
    Future Opportunities
    ConcludeProcess()
    ConsiderFutureOpportunities()
END EnhancementProcess
```

VII. RESULTS AND DISCUSSION

The findings of this study offer valuable insight into enhancing organizational services through the strategic application of BI tools. This study introduced a cohesive and simplified framework designed to effectively address the objectives laid out during the research phase. This framework not only addresses immediate tasks but also aligns with the overarching goal of improving organizational efficiency and responsiveness. A key element of this research is the proposed integrated solution that leverages advanced BI tools to optimize company services. By harnessing the power of data analytics and decision-making support systems, organizations can significantly enhance operational performance and strategic insights. Furthermore, this study features a comprehensive data flow diagram that is instrumental in guiding the selection of the most appropriate agile processes for project execution. This diagram serves as a visual representation of data movement and process interaction, facilitating a clearer understanding of workflows and aiding in the identification of bottlenecks or inefficiencies. In addition to theoretical contributions, this research includes practical applications through the partial development and implementation of a system within the organizational context. This real-world application demonstrates the feasibility and utility of the proposed solutions, ultimately reinforcing the relevance of business intelligence in operational decision-making.

The findings align with previous research, especially the studies in [2] and [6], contributing to the existing body of knowledge in this domain. This consistency underscores the validity of the results and their applicability across different contexts within the field. The scientific contribution of this study is twofold: it provides a detailed examination of how BI shapes organizational development strategies and introduces a robust framework specifically aimed at service enhancement. In summarizing the impact of BI tools on service improvement, this research offers a significant step forward in understanding the strategic role of data-driven decision-making in advancing organizational objectives.

VIII. CONCLUSION

This study presents a novel method for the continuous improvement of SaaS services by integrating BI technology with SCRUM as the development method. The method follows a comprehensive process that includes service state analysis, bottleneck identification, cause investigation, and systematic improvement, leading to measurable improvements in service quality, operational efficiency, and cost management. The practical application within a company leads to improvements in training manuals, requirement formulation, and enhanced personnel performance. This work contributes to the field by offering a unique framework that combines BI and Scrum to drive continuous improvement in the SaaS industry, demonstrating clear benefits in terms of service delivery and competitiveness. Furthermore, the study suggests the integration of data mining technologies to enhance insights into service states, further improving bottleneck analysis and enabling sustained business success. This innovative approach not only enhances the adaptability of organizations to changing business environments but also provides a practical methodology for organizations seeking to optimize their operations in the dynamic SaaS market.

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