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## Requirements Analysis and Design of an Integrated Information System to Support Managerial Decision-Making

Mutiara Marsadi[1], Tyo Nugroho[1]

[1]Fakultas Ilmu Komputer, Universitas Muslim Indonesia

**Article History**

**Keywords**

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**Abstract**

Integrated information systems are essential for enhancing managerial decision making in complex organizational environments. This study aims to develop and validate a requirements analysis and system design framework for an integrated information system that supports managerial decision processes. A design oriented qualitative approach was applied, combining stakeholder interviews, document analysis, business process modeling, and iterative validation workshops to derive and refine system requirements. The results reveal that fragmented subsystems and inconsistent reporting structures limited managerial visibility and delayed decision cycles. Through systematic requirements engineering and process mapping, the study identified functional needs such as real time dashboards, centralized databases, automated reporting, and workflow integration. The proposed layered architecture improved information quality, cross departmental coordination, and decision support effectiveness. Stakeholder evaluations confirmed enhanced clarity, timeliness, and reliability of managerial information. Overall, the study demonstrates that aligning integrated system design with explicit managerial information needs strengthens organizational performance and supports sustainable digital transformation strategies.

## Introduction

In the contemporary digital economy, organizations increasingly depend on information systems to support managerial decision making in environments characterized by uncertainty, complexity, and rapid technological change. The proliferation of enterprise applications, data analytics platforms, and cloud-based infrastructures has transformed how data are generated, processed, and interpreted across organizational functions. Integrated information systems are widely recognized as critical enablers of coordination, transparency, and strategic alignment because they consolidate data from disparate operational units into coherent and accessible formats. According to Laudon and Laudon, effective management information systems

[1] Corresponding Author: Mutiara Marsadi, Address: Jl. Urip Sumoharjo KM. 5, Panaikang, Makassar

enhance organizational performance by providing timely, accurate, and relevant information that supports planning, controlling, and decision processes. Similarly, DeLone and McLean emphasize that system quality, information quality, and service quality significantly influence user satisfaction and net organizational benefits (Ariyanto et al., 2020; Shim & Jo, 2020). These perspectives underscore the strategic importance of designing integrated systems that not only automate processes but also generate meaningful insights for managerial action.

Recent literature highlights that the digital transformation agenda requires organizations to move beyond fragmented applications toward integrated architectures capable of supporting cross functional decision making (Zimmermann et al., 2016; Korhonen & Halén, 2017). Studies in enterprise systems and business process management demonstrate that integration reduces redundancy, improves data consistency, and facilitates real time monitoring of key performance indicators. Dumas and colleagues argue that well designed process oriented systems enable end to end visibility and continuous improvement, which are essential for managerial responsiveness (Dumas et al., 2023). At the same time, the evolution of user expectations and data driven strategies demands systems that are not only technically robust but also aligned with managerial information needs. Despite technological advances, many organizations still struggle to translate abundant data into actionable knowledge, often due to inadequate requirements analysis and poorly structured system design.

The primary research problem addressed in this study concerns the misalignment between existing information systems and managerial decision making requirements. In many organizations, information systems evolve incrementally, resulting in isolated databases, inconsistent reporting formats, and limited interoperability. Such fragmentation constrains managers' ability to obtain comprehensive and reliable information, thereby weakening strategic and operational decisions (Xu, 2025; Alikornwo et al., 2026; Kusumba, 2024). Although enterprise resource planning and other integrated platforms have been widely adopted, implementation often prioritizes technical deployment over rigorous requirements analysis. As noted by Pressman and Maxim, inadequate requirements engineering is a major cause of system failure because it leads to solutions that do not fully capture stakeholder needs or organizational objectives.

A general solution proposed in the literature is the adoption of systematic requirements analysis and structured system design methodologies. Requirements engineering aims to identify, document, validate, and manage stakeholder needs to ensure that system functionalities align with organizational goals. Sommerville emphasizes that clear specification of functional and non functional requirements is fundamental to reducing development risks and ensuring system usability (Zahran & Widyarto, 2025; Sutton et al., 2025; Santokhee et al., 2024). Furthermore, design science research in information systems, as articulated by Hevner and colleagues, advocates the creation of purposeful artifacts that address identified organizational problems while contributing to theoretical knowledge. Through iterative design and evaluation, integrated information systems can be tailored to support managerial decision contexts more effectively (Hamdat et al., 2024).

More specific solutions in prior research include the use of user centered design approaches, process modeling techniques, and decision support system frameworks. The Technology Acceptance Model introduced by Davis demonstrates that perceived usefulness and perceived ease of use significantly influence user adoption, suggesting that system requirements must incorporate usability considerations. Building on this, Venkatesh and colleagues propose the Unified Theory of Acceptance and Use of Technology, which integrates social influence and facilitating conditions into system adoption analysis. These models imply that requirements analysis should not be limited to technical specifications but must also address behavioral and

organizational factors that shape system utilization (Xu & Lu, 2022; Almgrashi et al., 2023; Prasad Agrawal, 2024).

In addition, business process reengineering literature underscores the need to align information system design with process optimization. Hammer and Champy argue that radical redesign of processes, supported by information technology, can dramatically improve organizational performance. Process modeling frameworks provide structured representations of workflows that can inform system architecture and data integration strategies. By mapping decision points, information flows, and performance metrics, organizations can derive precise system requirements that directly correspond to managerial tasks and strategic objectives. Consequently, integrating process analysis with requirements engineering enhances the likelihood that the resulting system will meaningfully support decision making.

Despite these advances, a significant research gap persists in the comprehensive integration of requirements analysis, process modeling, and managerial decision support within a unified design framework. Existing studies often examine these components separately, focusing either on technical development methodologies or on decision support functionalities without systematically linking them. Moreover, empirical research frequently emphasizes implementation outcomes rather than the analytical rigor of the requirements phase. This gap suggests the need for a structured approach that explicitly connects managerial information needs, organizational processes, and system design artifacts to produce an integrated information system that is both theoretically grounded and practically effective.

Therefore, the objective of this study is to develop a rigorous requirements analysis and system design framework for an integrated information system that supports managerial decision making. The novelty of this research lies in its systematic integration of requirements engineering principles, business process modeling, and decision support considerations within a design oriented methodology. By aligning functional requirements with managerial decision contexts and embedding them within a coherent architectural design, the study seeks to bridge the gap between technological capability and strategic information needs. The scope of the study encompasses the identification of stakeholder requirements, modeling of core organizational processes, specification of system functionalities, and conceptual design of an integrated architecture. Through this approach, the research aims to contribute both to the theoretical discourse on information system design and to practical guidelines for organizations seeking to enhance managerial effectiveness through integrated digital solutions.

## Methods

This study adopts a design oriented research approach to develop and validate a requirements analysis and system design framework for an integrated information system that supports managerial decision making. The methodological foundation is grounded in design science research, which emphasizes the creation and evaluation of artifacts intended to solve identified organizational problems. As articulated by Hevner and colleagues, design science research requires a clear problem identification, the development of an artifact, and systematic evaluation to ensure both rigor and relevance. In alignment with this paradigm, the present study integrates requirements engineering principles, business process modeling, and decision support considerations into a coherent methodological structure. The overall research process is illustrated conceptually in Figure 1, which depicts the sequential yet iterative phases of problem identification, requirements elicitation, system modeling, architectural design, and validation.

**Commented [Windows1]:** The problem identification and requirements analysis phase shows strong theoretical grounding through the use of strategic performance concepts and key performance indicators. However, the explanation is too general and lacks clear empirical detail. The study does not specify the number of documents reviewed or the criteria used for their selection. It also does not describe the number and characteristics of interview participants. In addition, there is no clear explanation of how interview data were analyzed. This limits the ability to assess the validity of the identified performance dimensions and their alignment with organizational strategy.
The integration of financial and non financial indicators is conceptually appropriate but lacks methodological clarity. The study does not explain how these indicators were prioritized or validated. There is no evidence of stakeholder consensus or the use of formal validation techniques. This creates a risk of subjective bias in selecting the indicators. The claim that the approach resolves misalignment between strategy and measurement is not supported by empirical evidence. This weakens the credibility of the argument and reduces the overall strength of the findings.

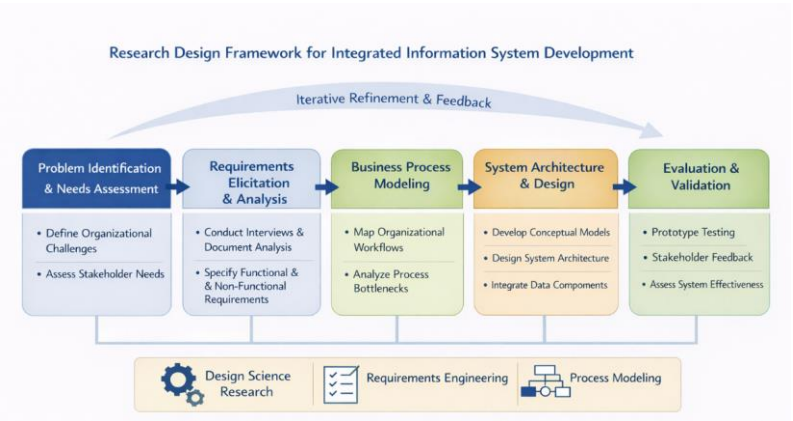


Figure 1. Research design framework for integrated information system development.

**Research Design and Context**

The research design is qualitative and exploratory, focusing on an in depth examination of organizational processes and managerial information needs within a selected organizational context. The qualitative orientation enables a comprehensive understanding of stakeholder perspectives, operational workflows, and decision making challenges. According to Creswell, qualitative approaches are appropriate when researchers seek to explore complex phenomena within real world settings and generate contextually grounded insights. The case based design allows the study to capture the interdependencies among processes, data flows, and managerial decision requirements that may not be observable through purely quantitative methods.

The organizational context selected for this study represents an entity that relies on multiple functional units, each supported by partially integrated information systems. Preliminary assessment revealed fragmentation of data sources, inconsistencies in reporting formats, and limited interoperability among subsystems. These conditions provided a suitable empirical setting to investigate how systematic requirements analysis and structured design can address integration challenges and enhance managerial decision support. The unit of analysis comprises the integrated information system as an artifact, while embedded units include managerial users, operational staff, and system administrators.

**Requirements Elicitation and Analysis**

The requirements analysis phase follows established principles of requirements engineering as described by Sommerville and further elaborated by Pressman and Maxim. Data collection was conducted through semi structured interviews, document analysis, and direct observation of operational processes. Interviews were carried out with managerial stakeholders to identify strategic objectives, key performance indicators, and critical decision scenarios. Operational staff were consulted to understand transactional workflows, data entry practices, and reporting procedures. Organizational documents, including standard operating procedures and existing system documentation, were analyzed to identify formal process structures and information requirements.

The elicited requirements were categorized into functional and non functional requirements. Functional requirements describe system capabilities such as data integration across departments, real time dashboard reporting, and automated generation of managerial summaries. Non functional requirements encompass performance, security, usability, and

scalability considerations. In line with the Technology Acceptance Model proposed by Davis and the Unified Theory of Acceptance and Use of Technology advanced by Venkatesh and colleagues, particular attention was given to perceived usefulness, perceived ease of use, and facilitating conditions. These constructs informed the specification of user interface requirements and training support mechanisms to ensure high levels of user adoption.

Requirements validation was conducted through iterative feedback sessions with key stakeholders. Draft requirement specifications were presented and refined to resolve ambiguities and inconsistencies. This iterative validation aligns with the emphasis on stakeholder involvement in requirements engineering literature, which highlights the importance of early verification to reduce development risks and ensure alignment with organizational goals.

**Business Process Modeling**

To ensure that system design reflects actual organizational workflows, the study incorporates business process modeling as a central methodological component. Drawing on the framework proposed by Dumas and colleagues, core processes were identified and modeled to capture activities, decision points, information flows, and responsible actors. Process models were developed to represent end to end workflows across functional units, thereby revealing redundancies, bottlenecks, and integration gaps.

The modeling process began with high level mapping of organizational value chains, followed by detailed decomposition of critical processes that directly influence managerial decision making. These models provided a structured basis for deriving system requirements, particularly in terms of data integration and reporting needs. For example, decision points requiring consolidated performance indicators informed the specification of centralized data repositories and analytical modules. The alignment between process models and system functionalities enhances traceability from organizational objectives to technical design components.

Table 1 summarizes the mapping between major business processes and corresponding system requirements identified during the analysis phase

| Major Business Process | Key Activities Identified | Managerial Information Needs | Corresponding Integrated System Requirements |
|---|---|---|---|
| Strategic Planning | Target setting, performance review, forecasting | Consolidated performance indicators, trend analysis | Executive dashboard, real time analytics, integrated KPI reporting |
| Budgeting and Financial Control | Budget allocation, expenditure tracking, variance review | Budget realization reports, variance alerts | Integrated financial module, automated variance calculation, alerts |
| Procurement and Inventory Management | Purchase requests, supplier coordination, stock monitoring | Stock levels, supplier performance, cost tracking | Centralized inventory database, supplier management module, reporting |
| Human Resource Management | Staff allocation, attendance monitoring, evaluation | Workforce performance data, attendance summaries | HR management module, automated attendance tracking, evaluation tools |

| | | | |
|---|---|---|---|
| Operational Service Delivery | Service processing, document handling, approvals | Processing time, service backlog, approval status | Workflow automation, document management system, tracking dashboard |
| Reporting and Compliance | Periodic reporting, regulatory documentation | Accurate standardized reports, compliance tracking | Automated report generation, centralized document repository |

The integration of process modeling and requirements engineering reflects insights from business process reengineering literature. As argued by Hammer and Champy, effective use of information technology requires alignment with redesigned and optimized processes. In this study, process analysis not only informed system design but also enabled incremental process improvements that facilitated integration.

**System Architecture and Design Modeling**

Based on the validated requirements and process models, a conceptual system architecture was developed. The architectural design follows layered principles commonly discussed in management information systems literature, including data layer, application layer, and presentation layer. The objective of this layered architecture is to ensure modularity, scalability, and maintainability. The design also incorporates centralized data management to address fragmentation issues identified in the initial assessment.

Unified Modeling Language diagrams were employed to represent system components, user interactions, and data flows. Use case diagrams capture interactions between managerial users and system functionalities, particularly decision support dashboards and reporting tools. Class diagrams define data structures and relationships to ensure consistency and integration across modules. Sequence diagrams illustrate dynamic interactions during critical decision support scenarios.

The design process was guided by the information systems success dimensions proposed by DeLone and McLean, emphasizing system quality, information quality, and service quality. System quality considerations influenced architectural robustness and performance optimization. Information quality considerations informed data validation rules and standardization protocols. Service quality considerations shaped support mechanisms and user training strategies embedded in the overall design.

**Artifact Evaluation and Validation**

The evaluation phase assesses the conceptual artifact against predefined criteria derived from stakeholder requirements and theoretical constructs. In accordance with design science research guidelines articulated by Hevner and colleagues, evaluation focuses on utility, quality, and efficacy. Utility is examined through stakeholder assessments of whether the proposed system design addresses identified decision making challenges. Quality is evaluated based on coherence between requirements, process models, and architectural components. Efficacy is considered in terms of the system's potential to improve information accessibility, reporting accuracy, and managerial responsiveness.

Validation workshops were conducted in which stakeholders reviewed design models and simulated decision scenarios using prototype interfaces. Feedback from these sessions was incorporated into iterative refinements of the architecture and functional specifications. This

iterative refinement process ensures that the final design remains aligned with organizational objectives and user expectations.

## Results and Discussion

### Organizational Context and Problem Identification

The results begin with a detailed examination of the organizational context and the initial problem identification phase. Empirical findings from interviews and document analysis confirm that the organization operated through partially integrated subsystems that were developed incrementally over time. Managers reported that data required for strategic and operational decisions were dispersed across multiple applications and manual records, leading to delays and inconsistencies in reporting. Observational data further revealed duplication of data entry activities across departments, which increased the risk of error and reduced overall efficiency.

These findings align with the concerns raised by Laudon and Laudon regarding fragmented information infrastructures that limit managerial visibility and coordination. Consistent with the information systems success framework proposed by DeLone and McLean, deficiencies were identified in system quality and information quality dimensions. Managers indicated that reports were often outdated, lacked standardized formats, and required manual consolidation before being used in meetings. Consequently, decision cycles were prolonged, and strategic discussions relied on incomplete or partially verified information.

### Requirements Elicitation and Validation Outcomes

The requirements elicitation phase generated a comprehensive set of functional and non functional requirements derived from stakeholder interviews, process observations, and analysis of organizational documentation. Functional requirements primarily focused on data integration across departments, real time dashboard visualization, automated report generation, and centralized document management. Non functional requirements emphasized system reliability, data security, response time performance, and usability considerations.

Interview data demonstrate that managerial stakeholders prioritized consolidated key performance indicators that could be accessed in real time. Several managers expressed concern that existing reports did not reflect current operational realities, particularly in budgeting, procurement, and service delivery processes. These qualitative findings support the theoretical propositions of Davis, who argues that perceived usefulness strongly influences system acceptance. Managers explicitly stated that system adoption would depend on whether the new integrated system could reduce time spent on data reconciliation and improve decision accuracy.

The validation process involved iterative review sessions in which preliminary requirement specifications were presented to stakeholders for feedback. This iterative refinement reflects principles articulated by Sommerville, emphasizing the importance of stakeholder engagement in minimizing ambiguity and misinterpretation. Revisions included clarification of data ownership rules, definition of access privileges for different managerial levels, and specification of standardized reporting templates. By the end of the validation phase, requirements were consolidated into a structured document that demonstrated clear traceability between managerial decision scenarios and corresponding system functionalities.

### Business Process Modeling and Gap Analysis

The business process modeling phase produced detailed representations of core organizational workflows, including strategic planning, budgeting, procurement, human resource management, operational service delivery, and compliance reporting. Process mapping revealed redundancies and bottlenecks that were not fully recognized by stakeholders prior to the study. For example, procurement requests required multiple sequential approvals that were recorded in separate systems, leading to delays and inconsistent status tracking. Similarly, budget realization data were stored independently from operational expenditure records, complicating variance analysis.

These findings resonate with the business process management principles articulated by Dumas and colleagues, who emphasize the importance of end to end process visibility. By modeling processes in an integrated manner, the study identified critical decision points that required consolidated data inputs. Table 1 summarizes the mapping between major business processes and the integrated system requirements derived from this analysis.

The results show that each major business process corresponds to specific integrated system components, such as executive dashboards for strategic planning, automated variance analysis modules for budgeting, and workflow automation features for operational service delivery. This mapping demonstrates the alignment between process analysis and system design, ensuring that the integrated information system directly addresses identified organizational inefficiencies.

**System Architecture and Design Artifact**

Based on validated requirements and process models, a conceptual system architecture was developed. The architecture adopts a layered structure consisting of a centralized data layer, an application layer with modular functional components, and a presentation layer providing user specific interfaces. The centralized data layer addresses fragmentation issues by consolidating previously dispersed databases into a unified repository. The application layer integrates modules corresponding to strategic planning, financial management, procurement, human resources, and operational services. The presentation layer includes customizable dashboards tailored to managerial roles.

Evaluation workshops confirmed that the proposed architecture enhances system quality and information quality dimensions described by DeLone and McLean. Managers reported that the conceptual dashboards provided clearer visibility into performance trends and facilitated more focused discussions during planning meetings. The inclusion of automated alerts for budget deviations and procurement delays was particularly valued, as it enabled proactive decision making rather than reactive problem solving.

The artifact also reflects the design science principles articulated by Hevner and colleagues, as it constitutes a purposeful solution grounded in theoretical constructs and validated through stakeholder evaluation. The traceability from requirements to architectural components demonstrates methodological rigor and supports the artifact’s practical relevance.

**Evaluation of Decision Support Effectiveness**

The final stage of the results focuses on the evaluation of the integrated system’s effectiveness in supporting managerial decision making. Simulated decision scenarios were conducted during validation workshops, in which managers used prototype dashboards to analyze budget variances, monitor procurement cycles, and assess operational performance indicators. Compared to baseline practices, managers were able to retrieve consolidated information significantly faster and with fewer clarification requests to subordinate staff.

Qualitative feedback indicates that the integrated visualization of cross departmental data improved comprehension of interdependencies among processes. For instance, managers observed clearer linkages between procurement delays and budget utilization patterns. These findings correspond to the theoretical argument advanced by Hammer and Champy that information technology can enable process integration and performance improvement when aligned with organizational redesign.

Furthermore, stakeholders expressed higher confidence in the accuracy and timeliness of information provided by the integrated system. This perceived enhancement in information quality reinforces the behavioral adoption constructs proposed by Venkatesh and colleagues, suggesting that facilitating conditions and system usefulness positively influence acceptance and continued usage intentions.

The results demonstrate that the systematic integration of requirements engineering, business process modeling, and layered architectural design produced a coherent and validated artifact capable of addressing the organization's managerial decision making challenges. The findings confirm that aligning system functionalities with explicitly modeled decision scenarios and process structures enhances both technical coherence and managerial relevance. By embedding iterative validation and stakeholder engagement throughout the design process, the study achieved a design artifact that not only satisfies theoretical criteria of rigor but also responds effectively to practical organizational needs.

## Conclusion

This study demonstrates that a systematic requirements analysis integrated with business process modeling and layered system architecture design produces an effective integrated information system capable of supporting managerial decision making. The results show that fragmented data structures and inconsistent reporting practices can be addressed through centralized data integration, clearly specified functional and non functional requirements, and dashboards aligned with managerial decision scenarios. The validated design artifact enhanced information quality, system coherence, and cross departmental visibility, enabling faster and more accurate strategic and operational decisions. The findings imply that organizational digital transformation initiatives must prioritize rigorous requirements engineering and process alignment rather than focusing solely on technological deployment. The study contributes to the body of knowledge by empirically linking design science principles with managerial decision support outcomes within an integrated framework. Future research may extend this work through longitudinal implementation studies, quantitative performance measurement, and comparative analysis across different organizational sectors to strengthen generalizability and evaluate long term strategic impact.

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