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# A Qualitative Elicitation and MoSCoW Prioritization Approach for Academic Information System Development in Health Higher Education

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## **Keywords**

*requirements engineering; requirements elicitation; requirements prioritization; academic information system; higher education;*

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## **Abstract**

Academic Information Systems are essential for supporting curriculum management, assessment, scheduling, and reporting in higher-education institutions. Many small health institutions continue to manage these activities manually, which creates inconsistencies in grading, scheduling conflicts, and delays in national reporting. This study examines how software requirements can be elicited and prioritized for a new Academic Information System in a health higher-education context. A qualitative case study was conducted at STIKES Pemkab Jombang using stakeholder interviews and document analysis. The data were interpreted into structured requirements and prioritized with the MoSCoW method. The process yielded 52 requirements classified into 23 Must-Have, 16 Should-Have, 11 Could-Have, and 2 Won't-Have items. The results highlight the central role of dependency analysis, regulatory demands, and institutional readiness in determining priority levels. The study contributes a systematic pathway for transforming qualitative input into a prioritized requirement set suitable for phased implementation in low-resource environments. It also identifies the need for further work on full specification and architectural modeling. The findings provide a foundation for developing a complete software requirements specification in future research.

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## **1. Introduction**

Higher-education institutions depend on reliable academic administration to support curriculum delivery, assessment, scheduling, and student reporting. Many small institutions, including those focused on health education, continue to manage these activities manually. Manual workflows frequently create inconsistencies in grading practices, scheduling conflicts, delays in reporting, and limited access to academic information for students. These issues are often amplified in health programs due to competency requirements, structured clinical practice schedules, and strict national reporting obligations.

The institution examined in this study is STIKES Pemkab Jombang, a health higher-education institution that offers professional and academic programs in the health domain. The institution manages curriculum planning, assessment, course registration, attendance, and academic reporting without the support of a dedicated Academic Information System. All academic data are processed manually, and official reporting to the national

PDDIKTI database is performed through Neo Feeder using repeated manual entry. The institution also has limited information technology resources, which restricts its ability to implement large-scale digital initiatives.

Developing an Academic Information System is therefore an essential step for improving institutional reliability. However, institutions with limited digital readiness cannot deploy all system functions at once. They require a systematic process to identify stakeholder needs, refine those needs into structured requirements, and determine the sequence in which functions should be implemented. The absence of a digital baseline increases the complexity of this process because workflows must first be documented and interpreted before they can be translated into software requirements.

Requirement engineering in this context is further shaped by the diversity of stakeholder roles. Academic leaders focus on governance and compliance, program heads oversee curriculum and instruction, lecturers manage grading and course operations, students depend on timely academic information, and IT staff maintain technical infrastructure. Their perspectives generate a large set of raw statements that require interpretation, consolidation, and prioritization.

Research on requirement prioritization has examined diverse techniques in educational and organizational settings, yet studies focusing on health higher-education institutions remain limited. These institutions operate under contextual conditions that differ from general higher education, including competency-based learning structures, clinical fieldwork, interdependent scheduling, and mandatory integration with national reporting systems. Understanding how requirements can be elicited and prioritized under these conditions remains an open question.

This study addresses that gap by applying a structured qualitative approach to elicit and prioritize software requirements for an Academic Information System in STIKES Pemkab Jombang. The research integrates stakeholder interviews, document analysis, requirement refinement, and prioritization using an established decision model. The study makes three contributions. First, it demonstrates how qualitative input from diverse stakeholder groups can be converted into structured requirements. Second, it presents a prioritized requirement set that reflects operational dependencies, regulatory constraints, and institutional readiness. Third, it proposes a methodological pathway that can support similar institutions in early-stage digital transformation. These contributions form the groundwork for future research that will develop a complete software requirements specification and link priority decisions to system design and implementation strategies.

### **1.1 Literature Review**

Requirement engineering literature emphasizes four core activities: stakeholder identification, elicitation, interpretation, and prioritization. These activities are particularly important in organizations with inconsistent or undocumented workflows. Qualitative methods such as interviews, observations, and document analysis have been shown to capture contextualized requirements effectively in higher education settings (Razali & Anwar, 2011; Mulla & Girase, 2012). Recent studies highlight that stakeholder engagement quality directly affects completeness and traceability. Agile-oriented approaches adapted for academic administration have also demonstrated improved alignment between user needs and institutional priorities (Tam et al., 2022; Prasetyo, 2018).

Stakeholder prioritization is widely recognized as a mechanism for managing conflicting interests. Fuzzy-based stakeholder ranking models have shown improvements in communication clarity and redundancy reduction (Majumdar et al., 2014). More recent digital transformation research highlights the need for structured stakeholder prioritization to support strategic alignment in higher education institutions (Osorio et al., 2024).

Multiple prioritization techniques are used in software engineering. MoSCoW is frequently adopted because of its simplicity and suitability for collaborative environments. However, classical MoSCoW may struggle with ambiguous stakeholder preferences. Extensions such as Fuzzy\_MoSCoW help address linguistic uncertainty and improve decision stability (Ahmad et al., 2017). Hybrid approaches such as OurRank have also emerged,

integrating expert judgment, qualitative assessment, and cost-benefit considerations to support balanced prioritization outcomes (Rojas et al., 2022).

Research on agile and iterative prioritization emphasizes the importance of understanding requirement dependencies and contextual risks. Large-scale studies show that dependency management often outweighs business value as a prioritization factor (Daneva et al., 2013). Similar findings in Indonesian higher-education systems suggest that agile adaptations can increase responsiveness to dynamic academic workflows (Tam et al., 2022; Prasetyo, 2018).

Academic Information System development frequently faces challenges related to scheduling automation, assessment standardization, curriculum alignment, and national reporting integration. Prior research highlights the need to reconcile formal standards with operational realities in higher education (Majumdar et al., 2014). Broader digital transformation studies reinforce that successful implementation depends on leadership commitment, data-informed decisions, and effective stakeholder involvement (Díaz-García et al., 2023). Emerging perspectives, including Industry 5.0 principles, call for balancing technological innovation with human-centered priorities in digital health education (Pang et al., 2023).

In health education specifically, system development must account for regulatory complexity and competency-based models. Foundational work argues that digital transformation in medical and health education must strengthen the alignment between educational systems and health system needs (Frenk et al., 2010). Recent research underscores the value of phased, human-centered system adoption strategies that maintain institutional resilience during transitions (Cassidy & Sklar, 2024).

Collectively, the literature indicates that effective requirement engineering in higher education relies on context-sensitive elicitation, structured stakeholder prioritization, and adaptive decision-making frameworks. These insights justify the use of qualitative elicitation and MoSCoW prioritization in this study, particularly for institutions operating with limited resources and complex regulatory obligations.

## 2. Research Methods

This study used a qualitative case study approach to capture and prioritize software requirements for a new Academic Information System (AIS) in a health higher-education institution. The institution operated all core academic workflows manually, which required a systematic process to document stakeholder needs and guide phased system development. The overall methodological workflow is presented in Figure 1.

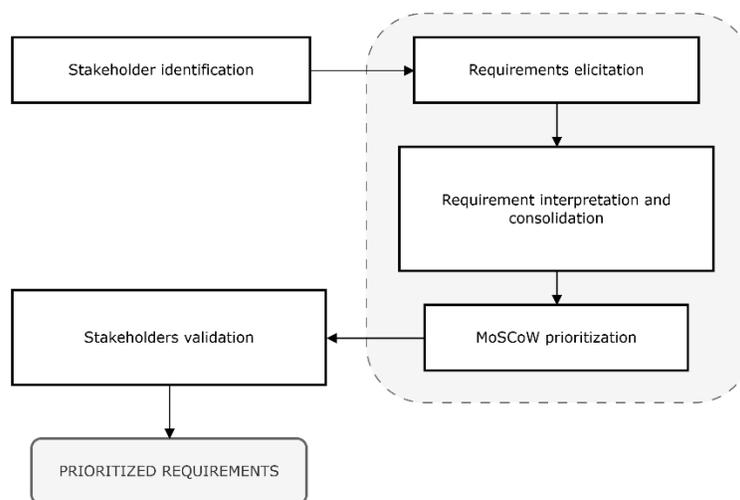


Fig. 1 Research Workflow

Stakeholder identification was conducted first to ensure comprehensive coverage of academic operations. Six stakeholder groups were mapped: Vice Chair I, Vice Chair II, program heads, lecturers, students, and IT staff. Each group held distinct responsibilities related to curriculum, scheduling, assessment, registration, or infrastructure. Their roles and expected contributions to elicitation are summarized in Table 1.

*Table 1. Stakeholders in Requirements Elicitation*

<b>Stakeholder</b>	<b>Role in Academic</b>	<b>Contribution to Elicitation</b>
Vice Chair I (Academic)	Oversees curriculum structure, course planning, academic regulations	Provides requirements related to curriculum, CPL and CPMK alignment, scheduling constraints
Vice Chair II (Infrastructure)	Manages information systems, IT infrastructure, Neo Feeder operations	Provides requirements related to assessment schema, PDDIKTI reporting, system integration feasibility
Program Heads	Manage program-level academic operations	Contribute needs related to RPS structure, course offering, academic advisement
Lecturers	Deliver teaching, grading, and KRS validation	Provide requirements related to grade entry, class management, KRS validation workflow
Students	Primary users of academic services (KRS, attendance, grades)	Contribute insights on usability, scheduling needs, transparency of academic information
IT Staff	Operate and maintain internal systems	Provide technical requirements on database structure, server capacity, backup and recovery mechanisms

Requirements were elicited through semi-structured interviews and document analysis. Interviews explored daily academic activities, operational issues, and expectations for digitization. Document analysis reviewed curriculum guidelines, academic regulations, RPS templates, and PDDIKTI reporting procedures. Combining these sources improved the consistency and credibility of the collected information.

Raw statements were then interpreted into structured functional or non-functional requirements. Redundant or ambiguous items were consolidated or clarified through brief follow-ups. This step ensured consistent terminology while maintaining traceability to the original stakeholder input.

Prioritization used the MoSCoW method. Requirements were categorized as Must, Should, Could, or Won't based on their regulatory relevance, operational impact, dependency relationships, and feasibility under resource constraints. This approach aligned with the institution's need for incremental implementation and collaborative decision-making.

Validation was performed through review sessions with Vice Chair I, Vice Chair II, and IT staff. They assessed completeness, correctness, and alignment with institutional policies. Priority adjustments were made when conflicts or overlooked dependencies were identified. This iterative validation strengthened the reliability of the final prioritized requirement set.

### **3. Result and Discussion**

The elicitation process produced 52 candidate requirements across curriculum management, scheduling, assessment, student services, and institutional reporting. These requirements reflected both formal academic procedures and the practical constraints of a fully manual environment. The diversity of needs also illustrated the operational complexity of higher education, where competency-based learning, structured clinical practice, and strict reporting obligations shape day-to-day academic workflows.

The MoSCoW prioritization resulted in a clear distribution of criticality levels. Twenty-three requirements were classified as Must-Have, sixteen as Should-Have, eleven as Could-Have, and two as Won't-Have. This distribution, presented in Figure 2, shows a strong concentration of essential functionality required to support academic continuity and regulatory compliance. Must-level items focused on curriculum integrity, grading consistency, scheduling accuracy, and the synchronization of data with national reporting systems. These areas carry the highest institutional risk because they affect both academic governance and external accountability.

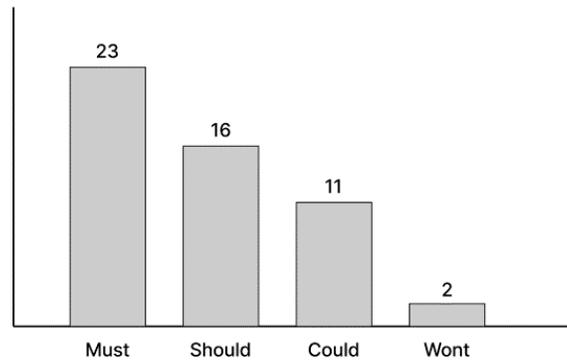


Fig. 2 MoSCoW Requirements Distribution

Dependencies were a major factor in assigning Must-level priorities. For example, the requirement for configurable assessment weightings arose from inconsistent grading practices, which affected transcript generation and official reporting. Automated scheduling was also prioritized because recurring conflicts in class timetables disrupted both teaching and student progression. These examples, shown in Table 3, demonstrate how operational constraints and cross-module dependencies shaped the priority decisions.

Should-level requirements were important but not foundational for early system deployment. These items primarily addressed service enhancements such as student access to grade histories or digital attendance. Although these features improve user experience, they do not directly influence regulatory obligations or curriculum governance. Their placement in the Should category reflects the need to implement foundational functions before expanding to supporting services.

The refinement pathway emphasized how raw stakeholder input required transformation before prioritization. As illustrated in Table 2, stakeholder statements were often incomplete or expressed in non-technical terms. Refining these statements involved interpreting workflow context, identifying hidden dependencies, and clarifying ambiguous conditions. Table 3 shows how refined interpretations were then linked to specific priority levels. This iterative process strengthened the internal validity of the requirement set and ensured that priority decisions were grounded in evidence.

Table 2. Sample Elicited Requirements from Stakeholders

Stakeholder Statements	Proposed Software Requirements	Source
"Assessment practices differ between lecturers."	The system should allow configuration of assessment weighting schemes.	Vice Chair II
"Class schedules frequently conflict with each other."	The system should generate schedules automatically to reduce class conflicts.	Vice Chair I
"Course registration is still filled out and validated manually."	The system should provide online KRS submission with advisor validation.	Program Head & Lecturer
"Student attendance is still recorded using paper."	The system should support digital attendance tracking for students.	Lecturer
"We have to re-enter academic data manually for PDDIKTI reporting."	The system should synchronize academic data with the Neo Feeder service.	IT Staff
"Students often have difficulty accessing their grades and study records."	The system should offer student access to grades and study records.	Students

Several methodological insights emerged from the refinement and prioritization processes. Multi-level stakeholder participation confirmed that academic leaders, lecturers, students, and IT staff emphasize different aspects of academic operations, which aligns with research showing that stakeholder diversity is essential for achieving requirement completeness and resolving conflicting expectations (Razali & Anwar, 2011; Mulla & Girase, 2012). The decision patterns observed in Table 3 also reflect findings from requirement dependency

studies, particularly the role of risk and operational coherence in determining priority levels in constrained environments, as noted by Daneva et al. (2013). The structured transformation from qualitative statements to interpreted and validated requirements, illustrated through Table 2 and Table 3, is consistent with the literature indicating that contextual interpretation strengthens traceability and internal validity in higher-education information system development (Tam et al., 2022).

Table 3. Sample Requirements Priority Analysis

Statements from Stakeholder	Interpreted Requirement	MoS CoW Priority	Analysis Results
"Assessment practices differ between lecturers."	System should provide configurable assessment weighting schemes.	Must Have	Required to standardize grading across programs; directly impacts academic integrity, transcript accuracy, and PDDIKTI reporting. Identified as a dependency for grade entry, transcript generation, and curriculum compliance.
"Class schedules frequently conflict with each other."	System should offer automated schedule generation to minimize class conflicts.	Must Have	Scheduling affects all students and lecturers simultaneously. Conflict-free scheduling is a prerequisite for course registration, room allocation, and lecturer assignment. High operational impact and strong stakeholder agreement.
"Students often have difficulty accessing their grades and study records."	System should provide student access to grades and study history.	Should Have	Important for transparency and student experience but not directly tied to regulatory compliance or core academic workflow. Can be implemented after foundational modules (grading, transcript) are stable.
"Student attendance is still recorded using paper."	System should support digital attendance tracking.	Should Have	Improves efficiency and reduces errors but considered secondary to core academic data flows. Not required for PDDIKTI synchronization; minimal cross-module dependencies.

This study has limitations that create opportunities for future work. The analysis focused on the prioritization of requirements but did not extend to the full specification, modeling, or architectural design of the Academic Information System. As a result, several technical considerations remain outside the scope of this conference paper. The prioritized requirement set and methodological pathway established here form a foundation for subsequent research that will develop a complete software requirements specification and map priority outcomes to system modules and implementation strategies. This planned follow-up will build directly on the process summarized in Figure 1 and the analytical insights presented in Figure 2, Table 2, and Table 3, and will contribute deeper technical guidance for institutions undertaking digital transformation in resource-limited health higher-education environments.

#### 4. Conclusions

This study documented how a higher-education institution identified and prioritized software requirements for a new Academic Information System. Manual academic operations produced diverse needs across curriculum, scheduling, assessment, and reporting. Using interviews and document analysis, the research team captured these needs and refined them into structured requirements. The overall workflow, shown in Figure 1, enabled consistent interpretation and validation across stakeholder groups.

The MoSCoW method produced a prioritized set consisting of 23 Must-Have, 16 Should-Have, 11 Could-Have, and 2 Won't-Have requirements. Must-level items reflected regulatory obligations, academic integrity needs, and key operational dependencies. Should-level items focused on service enhancement rather than core stability. Tables 2 and 3 illustrated how raw statements were transformed into justified priority decisions. The results suggest that structured qualitative elicitation combined with MoSCoW is effective in low-resource contexts because it supports consensus and incremental planning.

The study contributes a concise and replicable approach for institutions initiating digital transformation. Stakeholder diversity proved essential for identifying hidden dependencies, and the prioritization logic offers a practical foundation for phased system development in similar academic environments.

This work still has scope limitations. It addressed prioritization but not full specification or system design. Further research is required to develop a complete SRS and link prioritized requirements to architectural and implementation plans. These areas will be expanded in a subsequent journal article that builds on the findings of this conference paper.

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